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The Conference of the 19th International Symposium on Electronic Art, ISEA2013, was held at the University of Sydney from 11-13 June, 2013. Presented by the Australian Network for Art and Technology (ANAT) and held alongside Vivid Sydney, the Symposium showcased a selection of electronic and media artworks from around the world and staged a suite of events across Sydney that provided a platform for the lively exchange of future-focused ideas. Speakers at the conference were invited to respond to several topics linked to ISEA2013's theme Resistance is Futile. Following the conference, participants were invited to develop their presentation into a scholarly paper for publication in the proceedings.

The papers collected here were peer reviewed to HERDC standards (two reviewers per paper) by colleagues from around the world. The review process for the proceedings was separate from the review process for acceptance of abstracts. Kathy Cleland, Laura Fisher and Ross Harley then edited and compiled the final versions, and would like to thank all the authors and peer reviewers for their contributions.

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ISEA2013 PROCEEDINGS
Table of Content

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Cybernetics in Society and Art

Abstract:

This paper argues that cybernetics is a description of **systems in conversation**: that is, it is about systems "talking" to each other, engaging in processes through which information is communicated or exchanged between each system or each element in a particular system, say a body or a society. It proposes that cybernetics describes the process, or mechanism, that lies at the basis of all conversation and interaction and that this factor makes it valuable for the analysis of not only electronic communication systems but also of societal organisation and intra-communication and for interaction within the visual/electronic arts.

The paper discusses the actual process of Cybernetics as a feedback driven mechanism for the self-regulation of a collection of logically linked objects (*i.e.,* a system). These may constitute a machine of some sort, a biological body, a society or an interactive artwork and its interlocutors. The paper then looks at a variety of examples of systems that operate through cybernetic principles and thus demonstrate various aspects of the cybernetic process. After a discussion of the basic principles using the primary example of a thermostat, the paper looks at Stafford Beer's *Cybersyn* project developed for the self-regulation of the Chilean economy. Following this it examines the conversational, *i.e.*, interactive, behaviour of a number of artworks, beginning with Gordon Pask's *Colloquy of Mobiles* developed for Cybernetic Serendipity in 1968. It then looks at some Australian and international examples of interactive art that show various levels of cybernetic behaviours. These include Stan Osotja-Kotkowski's interactive paintings of the early 1970s, Mari Velonaki's *Fish-Bird* robotics project circa 2006 and Stelarc's *Prosthetic Head* (2003-2009).

Keywords:
Cybernetics, self-regulating systems, Cybersyn, conversation, interactive art.

This article proposes that cybernetics, when all is said and done, is about the conversation: that is, about systems "talking" to each other, which itself is a process of communicating or exchanging information between each system. A crucial point is that this information has to be recognisable so as to change something within the "receiver", while the response or the "feedback" the receiver provides also has to be recognisable to the sender so as to change something in the original "sender", thus modulating/moderating their response. Therefore cybernetics is about conversation through both recognition, and change and adaptability within some system.

I use the term conversation because it is readily familiar. It is something that most of us *engage* in on a day-to-day basis, communicating with our partners, our colleagues, people we meet at parties or conferences, when we go to the shops, or a wide range of other situations, and these can include communicating with other species of living creatures as well as various species of mechanical objects.

In a more general sense, conversation takes place between all kinds of systems and especially those we think of as being living "entities" (i.e., having some quality of being a living thing (or showing signs of life)). It is this notion of 'living thing' that opens up the spectrum of things that will behave in cybernetic ways: e.g., human or animal bodies that undergo metabolic processes, and possess the capacity to fuel and supply those processes; ecological systems in which predator-prey processes occur or in which the shedding or excretion of waste products feeds some other class of entity within the overall proximal system.

Social systems, too, are usually cybernetic (although one might be justified in wondering about that these days). That is, they involve the operation of feedback structures that allow exchanges of various materials and information or the adaptations necessary to accommodate changes in the proximal environment.

Cybernetics also operates in systems we usually think of as being mechanical. In fact when Norbert Wiener adopted the term he was thinking specifically about mechanical systems, although he had also already been introduced to notions of feedback control in neurological systems in his work with the Mexican neurologist Arturo Rosenblueth, particularly in the reduction of tremor (or "hunting") through proprioception in the limbs.[1]

Cybernetics, as a theory described by its mathematics, was developed by Wiener[2] out of the wartime need to dynamically point anti-aircraft guns so they would be capable of hitting an enemy aircraft while it was traversing the sky, given that the shell would take time to get up to the aircraft. So, in effect, it was a predictive method that accounted for the time it took for the result to occur, and it greatly increased the chances of the result occurring. It was developed by creating a mathematics in which the result, the output, could be fed back into the ballistic maths in real-time as one of the inputs so the artillery system could make the necessary accommodations.

But cybernetics has a much deeper past than these dark arts. Ultimately it drives evolution (though the loop may be generations long) and in a more palpable way it drives human evolution, particular in its social forms through one utterly important process: that of conversation, which, itself, will have come about through signalling processes; inevitably the signal that there is a predator nearby, or that this is where the honey is. Wiener also recognised that it was applicable in many areas of machine control, and that it was analogous to the behaviour of animals and people in many ways, for example in the development and coherence of societies. A particularly interesting example of the use of cybernetics in politico-economic systems was the Chilean Cybersyn project of 1971-73, which I shall come to shortly.

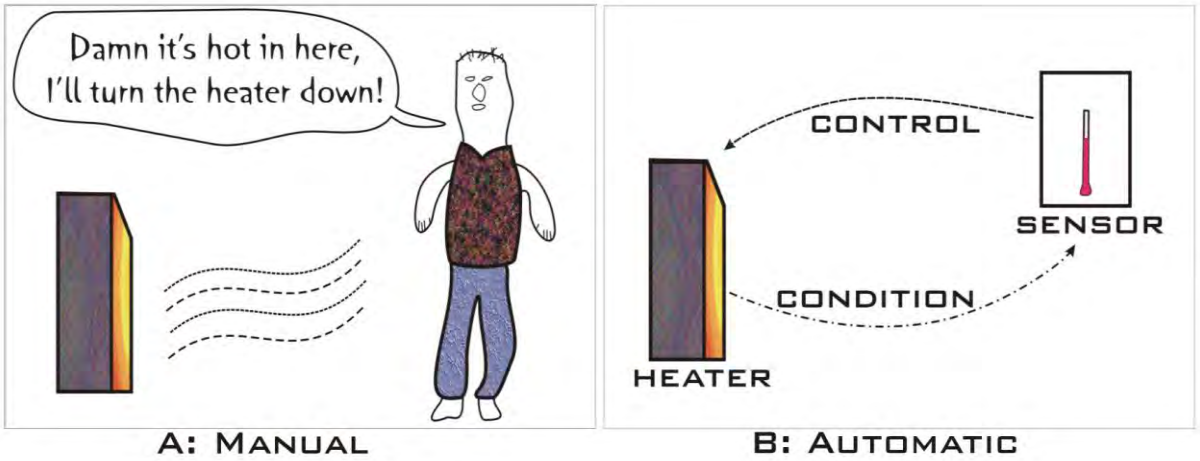

Fig. 1: The classic feedback control example of the thermostat. The sensor, human (A) or thermostat (B), senses the current condition and sends a control signal to the heater to modify its behaviour. [Graphic: Stephen Jones]

So, more formally, cybernetics is a theory of responsive (or adaptive) systems, in which reciprocal action-response (feedforward–feedback) cycles form the basic activity of communication. To illustrate, Wiener saw that in many circumstances the simple sending of a message to some device, say a heating system, was not going to be very useful unless there was some way of modifying that message so as to adapt to the changes that its implementation wrought. Continually telling the heater to increase the heat will only make the room unbearably hot, unless its occupant changes the message to say that we are warm enough now. To achieve some kind of automatic control over the heating system it must be equipped with sensors that provide appropriate information so that the feedback to the heater will be more or less useful in modulating the flow of what is, in fact, communication.

On a rather higher level, there is a biological/neurological need for feedback. It is necessary for the development of consciousness within each individual. At birth the infant is effectively mentally unformed, although some formative processes may have taken place while it is a foetus. But, shortly after birth, the first things that occur are that the nerves and the brain have to be educated through experience (i.e., their activity) that they are here for particular tasks, be those vision (in the short term) or speech (in the longer term). For example, the impact of

1 Rosenblueth, A; Wiener, N and Bigelow, J. (1943) "Behaviour, Purpose and Teleology" *Philosophy of Science*, vol.10, pp.18-24.

2 Norbert Wiener, *Cybernetics. Or Control and Communications in the Animal and the Machine*. New York, Wiley, (1948).

bumping into something, one's own body or one's mother, means that the affected nerves increase their association with movement or touch and the brain incorporates this in its logging of how to use the panoply of nerves that arrive at it to do the things that become necessary to do. Thus also, the brain, if it isn't appropriately stimulated, ignores the possibility that a lost stimulus might have generated (to be obvious, a deaf child will not learn language).

For Wiener, cybernetic processes fit into a larger category of *communications* systems. Communication is about the sending of *messages* between entities in which the message is a pattern of changes or differences (i.e., information) transmitted between the entities at either end of the channel. Supposing that the entity receiving the transmission is able to decode the message, then a communication has occurred, and in a certain sense a measure of *control* has been communicated between the entities.[3] This communication then becomes part of a *cybernetic* process when the receiver of the message responds, sending a message back to the original sender (which may be as simple as raising the temperature in the room), closing a loop of information between the two entities. Consider a conversation – I speak to you and you consider what I have said and produce a response back to me which I then consider. Supposing that I understand your response and respond in turn to you, we are producing a circular process that has a recognisable existence as a "conversation". This conversation will probably continue until one or the other of us fails to respond (a response in itself), or responds by stopping the process, and the conversation then ends [Fig.2].

The kind of information passed back to the source by the receiver, as some proportion of the output behaviour of the source, is called feedback and it becomes available to modulate the behaviour of the source in ways that are permitted by the construction of that source. When that proportion of information fed back is a function of some sort of *comparison* (*e.g.,* the success of the machine in reaching some goal) and inhibits the system, perhaps through being subtracted from the input, then the machine or the system is said to reach a basic level of *control*. Thus, as Wiener states, "control of a machine on the basis of its actual performance rather than its expected performance is known as feedback".[4] The process mentioned here is negative feedback and largely has a stabilising impact on the system of coupled components in which it is operating. Positive feedback on the other hand, in which the information fed back excites the system, can cause it to oscillate and go wildly out of control [Fig.3].

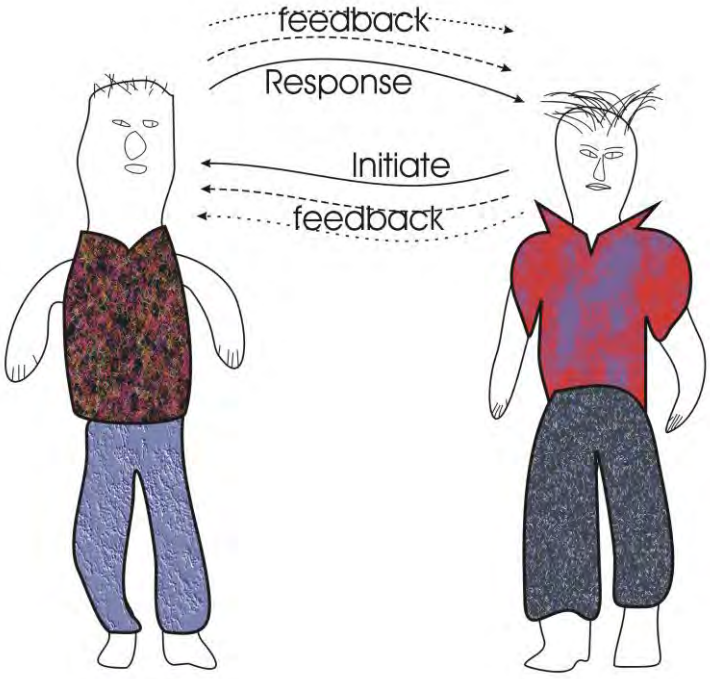

Fig. 2: A conversation is a two way interaction in which, after the opening gambit, each response is a feedback from the previous. [Graphic: Stephen Jones]

3 Wiener, Norbert (1950) *The* Human *Use of Human Beings - Cybernetics and Society*, Eyre and Spottiswoode, London, p.8.

4 Ibid, p.12.

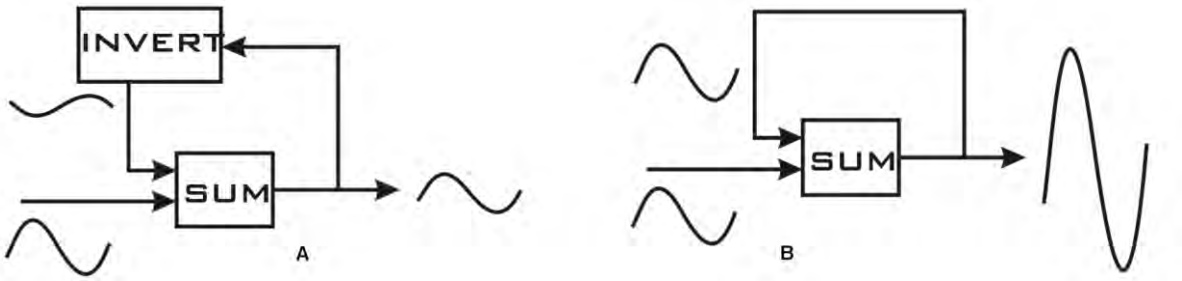

Fig. 3: Feedback can be either positive or negative (or anything in between). A: shows the inhibitory function of negative feedback. B: shows the tendency to oscillate caused by positive feedback. [Graphic: Stephen Jones]

Now, cybernetics does not simply operate on the small scale. As mentioned above, it is at the basis of large scale systems, such as ecologies or socio-political systems. I want now to venture into a description of a famous use of cybernetics in an economic system.

Stafford Beer and Fernando Flores – the Chilean industry coordination system – CYBERSYN (Cybernetic Synergy)

As the English cybernetician, Stafford Beer asked in *Platform for Change*, his post-1973 discussion of the potential of cybernetics in social, political, governmental and economic contexts: "What is cybernetics, that government should need it?". His reply is that it is "the science of effective organization"[5] that operates in all complex systems be they biological, neurophysiological, social or economic. He then argues that cybernetics is the tool that allows us to see that there are fundamental rules which, if not observed, lead to the breakdown of the system, to instability, to a failure to adapt and evolve.

The study of the cybernetics of a complex system, for example a political system, can show the way to making the system viable. A viable system has several important characteristics. Firstly it is **homeostatic**, in that it has a tendency to run towards a dynamic equilibrium condition, static equilibrium being the equivalent of death. In a dynamic equilibrium "the many parts of the complex system absorb each other's capacity to disrupt the whole."[6] It is in this point that, for example, biological diversity has its value. The more entities and species that are functioning within the system, the more opportunities for each member of the system to "absorb each other's capacity to disrupt the whole."

5 Stafford Beer, *Platform for Change*, London, New York: John Wiley and Sons, 1975, p.425.
6 Ibid, p.426.

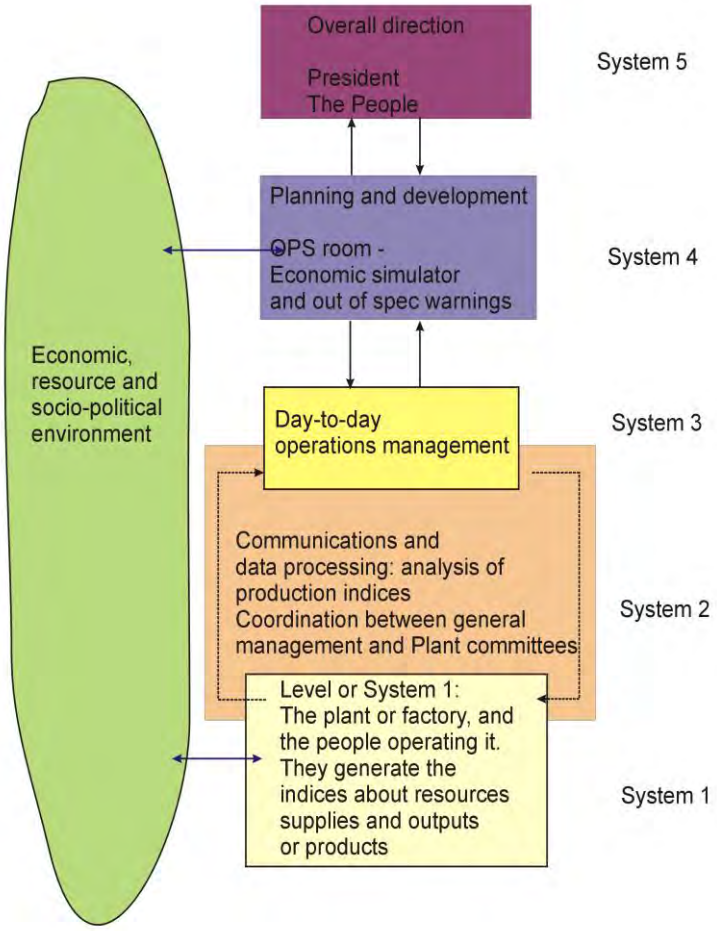

Fig. 4: The layers of viable systems that made up the Cybersyn project
[graphic: Stephen Jones]

Secondly, it must be **adaptive**, in that a system should change in response to some environmental change. However a system in which the stable region is moved beyond the physiological capacity of its collective – for example if the surrounding climate becomes hotter and drier so that there is less water available in the system – it will then lose its adaptability and become disrupted largely through a loss of coherence.

These two conditions, and the fact that there should be constant real-time interaction between systems of the overall aggregate, contribute to its **viability,** which become the criterion against which the success/value of the system as organised was judged.

For Beer (who was a very successful operations research scientist and management consultant) the opportunity to produce an economically and politically *adaptive* and potentially real-time control system arose in Chile in 1971 when he was asked by Fernando Flores, the director of the Allende government's program of nationalisation of Chilean industry, to assist in producing a system to monitor and regulate its effects. Allende's program of nationalisation had led to a situation that was very difficult to control as it became more and more difficult to monitor. The problem became a matter of effective management and led to serious instability in the economy, and so Flores requested Beer's "advice on applying cybernetic principles to the management of the nationalised sector"[7] of Chile's economy.

Beer proposed "that a system based on a firm understanding of cybernetic principles could accomplish technical

7 Eden Medina, "Designing Freedom, Regulating a Nation: Socialist Cybernetics n Allende's Chile," *Journal of Latin American Studies*, issue 38, 2006, 571-606.

feats deemed impossible in the developed world, even with Chile's limited technological resources" arguing that the "system should behave in a 'decentralising, worker-participative, and anti-bureaucratic manner'."[8]

The proposed system would "network every firm in the expanding nationalised sector of the economy to a central computer in Santiago, enabling the government to grasp the status of production quickly and respond to economic "crises in real time."[9] Named Cybersyn, it was a plan for a new technological system – developed (in 1971) by Beer and a small Chilean team – which would be capable of regulating Chile's economic transition in a manner consistent with the socialist principles of Allende's presidency.[10]

Cybersyn was based on Beer's notion of the viable system model (VSM), in which the system would be capable (through its variety of possible states) of adapting to ongoing changes in critical variables including inputs, resources and demands, thus maintaining its homeostasis within a workable range. The system would use feedback throughout the sub-systems of the VSM to link the people to their government. In the VSM the strata of systems into which the economy was divided each fed information up to the stratum above and downwards to the stratum below. The information going upwards consisted in data regarding available resources, the productivity of the factory and the social health of the workers. The data fed back down the strata consisted in how to maximise with the productivity of particular outputs, how to deal with crises, and the distribution of resources and products or output.

As Medina notes: "Beer constructed a five-tier model for viable systems, which he based on the human neurosystem. In spite of the model's biological origins, Beer maintained that the abstract structure could be applied in numerous contexts, including the firm, the economic enterprise, the body and the state."[11]

The VSM that Beer constructed for the Chilean economy was an hierarchical structure of the strata operating at each level of the company/organisation. Each stratum was to be a self-sufficient system which would only transmit problems up the hierarchy if necessary; if it couldn't deal with them itself. The lower levels, (levels 1, 2 and 3) governed daily operations, while levels 4 and 5 governed the direction and future development of the enterprise.

Level 1 handled supply of materials and the distribution of products, which also generated production indices, *e.g.*, how much was used and how much was produced.

Level 2 communicated the production indices to the various sectors, plant and factory, of
Level 1, and up the hierarchy to the director of operations at

Level 3, which looked after day-to-day management matters. These three levels were responsible for the overall functioning of the plant and handled the details that would otherwise have overwhelmed the management on the upper Levels 4 and 5. However major production problems that could not be resolved by the lower three levels were referred upward to Level 4 management, which was concerned with planning and enterprise development.

Level 4 was also the level at which the autonomy of the lower levels could be rescinded and a more centralised management could intervene. It was the stratum at which the senior management team met to consider the real-time flow of indices, and to whom the results of simulation of the production trends as compared to historical data were reported. It was the place in which a synopsis of the whole economic process could be seen and considered. If a parameter fell outside the expected range it would be flagged and a warning emitted to the head of the operations management team (on Level 3) at the particular factory concerned. The committee that considered these data at Level 4 worked in what was known as the Ops Room, a rather Space Age environment in which all the telex data and simulation outputs were displayed on screens.

Level 5 represented the CEO of the enterprise who "determined the overall direction of the enterprise."[12] Generally this was the president, Dr. Allende, although he always intended that it be the people themselves.[13]

It is the recursion, the ongoing conversation, within and between levels of the model that make it cybernetic.

8 Ibid, p.572.
9 Ibid.
10 Ibid.
11 Medina, op cit, p.583.
12 Medina, op cit, p.585.
13 Beer, op cit, p.447.

Each layer is capable of receiving data from its internal operation, of communicating that data to a higher level in the system, and each layer is capable of understanding the data fed back down to lower levels in response. The system is constantly adapting, more or less in real-time, to the changes and demands of the environment which, while being resources and supplies, also consisted of the people themselves.

Cybersyn was always designed "to provide an instrumental embodiment of Chile's socialist politics,"[14] which involved worker participation in government and in the management of industry. There were also thoughts about devolving it to each factory by building a simplified ops room that could enhance local workers' understanding of the factory's operations, assist their decision making and support the collectivisation of the factory so that each worker was less inclined to compete individualistically with others in the factory but would work towards an overall collective production output. Beer's interest overall was to expand Cybersyn type concepts to the political sphere. However these less technocratic aspects of his vision were not to be espoused by the Chilean engineers who were actually operating Cybersyn, nor the conservative opposition who argued that it would produce centralised or totalitarian (a la 1984) control (a projection, of course, of their own intentions), and hated the fact that it was intended to create an environment of workers' control.

But Cybersyn was to be tested and it succeeded hugely with its first test. The story is told by Andy Beckett of the Guardian newspaper:

> "Across Chile, with secret support from the CIA, conservative small businessmen went on strike. Food and fuel supplies threatened to run out. Then the government realised that Cybersyn offered a way of outflanking the strikers. The telexes could be used to obtain intelligence about where scarcities were worst, and where people were still working who could alleviate them. The control rooms in Santiago were staffed day and night. People slept in them - even government ministers. "The rooms came alive in the most extraordinary way," says Espejo. "We felt that we were in the centre of the universe." The strike failed to bring down Allende."[15]

However it never even had a chance on the next attack. On September 11, 1973, (a notable date) the Chilean opposition, with the backing and encouragement of the U.S. CIA, launched a military coup against Allende's government. Allende was assassinated and the Presidential palace put to the torch. The Military tried to understand Cybersyn but couldn't and dismantled it. The rest is sad history and the hypocritical support of very nasty political leaders for the sake of the wealthy owners of various supposedly democratic governments.

But in this paper I am talking about **Cybernetics in art, something which is particularly apposite to Interactive art.**

In 1967 the notions of cybernetics were taken up by Roy Ascott in the UK. This step, along with the systems art movement and Jack Burnham's "system's aesthetic", established the recognition of and, for a short while, direct push into a cybernetic art. These early practices mostly consisted of interactive art. In a 1966-67 paper in *Cybernetica*, Ascott spoke of "art that behaves", art that is intended "to draw the spectator into active participation in the act of creation" and that to accomplish this "a feedback loop is established so that the evolution of the artwork/experience is governed by the intimate involvement of the spectator."[16] It is this notion that lies at the basis of interactive art: the artist wants to engage the viewer in a dialogue and this interplay is necessary for the completeness of the work.

Not long after this, in his 1968 book *Beyond Modern Sculpture*,[17] Burnham developed his systems aesthetic (derived in part from the cybernetics of Wiener but also from von Bertalanffy's *General Systems Theory*). This aesthetic theory was a means for understanding developments in art arising from Kinetic art and what was then becoming conceptual art and was otherwise leading into systems art, some of which involved various aspects of computing (given a wide ranging definition of that concept). These are the kinds of developments that Donald

14 Medina, *op cit*, p.596.

15 Andy Beckett, "Santiago dreaming," *The Guardian*, Monday 8 September 2003 [http://www.guardian.co.uk/technology/2003/sep/08/sciencenews.chile]

16 Ascott, Roy (1967) "Behaviourist Art and the Cybernetic Vision," *Cybernetica: Review of the International Association for Cybernetics*, vol.9, no.4, 1966; vol.10, no.1, 1967, p.29.

17 Jack Burnham, *Beyond Modern Sculpture. The Effects of Science and Technology on the Sculpture of this Century*. Allen Lane: The Penguin Press, London, (1968).

Brook discussed in his lecture "Flight from the Object".[18] However systems art, while potentially being pro-active, is not necessarily fully cybernetic.

Also in 1968, the ICA in London presented *Cybernetic Serendipity*, curated by Jasia Reichardt.[19] This exhibition attempted to show examples of almost all versions of art that in some way or another involved the computer in its making. It included many works in which I would argue there was little actual cybernetic process, but one or two showed it off well. I will come to one of these, Gordon Pask's *Colloquy of Mobiles*, shortly.

So, what is cybernetic art? To my mind, it is any work that by some process is capable of recognising, understanding, and taking into account some aspect of any information that is reflected back to it from its output or behaviour. This is feedback, and it is necessarily constitutive of one form or another of **interactive art**.

The crucial point is that both the artwork and its spectator/interlocutor must possess the capacity to understand and act appropriately on the output of the other, the feedback. This would require a common vocabulary of some kind, *i.e.*, the content of the feedback has to be understandable by the entity to whom it is directed. And of course, depending on how far apart the species of entities (objects and audiences) are, it may require a considerable amount of learning to take place over the process/period of the interaction (even if these occur as a number of sessions).

However there is a caveat: **while interactive art may have many of the factors necessary to a cybernetic process, it is by no means necessarily cybernetic.** Entities engaging in interactive art must possess the ability to change their state to accommodate changes in their environment. This is a necessary first condition that has to be possessed by any entity that will undergo interaction. Interactive artworks occupy a wide range of levels between the potential fully conversational robot and the video replay that simply switches on when the spectator enters the gallery.

Interaction involves engagement with, usually, a single other entity (person or machine), and is one-to-one. The work is not complete without the interaction, but the focus will be on reciprocal relationships and their development over time. To interact is usually considered to involve engaging with devices of varying kinds, through the exercise of controls or sensors or other data gathering attachments that provide information as to changes in local conditions, and thus permit the spectator, as user, to participate in the process of the thing so that some kind of reciprocal relationship develops with it.

Interaction may simply be a process of controlling some machine, for example in the way that one drives a car (it will generally not talk back, or at least not yet). Or, for example in art, interaction would ideally involve engagement with, usually, a single other entity (person or machine), and the work is not complete without the interaction, but the focus will be on possible reciprocal relationships and their development over time. The key is that some sort of communication transpires; a reciprocal exchange of (generally 'meaningful') information that endures because of that meaningfulness and its reciprocation.

But for this to occur it must be able to sense its environment and affect internal changes that accommodate those sensed external changes. These processes are structurally fundamental to interaction, and they constitute the primary level of the process of communication.[20] They require the two orthogonally related conditions of 'autonomy' and 'agency'.

By any measure the peak class of interaction is conversation – an ongoing, inherently stable, multi-sided, adaptive process of information transfer, that consists in alternating, reciprocal production and transmission of information and response to that information, through consideration, recognition (of signs), understanding (of their meanings), development or extension of 'ideas' embodied in the messages and the production of further transmissions. That is, conversation must involve *understanding* which is a function of a mutually agreed, or learned, set of signs (language) that convey the meaning.

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18 Brook, 1970, *op cit*.

19 Jasia Reichardt, *Cybernetic Serendipity: the computer and the arts*, London: Studio International (1968). Catalogue of the exhibition held at the Institute of Contemporary Art, Nash House, The Mall, London, August 2 - October 20, 1968.

20 Stephen Jones, "Interaction Theory and the Artwork," in *Interaction: Systems, Practice and Theory*, ed. Ernest Edmonds and Ross Gibson, (Sydney: University of Technology Sydney, 16–19 November 2004): 283–303.

Conversation necessarily involves feedback; the closing of the loop through the response by the second party, which is in turn considered and responded to by the first. Thus a continuing circle of feedback undergoes temporal development as the conversation continues, and each party is, at least, able to utilise its existing repertoire of behaviours – ranging from language and gesture to the demonstration of objects and processes or the operation of machines. This circular feedback relation, though largely neglected in contemporary art over recent decades, provides a framework of immense value in understanding how interactive systems can work. It is the circular feedback system that renders the conversation something greater than what exists within each party, such that its coherence gives it a mutually embodied autopoietic presence.

More interestingly, in any intelligent entity (living or artificial) the learning of a set of signs to convey meaning will require the development of new behavioural repertoire through a process of adaptation.

Regarding conversation, and paraphrasing a member of the original group of British cyberneticians, Gordon Pask:[21]

1. Conversation between individuals occurs over time and alters the mental contents of each individual over that time.
2. Conversations have a start and a finish and unfold over time, although they may run in parallel, supposing more than two individuals are engaged.
3. The conversation is in the *intersection* of the minds of the individuals engaged. That is, it exists as a superstructure that is not contained exclusively in either mind but is necessarily a function of the activity of both. This is what I mean by saying that the conversation embodies an autopoietic structure.
4. There is a process of feedback that gives conversation its unified character.
5. There is a "transfer of tokens" (language, signs) between each individual within the conversation.
6. These 'tokens' must be mutually understandable. However, the interpretations of the conversation are nevertheless a function of each individual mind.

Examples of art that behaves and may interact with its audience.

Gordon Pask's *Colloquy of Mobiles.* This work from one of the British cyberneticians constituted what Pask thought of as an "aesthetically potent environment" that "encourages the hearer or viewer to explore it, to learn about it [and] to form a hierarchy of concepts that refer to it."[22] It consisted in a group of mobiles that engaged in discourse with each other and in which the spectator could be engaged if he or she wished. Two types of mobiles are involved, each of which have a selection of programmes and drives that allow them to learn "how to deploy its programmes in order to achieve a goal."[23] Members of each type may have cooperated with a member of the other type to achieve a goal, "for one possesses programmes that are not in the repertoire of the other and jointly [the two types together] can achieve more than both individuals in isolation." The mobiles must communicate to achieve this cooperation which they do "in a simple language of [different coloured and time modulated] light flashes and [different tones and time modulations of] sounds"[24], and the spectator may also engage in this discourse if they wished.

Each mobile has several needs which it tries to satisfy, but to do so it must engage with a mobile of the other type. For example, type 1 mobiles possess a light which casts a beam outwards but cannot be focussed on itself, however to satisfy one of its needs that beam must strike it on some otherwise inaccessible part of its 'anatomy'. To do this the beam must be reflected back onto it by a mobile of the second type. So first, the originating mobile must seek out a mobile of the second type by sending out intermittent light signals and searching by rotating about its axes. If the search is successful type 2 mobile synchronises a sound signal with type 1's flashing light and, once it has detected the correlated sound signal, it stops its rotation and replies to the type 2 mobile with a short flash of its orange light. At this point the type 2 mobile reflects type 1's orange beam of light back onto type 1's receptor and its goal satisfaction is increased, and the type 1 mobile emits sound signals indicating it has

21 Gordon Pask, "Heinz von Foerster's Self Organization, the Progenitor of Conversation and Interaction Theories." *Systems Research* vol.13, no.3, (1996): 351–364.

22 Gordon Pask, in Jasia Reichardt, *Cybernetic Serendipity: the computer and the arts*, London: Studio International (1968), p.34. This is the catalogue of the exhibition held at the Institute of Contemporary Art, Nash House, The Mall, London, August 2 - October 20, 1968.

23 Pask, *op cit*, p.35.

24 Pask, *op cit*, p.35 and Pask, "A comment, a case history and a plan," in Jasia Reichardt, *Cybernetics Art and Ideas*, Greenwich, Connecticut: New York Graphic Society Ltd, (1971), p.89.

received the reinforcement of its satisfaction seeking and the 'conversation' is then able to continue.[25] To provide similar satisfaction of need for type 2 mobiles the type 2 mobile needs to receive the reinforcement in response to the type 2's correlated sound signal.

The mobiles of both types generate an intriguing and aesthetically potent environment. Pask notes that the mobiles produce quite complex patterns of light and sound which spectators may have some chance of interpreting, and suggests that if a spectator were given the means to produce signs in the mobiles' language it would be quite possible for them to communicate with the mobiles. If they did they could use similar patterns of signs to interact with the mobiles and they may well become engaged in a higher level conversational system with them. Pask goes on to note that he doesn't know what might happen then.[26]

Meanwhile in Australia
Stan Ostoja-Kotkowski's interactive sculptures and paintings.

The sculptures, such as the Laser Chromason, were largely synaesthetic devices that responded to contextual sound with light and colour, but didn't generate much primary (or originary) output. However a number of his interactive paintings driven by a Theremin did. These were paintings made either in baked enamel on steel or as fine sand blasted op-art patterns also on steel. The steel "canvas" meant that the painting itself could be utilised as an antenna for the theremin, and if you stepped up to the painting and waved your hands before it, it would growl and whistle and eventually scream the closer you got the picture. Thus the paintings were a system that could be played, both by an unskilled audience and by a skilled musician who might able to control the pitch of the "instrument".

Ostoja-Kotkowski was a serious maverick and while, particularly in the 1970s, he continued to produce works like the interactive (or Theremin) paintings, he had previously, around 1966, proposed such wild things as a control panel that could allow the artist to play the ensemble of video raster-manipulation devices built for him by Philips Industries in Adelaide and with which he made (c.1962-66) a remarkable series of photographs of twisted 3D raster images that were not far from the work of Herbert Franke. This may well have been the first description of a video image synthesiser.[27]

But even more interestingly he proposed later that the control system for a large scale presentation event could be directly controlled by the artist's mind if a device, based on the EEG, could be built that would draw enough detail from the EEG signals to apply to the controls of different sections of the production system. As he suggested

> "the translation of the activities of alphawaves into forms, colours, shapes and movements is technically possible. By the use of computers, a development of electronics used on my previous experiments with light, optics, polarchromatics and lasers would provide enough variety of basic material for the performers-composers-artists to draw on, and to make their conceptions audible and visible to the audience."[28]

However, this is an idea for which, even now, small breakthroughs are made, although the differentiation of control details is still a major problem. Should it become possible then we really will be able to enter into direct conversation with the machine.

Another of the early experimental artists working in Australia was the dancer **Philippa Cullen**. She was a thoroughly trained modern dancer who had her main active period between around 1969 and 1975 (in which year she died in India). She developed an interest in being able to dance to music that she and her company generated from the dancing. *i.e.*, the creation of a loop in which the dance made the sound and the sound then drove the movements.

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25 Gordon Pask, "A comment, a case history and a plan," in Jasia Reichardt, *Cybernetics Art and Ideas*, Greenwich, Connecticut: New York Graphic Society Ltd, (1971), p.89.
26 Ibid, p.91.
27 Stephen Jones, "Josef Stanislaw Ostoja-Kotkowski: Light becomes the Medium", *Meanjin*, vol.68, no.1, (Autumn 2009). Stephen Jones, *Synthetics: Aspects of Art & Technology in Australia, 1956-1975*, Cambridge, Mass.: MIT Press, (2011).
28 J.S. Ostoja-Kotkowski, "Investigation into the possibilities of the use of alpha waves in the creative arts", Washington, DC: The Conference Board of Associated Research Councils, Committee on International Exchange of Persons, (1973).

She saw a theremin being used in an interactive video and sound installation by Optronic Kinetics at the Tin Sheds at the University of Sydney and realised that the theremin they were using, which had a very long wire antenna, would work perfectly well on stage. She asked the electrical engineer, David Smith from Optronic Kinetics, to build her a similar device, with which she practised to work out what kind of movements would work with it. She then set up a group of nine dancers, three of whom would lead the movements and six of whom would act as a kind of 'Greek chorus' in background movement. The work was presented as *Electronic Aspects* (1970) in the Union Theatre at the University, but Cullen realised that the continuous sine wave tones were not very interesting. She was studying at the University and met a musician named Greg Schiemer and another electrical engineer named Phil Connor, and together they devised a new approach to the theremin in which its sine-wave output of varying frequencies could be used to great effect with the aid of a frequency-to-voltage converter and a peak detector which acted as control voltage sources for an EMS VCS3 audio synthesiser.

The result of all this work was *Homage to Theremin II* (1972) which she and her company (including Jackie Carroll and Deirdre Evans) performed at International House at the University of Sydney in April 1972. A collection of interesting antennae had been designed by Manuel Nobleza and with these and the reworked audio synthesiser they performed a dance work in which the dancers interacted directly with the thermins, having previously learned how to use them to make a very wide range of interesting sounds.

Cullen went to Europe after this and after about a year returned with a set of new ideas, among which was a proposal for a set of pressure sensitive floors. These were built for her by Arthur Spring and used in March 1975 in Canberra at the Computers and Electronics in the Arts program of Australia '75. She went overseas again after this and, being already quite ill, much to everybody's horror at the loss of such an inspiring person, she died in India in July 1975.[29]

In the same way that Cullen's dancers entered into a feedback driven conversation with the synthesiser, so does the musician also enter a cybernetic loop when playing an instrument. Even more interestingly, this becomes a social cybernetics when he or she is playing, and especially improvising, with a group of other musicians.

But it need not just be musicians. Any artist/performer who works live, such as someone playing a video synthesiser, is going to enter into a feedback loop with the system of instruments, presentation mode (screens or speakers, say), other musicians and audience. In that process the audience will often offer a particular form of feedback that will modulate performance. This would be obvious with a comedian for instance, but actors in the the theatre generally have this feedback available, as do people giving presentations and lectures.

Mari Velonaki – Fish-Bird[30]

To the audience Fish-Bird appear as a pair of wheel-chairs (thus rather disarming one's notions of the autonomous creature) quietly rolling about the gallery space, among a mess of short thermal-paper printouts all over the floor. Go quietly into their space and sooner or later (not that much later) one of them will tootle up to you like a shy animal coming to sniff you out. If you sit quietly it will hang around for a little while and then wander off, if you're active and noisy it'll get out of your way. Stay a little longer and observe their behaviour. They move towards each other or the audience – they know where the audience is and will seek them out – and one will print out a text. They also know each other's location, and they move towards each other as if seeking each other out, or break off into separate areas of the space. They also write their poems to each other.

Their behaviour may well be a mystery, however, given our culturally imbued tendency to slow down and watch the "robot" our stillness will attract it. Initially it may turn to face the spectator when they enter the gallery, while subsequent "changes of speed and direction are used to convey mood and intention."[31]

They engage in constant communication with each other about where they are, their mood, the poems they release and where the audience is. Also, they regularly attempt 'conversation' with the audience by coming up to you and perhaps dropping a printed poem at your feet. The printed poems are intended both for you and for each of them. While they appear to be only printouts, a complete version of each poem is also transmitted wirelessly

29 Stephen Jones, "Philippa Cullen: Dancing the Music", *Leonardo Music Journal*, vol.14, pp.64-73 (2004). Stephen Jones, *Synthetics: Aspects of Art & Technology in Australia, 1956-1975*, Cambridge, Mass.: MIT Press, (2011).

30 http://www.csr.acfr.usyd.edu.au/projects/Fish-Bird/index.htm

31 http://www.csr.acfr.usyd.edu.au/projects/Fish-Bird/Background.htm

to the other of the pair.

At the technical level the overall installation is monitored for audience presence and wheel-chair location by laser-scanners on the periphery of the space and video cameras in the ceiling. Their behaviours are constrained to seven behavioural sets that are governed by the resolution of a set of conditions – an index of mood determined by the day of the week, the time you spend with them, their internal condition, the current state of their relationship to each other (their interaction) and the behaviour of the spectator. The software system attempts to identify the behaviour of each participant in the installation space from their movement, and adjusts each robot's 'emotional' state on the basis of identified patterns.[32] These are encoded in a finite state machine and govern their interaction with each other and with you.

The conversation is carried through a central controller via Bluetooth using "the Active Sensor Networks architecture".[33] It is understood through a small pre-set lexicon, of which each term is meaningful to Fish and Bird. However the conversation with the audience is not so easily interpreted and while some level of consistency, due to more or less normal polite behaviour, is operational it is also up to each member of the audience to reach their own interpretations of, and to learn, the robots' behaviours. Between the robots, the content of the conversation loop is mediated through the processing of the laser and camera data by an installation controller system. This in turn stage-manages the wheel-chairs which seem to be interacting with each other and with the audience in a gently sentient manner. All this is not at all obvious to the audience, however they are included in the conversation loop (if they stick around long enough) and they also become partial content of the conversation between the robots.

If a truly autonomous cybernetic version were to be developed it might have to make its communications overt and clearly recognisable to the other, so each would have to carry their own proprioceptive, sensing and behavioural systems and ideally develop, over some growth period, sets of appropriate behaviours. It is these behaviours that become the signals, overtly sensible events, and each creature would need to be able to "see" that the other's behaviour is analogous to something it can do. That is, the signal triggers an internal, pre-established sequence. Communication here becomes a kind of dance.

Stelarc's Prosthetic Head[34]

The Prosthetic Head is a large video projection of a 3D model of Stelarc's head. It responds verbally to questions or comments typed into a keyboard on a plinth set in the gallery space in front of the projected avatar. The Head's responses are selected from a set of installed phrases based on the knowledge that Stelarc gives it. It also has a range of gestural responses: smiles, head movements, eye movements and gaze, and can seem to become quite involved in the conversation. It uses an embedded conversational agent software (a la *Eliza*) to generate its responses from its internal knowledge and your questions.

It appears to be generating feedback that is directly related to your enquiries, but since it selects from a prespecified set of sentences, this is actually an illusion. This is because, as yet, it has no capacity to generate novel statements. The feedback is what you provide based on its selections and your interpretation not so much of what it said but of why it might have said it. It functions as a product of our projections – and this brings up an important question: to what extent do we all do that when we are relating to each other?

However the Prosthetic Head is structurally open enough to make a wonderful test bed for experimenting with most of the technical (*i.e.*, computer-based) ways of learning, recognising and generating speech. It is also potentially valuable as a vehicle for developing vision, especially in face and gesture recognition. The evidence so far is that all of these processes do not seem to be possible through top-down AI-programming but are more the kinds of things for which neural networks are useful. So if one was to develop new artworks from this approach it would be useful to include a great deal of the work coming out of neural nets and especially neural and self-constructing hardware systems.

Creating a Speaking Machine

I am prompted by these thoughts to ask how we could develop a machine that could speak spontaneously and respond generatively to verbal stimulus? First, it has to have an engine for generating sounds (like phonemes), then it has to have an engine for linking sequences of sounds into 'somethings' analogous to words, each se-

32 http://www.csr.acfr.usyd.edu.au/projects/Fish-Bird/Background.htm
33 http://www.csr.acfr.usyd.edu.au/projects/Fish-Bird/Realisation.htm
34 http://www.stelarc.va.com.au/prosthetichead/index.html

quence then being required to connect to some kind of state of knowledge of itself or its world, or more usefully to be the 'mental' representation of that state of knowledge. This is self-constructing hardware implemented in us through the plasticity of our neuro-physiology, our brains. This then confers a meaning on the sequence. But, more importantly, the sound generating engine has to be controlled by the listening engine so that the machine has a means of modulating its sound/phoneme generation so that the sounds its 'teachers' hear start to be recognisable and understandable. As the machine learns to babble in more and more coherent ways, its feedback reception and production reward it more and more so that the pleasure of communication, and especially of getting what it wants, motivates the process. One could think of the overall set of production and listening engines as a desiring machine, a la Deleuze and Guattari.

One final work that demonstrates a considerable level of conversational behaviour (even if its language is obscure) is **Ken Rinaldo's *Autopoieses*[35]**

In the American artist Ken Rinaldo's ***Autopoieses*** a robotic sculptural group "interact[s] with the public and modify their [own] behaviors based on both the presence of the participants in the exhibition and the communication between each separate [object]." The sculptures "talk with each other through a hardwired network and audible telephone tones, which are a musical language for the group."[36]

It consists of 15 articulated robot sculptures made from grapevine and which give the distinct impression of being arms hanging from a grid in the roof of the gallery. It senses the presence of the spectator through infra-red sensors placed at the top of each arm, and when it knows that there is a spectator in the gallery it can respond appropriately by 'pointing' or swinging towards them. As it is moving, an infra-red sensor in the tip of the arm limits its approach to the spectator. A central controller assists the sensors to coordinate their behaviour so that a spectator can move through the "installation and have the arms interact both individually and as a group."[37]

Each arm's movement and speed is delicate and accurate. The arms and the central controller communicate on a private network. The controller gains "a feel" for the overall environment from the strings of data generated by the arms and some knowledge of the number of spectators in the gallery. If the number of "sensor hits" is large then the arms' behaviour becomes less vigorous, but as the number drops "the arm's behaviors become more vigorous and large group behaviors are expressed."[38] Group sculptural form and sound may also evolve through the generation of random numbers in the central controller's state machine. The sounds – telephone tones – constitute "a musical language that allows individual arms to communicate and give the viewer a sense of their emotional state." Rinaldo notes that "the telephone tones are a consistent language of intercommunication and manifest a sense of overall robotic group consciousness, where what is said by one effects what is said by others. *Autopoiesis* continually evolves its own behaviors in response to the unique environment and viewer/participant inputs. This group consciousness of sculptural robots manifests a cybernetic ballet of experience, with the computer/machine and viewer/participant involved in a grand dance of one sensing and responding to the other." [39]

35 see http://www.kenrinaldo.com/
36 http://www.kenrinaldo.com/
37 Ibid.
38 Ibid.
39 Ibid.

UNHOMELY

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Abstract

As winter's dusk encroaches on The Rocks, under the shadowy reach of the Sydney Harbour Bridge, anonymous and unnoticed by the lively crowds, the shutters open, and the blank upper windows flash alive in vacant Reynold's Cottage. Through the unraveling night the cottage innards twist and flutter, spit and ooze with glimpses of disarray, despair and turmoil, the windows spirit-lenses on the turbulent world of mid-twentieth century Sydney.

Keywords: Uncanny; electronic art installation; affect; database aesthetics

Unhomely is a site-specific installation, an 'expanded cinema' of 6 video channels projected inside Reynold's Cottage. Created by myself and collaborators Ross Gibson and Aaron Seymour, our aim with *Unhomely* was to create an uncanny and spooky audience experience, by filling and electrifying - possessing and processing – the cottage with unfolding scenographies created from our mid-twentieth century crime archive. The site evokes an unhomely inner city Sydney, the windows a dark lens on Sydney's hard and dirty past, a shifty spirit-world from the harbour-side of the mid-twentieth century. The audience views the cottage from outside, from both the front and back of the site. This paper outlines the creative context and design processes behind the installation *Unhomely*.

Unhomely is a new art work in the Life After Wartime suite, a local body of significant electronic art (started in 1999) that poetically engages with Sydney's past, mediated through a renowned archive of police scene of crime photographs from 1945 – 1960 [1]. In *Unhomely* the images come from several local and Sydney crimes - from murders to petty theft, assault, abortion and illegal gambling.

Uncanny, unheimlich, unhomely

The word unhomely has an evocative, recursive etymology. I am arguing here that unhomely is the modern English translation of unheimlich, a nineteenth century German concept that entered western epistemology through the field of psychoanalysis and gave to English another expression for the concept of the uncanny. Unheimlich translates to unhomely. The etymology - from the uncanny, via German psycholoanalysis, to unhomely - is a tale metonymic of the complex aesthetic and historic relations evoked in *Unhomely*.

As I am using it, and as it has been applied creatively in relation to the installation, unhomely is a fundamentally modern trope. Let's begin with uncanny, from a wonderful Celtic verb, to ken, so essential and yet so ephemeral it sits between sight and cognisance in the visual thesaurus. It arose in the Romantic movement and in the extreme expressions of 'the sublime', where the domesticated can manifest absolute terror in the form of the 'uncomfortably familiar'.

Arguably first embodied in the early nineteenth century stories of E.T.A. Hoffman and Edgar Allen Poe, the domestic uncanny is an affect to be enjoyed in private quarters, whereby one finds a thrill in "the contrast between a secure and homely interior and the fearful invasion of an alien presence; on a psychological level, its play was one of doubling, where the other is, strangely enough, experienced as a replica of the self, all the more fearsome because apparently the same" [2].

As an alienating affect, the uncanny took even greater hold on the vulnerable inhabitants of newly industrialised cities. These people experienced a sense of urban estrangement, reinforced by their powerlessness in the face of the improverishing landlord/rent system, detached from community bonds and meaningful labour, and inhabiting a fast-paced world in which they were relegated to the status of scurrying insects. The uncanny on this scale is identified with the emerging spatial fears of the late nineteenth century, including both agoraphobia and claustrophobia: still concerned with interior space, now the unhomely exists in the interiorised mind [3]. World War One sees the site of the uncanny "no longer confined to the house or city, but more properly extended to the no man's land between the trenches, or the fields of ruin left after bombardment" [4].

In 1906 German psychiatrist Ernst Jentsch wrote his essay "Zur Psychologie des Unheimlichen," translating uncanny as the richly loaded German unheimlich [5]. However it was Freud's 1919 essay "The Uncanny" exploring the phenomenon, and his analysis of E.T.A Hoffman's "The Sandman," that was more influential. Here Freud focuses particularly on the contrast and doubling of unheimlich to its base word heimlich as "concealed, hidden, secret," so that the unheimlich is that which is taboo, abhorrent and hidden from the public eye – the propensity of the familiar to turn on its owners [6]. Taken up by later philosophers such as Bachelard, Heidegger and Lukács, the unheimlich stands for the unsettledness, the fundamental world anxiety, which Heidegger sought to redress with his profound nostalgia and discourse on 'dwelling'.

Front of Reynold's Cottage © Aaron Seymour and LifeAfterWartime 2013

As Anthony Vidler puts it: "Thus historised, the uncanny might be understood as a significant psychoanalytical and aesthetic response to the real shock of the modern, a trauma that, compounded by its unthinkable repetition on an even more terrible scale during World War II, has not been exorcised from the contemporary imaginary. Estrangement and unhomeliness have emerged as the intellectual watchwords of our century…" [7]

In our suite Life After Wartime, given that our database of images come from 1945-1960, our focus is on the changing cultural, social, physic and economic conditions of Sydney in that era. As my collaborator Ross Gibson puts it:

The crimes represented in our archive are metonymic of and typify the aftermath of World War 2 that so informed our parents' lives, the society into which we were born, and our childhood consciousness. Thus the project title Life After Wartime. [8]

Site specificity

"The whole atmosphere of that dirty old slum house was instinct with mystery and evil. It seemed to gloat, and hold to itself all the murders that had been committed within its walls. The smell of blood was there, and the miasma of cowardice and stealth and cruelty" [9].

I love The Rocks - an obdurate finger of rocky Hawkesbury sandstone extruding into the harbor west of Sydney's Circular Quay – site of colonial quarries and windmills, docks, debauchery, poverty, plague and twentieth century changes too fast and complex to outline here [10]. When ISEA offered a location for *Unhomely* in The Rocks, in association with the Sydney Harbour Foreshore Authority (SHFA), I excitedly anticipated the site visit.

Stepping into the cottage from the shimmering summer street, inside is dark, warm and spicy – the smell of Sydney heathland on a summer's day. Pleasingly symmetrical, originally one room deep (and still so, upstairs) the house afforded 7 windows, four front and three back. No lines are true, you can see that, but it is incorporating its growing wonkiness and is resonantly charming and darkly redolent. I accept straight away – a controlled environment, level access, high traffic location – the producer in me syncopated smoothly with my joyful artist's heart – a house in the Rocks!

Reynold's Cottages (our site was one of 2 cottages) were average working class houses, convict built in 1829 in the ubiquitous Colonial Georgian style of early Sydney. Before Reynold's Cottages were built, the site was continuously occupied from the arrival of the First Fleet – including by forger turned government architect Francis Greenway, who owned the block bounded by George, Argyle, Harrington Streets and Suez Canal where the cottages now sit. Archetypal of much Sydney real estate, Reynold's Cottage has its intricate history of ownership, loss, death, birth, rise and fall. Having been the owner/builder, Reynolds himself become tenant through corruption in the Land Office. During the twentieth century it was public housing. It is remarkable that the cottages should have survived the rapacious real estate turf wars native to post-contact Sydney [11]. Without doubt the site would have also been treasured, in the same and other, deeper ways, by local Aboriginals for its protected north-east aspect, natural water well, sandstone shelters and excellent view [12].

The house as psyche

"…in the psyche there is nothing that is just a dead relic. Everything is alive."

Carl Jung, Mind and Earth (1964). [13]

Now we had the actual house, the final jigsaw piece in the creative concept. With its double story front, and a third space out the back comprised of a later kitchen and lean-to, or sleep-out, each with a window, the cottage offered not only the windows but its particular spatial and architectural affordances, and extra dimensions of engagement due to people's ability to view it from the front and, via the gloriously named Suez Canal, the back.

Without laboring the point, our aesthetic treatment and projection design was partially informed by Jungian analysis that embraces the house (dwelling) as a symbol of the dreamer's psyche – the rooms and levels representative of and analogous to aspects of self, or imagined as vessels into which we project our psychic fears and desires. Jung explains the initial metaphor of house for consciousness:

"I thought of the conscious as of a room above, with the unconscious as a cellar underneath and then the earth wellspring, that is, the body, sending up the instincts. ... That is the figure I had always used for myself, and then came this dream ..." [14].

Jung's dreamed house of 1909 had 3 or 4 floors, and exploring the lower cellars took him back in time to the roots of western culture, yet these floors still had a domestic look and feel; the exploratory experience analogous to "…a continuity of psychic stratification from the historical near past to the distant evolutionary past. Accordingly, the cave is the lowest extension of the house, a mere subcellar. In Memories Dreams Reflections, a kind of continuity with the house is captured in the images of thick dust on its floor and scattered broken pottery, which give the place a domestic feel. Elsewhere in Jung's and others' accounts, the lower cellar is like a cave or tomb" [15].

After this famous dream, Jung articulated the idea of the collective unconscious and its relationship to his dream house. Not a social construct but a physiological one, the collective unconscious is a shared and evolutionary structure of the brain just as the human body is a collection of evolutionary matter [16]. In *Unhomely*, we are connected to, tapping into, the collective unconscious of the site as we vitalise and electrify the cottage with the specific uncanny of post WW2 Life After Wartime.

Lower front detail, © Aaron Seymour and LifeAfterWartime 2013

The visual nature of dreams is generally highly phantasmagoric - different locations and objects continuously blend into each other. In *Unhomely*, whereby the cottage is a vessel with apertures, a magic lantern, we assigned to each room video content composed of animations of our crime scenes and victims/ perpetrators. No channel was technically synched with another, but we were attentive to the overall rhythm and pacing, focusing especially on the image transitions.

Design and creation

"Our Sydney pictures are as ordinary and wondrous as they are aweful. With their concussive stillness these images offer glimpses of lives you can almost remember. You can sense in these crime scenes a power that hums out of the past and makes an everyday city that is soulful and reverberant. A city with more blood and spirit than our perception usually lets us see". [17]

All Life After Wartime projects are characterised by a strong emphasis on the photographic, a dominant use of black and white, and the aesthetic experience of the images/sound emerging, and/or being called up out of the darkness. To this end, the image transitions themselves carry a lot of weight. For *Unhomely*, transitions comprise images emerging from ghosting fog; images spitting and stuttering; images twisting

Lower front detail, © Aaron Seymour and LifeAfterWartime 2013

Rear sleep-out detail © Aaron Seymour and LifeAfterWartime 2013

to unfold as they emerge from a chrysalis form and fill the visual plane. There is often a writhing, oozing and bleeding between images; and the electricity and the flickery flash of early photographic lighting.

In the cottage front, faces stare out of the lower left window: victims and perpetrators emerge out of ghosting fog and swirl into recognizable form, look right into the camera in an era when this was not typical of cinematic treatments – without the reverse shot, an incomplete anamorphosis. [18] These preternaturally oversized portraits hold the gaze of passersby. In the lower right side of the building, bedrooms and hallways, luminous, subtly moving, are at first glance seemingly innocuous and 'to scale', yet percussive with disturbance and disarray on closer viewing.

For these two downstairs windows, we opted for rear projection using a rear-pro fabric with a lot of warmth that enhanced the black and white and the detail of the images. The deep window casements added a dimension that was unexpected but powerful.

Lower front detail, © Aaron Seymour and LifeAfterWartime 2013

The top front windows are at times blank and vacant, and we might wonder: "what happens upstairs?" Then suddenly they are animated by strange flashes emphasising the spatial improbability – car headlights scan the interior, rain pours down, a red sky is riven by lightening, a torchlight seeks out dark corners. The impression is of a borderless space inside. Here we projected at an angle against the back walls and ceiling, which really opened up the spaces and created illusions of depth and complexity.

At the back of the building, the kitchen is almost untouched since the early twentieth century. The viscerally mottled and decaying wall becomes a component in the design as we project onto it a kitchen interior from the 1940s – the darkened window with its shabby curtains, the teapot and cups left at the moment of rupture. The image slowly morphs, seemingly with the weight of its witnessing. Traditionally the site of the happy hearth, the family and nurturing, this kitchen bears signs of a struggle: flour spilled from a set of upset scales, a woman's shoes left as she was lifted from them, a single child's bootee and well loved, thread-bare teddy bear, an upturned box cart bear witness to fingers dragged through the flour as they try and take purchase on the flag stones, a knee pressed into the floor. Dead leaves mingle with the spilled flour – echoing the outside-in treatment of the front windows and reminiscent of the opening sequence of 1950s classic melodrama, "Written on the Wind", in which autumn leaves are blown into the lush entry foyer of a mansion to symbolise the moral decay about to unfold in the film.

On the other back window – which looks into a room most likely added as a lean-to, or sleep-out, the corrugated iron suggests a space that was part interior, part exterior - the house spawns objects that unfold like a chrysalis – a hat, worn shoes; tools of illegal street trades (a gun, a spanner, abortion instruments, medical syringes; a threatening note); a snapshot of transsexuals dressed for a night out, another that decorates the rooms of a prostitute; police procedural documents detailing how a crime scene should be treated; a forged cheque drawn against the Bank of New South Wales. For this window we projected directly onto the glass, having first treated it to create a surface reminiscent of one dusted for figure prints. A series of interesting reflections resulted – up against the angled window shade, the ceiling of the room interior.

Rear kitchen detail, © Aaron Seymour and LifeAfterWartime 2013

"And he had just disappeared. Nothing was ever heard of him again… There was just a little box cart left lying on the roadway, and that was all."

Unhomely is an installation that captures the socio-cultural and economic disarray and alienation of post World War Two Sydney. By mobilising our archive of mid-twentieth century scene-of-crime images to possess and process abandoned Reynold's Cottage, we have created an opportunity for visitors to experience vernacular architecture, animated by electronic art and appreciated by visitors as an uncanny, site specific experience.

References and Notes

1. The seven projects in the *Life After Wartime* suite utilise a database of 3000 images, shot between 1945 and 1960, plus over one thousand of Gibson's texts, in a series of media artworks that offer interrogative and creative responses to the archival material and engage with database aesthetics and artist and audience agency. The projects have been created across multiple platforms and have been exhibited and reviewed and cited at state, national and international level.

2. Anthony Vidler, *The Architectural Uncanny - Essays in the modern unhomely.* Boston, USA:MIT Press, 1992 Introduction

3. It's a nice (Jungian) synchronicity that in 1895 The Lumiere Brothers screened their first film of workers leaving a factory, and in the same year Sigmund Freud and Joseph Breuer published 'Studies on Hysteria' in which psychoanalytic technique was first introduced: both cinema and psychoanalysis are characterised by an axiomatic imperative to observe and imagine.

4. Vidler [2], p7.

5. Ernst Jentsch, *On the Psychology of the Uncanny* 1906 – translation by Roy Sellars, accessed 06/2013 on http://theuncannything.wordpress.com/

6. Sigmund Freud *The Uncanny* 1919– accessed 06/2013 http://www-rohan.sdsu.edu/~amtower/uncanny.html

7. Vidler [2], p 9

8. Ross Gibson. *Crime Scene,* exhibition catalogue. (Sydney, Aust: Justice and Police Museum 1999).

9. Ruth Park *The Harp in the South*. Sydney Aust: Angus and Robertson 1948) page 123.

10. For a richly sourced (and sauced) history of early Sydney I suggest John Birmingham *Leviathan: The Unauthorised of Sydney* Australia: Random House 2008

11. M. Holmes,. *Reynold's Cottages*. 2012 Retrieved 2013, from Dictionary of Sydney: http://dictionaryofsydney.org/entry/reynolds_cottages

12. For an invaluable primer on the history of Aboriginal Australia as understood through the colonization of land see Heather Goodall, *From Invasion to Embassy: land in Aboriginal politics in New*

South wales 1770 – 1972, (Sydney: Allen and Unwin in association with Black Books 1996)

13. Carl Jung, "Mind and Earth", in H. Read, M. Fordham, & G. Adler, eds, *The Collected Works of C. G. Jung* Vol. 10 (London: Routledge 1964) pp. 29-49 par. 55(Original work published 1931)

14. Carl Jung, *Analytical Psychology: Notes of the Seminar Given in 1925 Princeton*, (Princeton USW: Princeton University Press 1989) p 22-23. (Original work published 1926)

15. Raya H.Jones, "A discovery of Meaning: The Case of C.G.Jung's Dream House", Working paper 79, Cardiff University, School of Social Sciences p 12

16. Case of C.G.Jung's Dream House", Working paper 79, Cardiff University, School of Social Sciences p 12

17. Ross Gibson. *Crime Scene,* exh. cat. (Sydney, Aust: Justice and Police Museum 1999).

18. Cinematic editing conventions enable a visual sequence to "make sense"; for example, a shot of someone looking at the camera, is reinforced by a shot of the subject of their gaze (the reverse shot). If enough shots cover the physical and emotional terrain, they attain an anamorphosis – a complex coverage of the event. For more on this see Kate Richards *Life After Wartime, a suite of Multi-media Artworks*, Canadian Journal of Communication Vol 31, Number 2 2006

19. Ruth Park [9], p 175.

GESTURECLOUD: GESTURE, SURPLUS VALUE AND COLLABORATIVE ART EXCHANGE

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Abstract

GestureCloud is an art collaboration founded by Beijing-based artist Fei Jun and Toronto-based artist Judith Doyle. At the ISEA2013 Creators Session, GestureCloud discussed its collaborative research-creation methodology and gave a demonstration of its Xbox Kinect 3D depth camera modified for motion capture. In addition to describing past and current artistic projects, this text expands on the theoretical concerns raised at GestureCloud's ISEA presentation, such as embodiment in the post-digital present and the changing status of labour. Particular attention is paid to networked installations that harness gesture to trigger physical effects between locations. Different types of value (economic, documentary, social) that may be attributed to gesture are also considered.

Keywords: China-Canada exchange, gesture, labour, visual art, motion capture, Kinect.

Introduction

GestureCloud was initiated in 2010 by Beijing-based artist Fei Jun and Toronto-based artist Judith Doyle, alongside artist-programmers Jim Ruxton, Ken Leung and Ian Murray [1]. The collaboration was sparked by a shared interest in the accelerating proliferation of virtual labour. In their initial assessments of the flow of labour between China and North America, the collaborators distinguished between traditional factory labour and emerging virtual workforces such as those in SecondLife (an online virtual world) and Mechanical Turk (a web service offered through Amazon) [2]. The name GestureCloud was chosen to signal the collaborators' long-term goal of developing a cloud-based gesture dictionary including an inventory of gestural language.

Gesture is considered as a meeting point of discourses and embodied experiences where meaning can be identified and generated. Different aspects of gesture are highlighted, such as its relation to embodiment and forms of labour that are increasingly detached from the body. The imbrication of the Internet with everyday life has enacted a number of shifts in the way we understand gesture and embodiment. GestureCloud analyzes, assesses, and seeks to intervene in the future of these shifts. The collaborators have long artistic and professional trajectories working with emerging technologies including early teleculture, fax, and net art. By studying and experimenting with emerging technologies whose meanings, functions and regulations are not yet fully fixed, the collaborators seek to affect how these technologies unfold and network in the future.

Fig 1. Wall of gesture animations at the entrance to GestureCloud's interactive installation at China Museum of Digital Art, CMoDA, Beijing, AV@AR 2.0 exhibition, 2013. (© GestureCloud. Photo © Fei Jun.)

Initially, GestureCloud engaged with emerging forms of virtual labour by connecting them to physical ones. As virtual forms of labour emerge, gesture as a by-product of physical labour becomes an important consideration. For example, gestures associated with physical labour hold archival value; they function as traces of work that goes unacknowledged due to its outsourcing to overseas factories or anonymous workers online.

The collaborators adopt a research-creation process. Research-creation is understood to engage a flexible array of studio-based creation practices that both derive from and contribute to new research methodologies. Research-creation activities have included long-distance collaboration that utilizes online and virtual studios, residency-exchanges in both universities, small community workshops, collaborations with other artist-researchers and students, and networked exhibitions.

Distinct from a continuous flow of movement, GestureCloud identifies gesture in intervals with a beginning, middle and end. These intervals are edited from within the flow of captured motion (input). Once isolated, gestures can be stored, notated and arranged in meaningful sequences (output). The collaborators select from these gestures to create prints. GestureCloud also makes interactive projects including installations, performance events, and art-creation tools. Recently, the collaborators have used 3D depth cameras adapted for motion capture to record gesture on-location and in the studio.

Documenting factory work and re-enacting gestures for motion capture

In January 2010 in Toronto, the collaborators identified a central research question: can labour be transposed via gesture across virtual locations to trigger material effects elsewhere in the world? For example, could the surplus value of gesture generated from factory labour in China activate events in virtual settings, accruing value that would return to the real-world factory workers?

An initial research-creation residency took place in Summer 2010 at the media lab of the Central Academy of Fine Arts (CAFA) in Beijing. The residency

provided an opportunity to prototype an artwork to be installed simultaneously in Beijing and Toronto galleries, linked by sensors that would send data through the SecondLife virtual environment [3].

The collaborators captured gesture data from physical labour in various locations in Beijing (restaurants, factories, construction sites). This included video and audio documentation of sewing, assembly lines, noodle-making, tai chi, and recycling of waste. Gesture research also took place in the Artron Factory in Beijing, a printing factory that produces fine art books. Fei Jun has worked at Artron as a graphic designer. GestureCloud collected video and audio documentation of workers at the factory. The collaborators analyzed this footage and identified a set of gestures that together comprise a factory labour system of actions, including lifting, stacking, trimming, conveying, shredding waste, and taking smoke breaks. The collaborators also sourced Beijing's Zhongguancun Electronics Market, finding parts to build a prototype of a robotic tripod head that could mount camera or projector, to be controlled across networks using gesture.

During the residency, GestureCloud created material and virtual components for its networked installations, considering aspects of exchange, value, embodiment, and automation. The collaborators set out to find how gestures produced during the course of factory work could be translated into data feeds to drive actions in virtual worlds (ie. SecondLife). These could potentially return value to the workers. The focus was on how real-world labour could be captured as gesture, cached, and loaded into SecondLife in the form of avatar animation files. GestureCloud's hypothesis was that these animations could be used to earn Linden dollars (SecondLife currency) to be converted to other virtual currencies, American dollars, or corporate shares. For example, workers manufacturing mobile phones for Motorola could generate Lindens by transforming their labour "force" into Second Life "camping" (a form of virtual labour in which avatars spend time on a site, thus increasing its traffic and position in search results). The compensation in Lindens for camping would trade for American dollars that could trade again for Motorola shares.

The collaborators had access to a traditional motion capture studio at CAFA in Beijing. They used this studio to re-enact the set of factory gestures recorded at the Artron printing factory, wearing special suits and gear. The intent was to build a cache including video, audio, and motion capture data that could be organized into a searchable repository of gesture files for digital applications. The motion capture data was converted to BVH file format by Tian Yue, who was also responsible for operating the motion capture recording software during the session. A standard in Maya and other 3D animation software, BVH expresses the relation between skeletal joints over time and is most immediately useful for animating 3D characters. The data can be applied to other outputs including instructions to devices.

The BVH files were imported into the inventory of a specialized SecondLife avatar named Gesture Warden. Working with virtual artist-fabricators – avatars Desdemona Enright and Ian Ah - factory materials and machines were created in SecondLife for Gesture Warden's inventory. These were used as props to demonstrate gesture (a bag of paper shreds to "stomp" on, a box for "stacking," a conveyor belt, etc.).

From materials produced during the residency, GestureCloud made two projects.

Concurrent media installations in Toronto and Beijing

A residency in RMB City included the artists Yam Lau, Adrian Blackwell, and the GestureCloud team. The exhibition, which was curated by Yan Wu, took place at the Japanese Canadian Cultural Centre in Toronto, and subsequently in the SecondLife online virtual world. The exhibition was conceived as a virtual residency entwined with a gallery manifestation. At Gendai, GestureCloud created a media installation. A montage of animations and documentary video footage of factory workers was projected on the gallery walls. A micro-projector attached to a robotic tripod head was used. Virtual factory workers appeared in different zones, evoking a virtual factory space. Fei Jun used an identical installation kit for his exhibition "Stranger: Fei Jun Works" at offiCina Beijing, in the 798 gallery district, curated by Feng Boyi. The two installations in Toronto and China ran concurrently. Gendai was also the site of a curatorial discussion conducted via SecondLife with real-world participants located in Toronto and Beijing. The value that returns to factory workers in this pair of joint exhibitions is symbolic, given to the workers through their expanded presence in both galleries [4].

A gesture vending machine in the SecondLife online virtual world

After the gallery exhibitions in Toronto and in Beijing, the participating artists created a virtual installation in RMB City, the extensive Second Life sim and curatorial project of Beijing-based artist Cao Fei. Named after the official currency of China, the Renminbi, RMB City literally translates as "Money City." The virtual architecture and art projects there reference the accelerated demolition and construction in Beijing around the time of the 2008 Olympic Games.

In RMB City, the GestureCloud vending machine was framed by expository signage with video of the Artron factory workers to the left and video of the gesture animations to the right. These didactic panels revealed the documentary origins of the gestures. From the vending machine, SecondLife avatars could test and buy animations with Lindens, the in-world currency. The avatar Gesture Warden holds the accumulated Lindens in its inventory. Anyone with access to SecondLife can log on using Gesture Warden's password, and collect Lindens from the sale of gestures from the vending machine. However, the exchange rate for Lindens is extremely low when traded for American dollars or Chinese yuan. The greatest exchange value is within the online virtual world itself.

Similar to the exchange rates of different currencies, the physical and the virtual cannot be made to mirror each other equally. Subsequently, GestureCloud ascertained that generating value that could accrue for factory workers would require more sustained and meaningful connections between physical workplaces and virtual ones. The next phase of research would consider how to record gesture on location, and how to link media installations that could work as portals.

A system for on-location motion capture

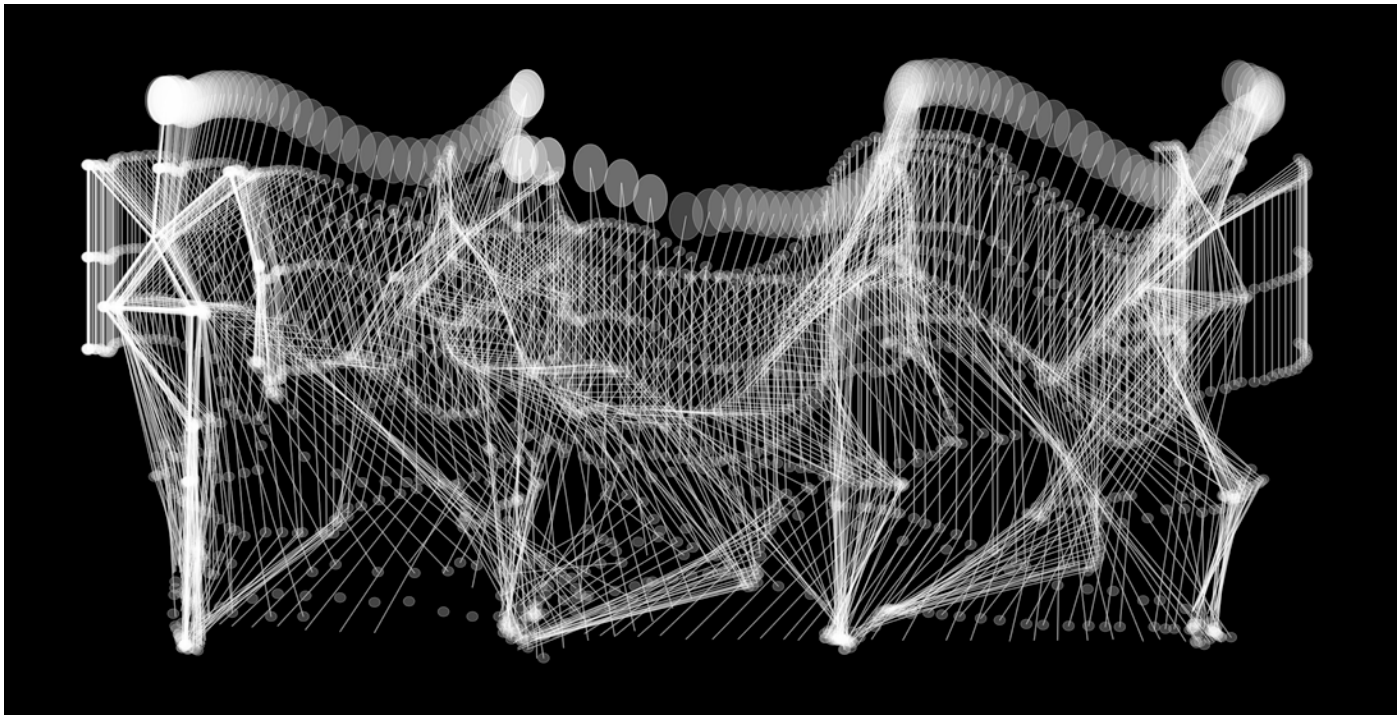

Fig. 2. *Runtime*, digital print, GestureCloud, 2012. The data for the print was captured using GestureCloud's Xbox Kinect-based 3D depth camera and applications for recording gesture on location. (© GestureCloud.)

During GestureCloud's second Beijing residency in 2011 the collaborators including Fei Jun, Judith Doyle, and Ken Leung developed a prototype system for on-location motion capture. The system includes the Xbox Kinect, open source code and Processing programming.

The unit included a laptop, an Xbox Kinect 3D depth camera, and a digital video camera. The two cameras were tethered to and powered by a car cigarette lighter-adaptor. This prototype was tested on location in a Beijing car wash and a family-run restaurant near the Great Wall of China.

Using this unit, the collaborators captured and encoded movement by workers on location, to be subsequently edited into gestural units. Benefits included lower cost and greater flexibility than performance in the cumbersome motion capture studio, and more direct worker participation. The disadvantages included much lower resolution data and the difficulties associated with capturing leg movement. Also, this system was too expensive to be installed and left as a dedicated unit on location; its drivers and software were complicated to install and troubleshoot.

Social Media and Collaboration Lab (SMAClab) Toronto

Judith Doyle is the Principal Investigator at the Social Media and Collaboration Lab (SMAClab) at OCAD University in Toronto. Since 2012, GestureCloud's research has been based in this lab. In Spring 2012, GestureCloud was awarded funding by the Federal Economic Development Agency for Southern Ontario (Fed Dev ARC 2) for activity based at the SMAClab. The Fed Dev project was intended to investigate gesture representation and generate art and art creation tools (software modifications, computer files, physical systems) incorporating motion capture and 3D depth cameras.

The collaborators developed a suite of applications using an Xbox Kinect and skeletal tracking for full-body gesture capture. The applications are intended for use as artist toolkits for sonic art installation, video compositing, character animation and figurative drawing.

GestureCloud investigated how to identify and organize gestural units. The focus was on how to record, store, and transfer gesture in a meaningful way for the creation of networked installations – specifically how gestures recorded by the Xbox Kinect could activate effects, such as turning on a light bulb, across countries.

GestureCloud's Xbox Kinect-based 3D depth camera uses a modified skeletal tracking system that calibrates the relative depth positions of 20 joints in the shoulders, torso, arms and legs. This data is collected from full-body motion within the Kinect's field of view (roughly twelve feet wide). Data flows to drivers, activating Open NI / NITE (a proprietary 3D sensing software that is free to use). OSCeleton is an open source software that makes NITE data available to GestureCloud's processing software, presently in development. GestureCloud's own programming generates the PDF files and/or HDMI display. The Runtime print was made with a PDF from a five-second motion capture thus obtained. Viewers can also generate real-time displays of their own movements, for example, in sweeps of overlapping figures that refresh every five seconds [5].

Fig. 3. GestureCloud's 3D depth camera and projection unit, incorporating an Xbox Kinect, microcomputer and applications, housed in a 3D printed shell with a tripod mount (© GestureCloud.)

Art-historical antecedents

When cinematic technologies began to emerge, artist-inventors adopted these new tools, devising new approaches to portraying and organizing gesture. The motion 'study' as a durational unit or loop (a zoetrope-like visual structure) emerged in late nineteenth century research undertaken by Edweard Muybridge and Étienne-Jules Marey. Marey and Muybridge used then-emerging, proto-cinematic technologies to shape understandings of embodiment, motion and time. Both Muybridge and Marey developed lab-studios that were optimized for capturing figurative images of people and animals using new techniques. The lab-studios also generated dissemination formats (prints and projections) that were presented to artists and collectors.

Muybridge's 781 motion studies (1884-1885) are widely understood as quantitatively obtained, scientific in both intent and methodology. Yet, elements of creative artifice enhanced the research results. Marta Braun deconstructs Muybridge's "tactics - insertion, expansion, contraction, substitution... to stage motion studies frame-by-frame for the camera" [6]. Marey adapted his laboratory and recording tools to capture useful images: "when Marey could not change an instrument any further to suit his subject, he would adapt the subject to suit the instrument" [7]. To capture high-contrast images, Marey photographed white animal subjects, added white lines to a black bodysuit and blackened the lab background. GestureCloud shares an interest with Marey and Muybridge in using emerging technologies to represent the subject of motion. This entails a process of creating new tools and outfitting specialized spaces, both of which combine elements of the laboratory with the art studio. Marey's graphic method distills overlapping frames into static time-lapse images – "chronophotographic" prints and sculptures that reveal gestural trajectories. GestureCloud adopted this chronophotographic method for its "Runtime" application.

Networked installations between Toronto and Beijing

In the Spring of 2013, GestureCloud exhibited interactive installations at CMoDA (China Museum of Digital Arts) and the Art Beijing International Art Fair. For the AV@AR 2.0 exhibition, GestureCloud converted a zone of CMoDA into a symbolic factory floor where labour - stacking, pulling, stomping, and lifting - was performed by visitors and recorded with an onsite motion capture system. The visitors' efforts powered a light bulb on location in Toronto, across a twelve hour time zone difference.

At the entrance to GestureCloud's exhibit, a collection of flat screen displays showed the series of factory labour gestures developed for the vending machine in the SecondLife RMB City. There was also an audio component that consisted of machine sound recorded live on the Artron factory floor in Beijing. In the adjunct performance zone, participants tried to copy the factory labour gestures while observing themselves on the Runtime display interface. If they successfully triggered the gesture recognition software, a light was activated for ten seconds in Toronto, illuminating a large tree, or, at times, a live performance. There is a twelve hour time difference between Beijing and Toronto, and the illuminated scenes from Toronto were shown on a live Skype feed. Clear text was sent over port 80 (the standard HTTP port) from GestureCloud's dedicated server in Canada to China to avoid triggering automated filtering of other ports (the firewalls).

The show at CMoDA led to an invitation to install at the Art Beijing International Art Fair. For the installation, the Runtime display application played on a large LED screen that visitors interacted with at the entrance into the art fair. Participation was lively and yielded lots of kinetic energy and PDF documentation. However, setting up the show required much technician time for installing software, drivers and programming. It became clear that for future projects, it was necessary to develop an affordable plug and play system that would not require complicated installation and maintenance.

At ISEA 2013 GestureCloud unveiled the first iteration of this 3D depth camera unit, including an Xbox Kinect, an inexpensive microcomputer with embedded programming, and a 3D printed shell with a tripod mount. The unit includes HDMI output interactive media installation. GestureCloud has begun customizing applications for differently-abled users, and field-testing the unit for on-location motion capture and interactive public art projects.

Conclusion

The formation of GestureCloud was spurred by changing forms of labour and embodiment as impacted upon by contemporary technology and digital conditions. What makes this subject matter so ripe for consideration, both artistic and otherwise, is its emergent, still-undefined nature. This allows for the possibility of intervention - changing the course of a still-developing process. Therefore, new technologies that have not yet been adapted or considered as art-making tools are ideal for attempting such interventions.

Most recently, this activity has taken the form of a portable motion capture system, the early iteration of which was shown in exhibitions in Beijing and at the ISEA 2013 conference. Since the camera-projector unit works for real-time, on-location motion capture and as a projector, it is an ideal tool for opening up "portals" between locations, such as a museum in Beijing and an art studio in Toronto. These portals, occurring in the context of networked installations, can be thought of as temporary allegiances that are context-specific and project-based. It opens up the possibility for portals to be initiated and maintained without extensive technical expertise. The system can also be used as a sustainable tool to facilitate art collaborations and small-scale

Fig. 4. Choreographer Spirit Synod testing GestureCloud software for wheelchair applicability at the Social Media and Collaboration Lab (SMAClab) OCAD University, Toronto, 2013. (Photo © Judith Doyle)

residencies. It could decrease the need for physical travel between countries, and even continents, to facilitate collaboration.

This system is inherently hybrid in nature; it is only activated through the simultaneous engagement of the physical realm and the virtual realm. The SecondLife project, for example, relied upon a continual process of "translation", from documentary-recorded gestures that were re-performed and saved as BVH files, and traces of physical labour that were reconfigured and sold for use by online avatars. The currency attributed to a product made in a factory is not the same currency used to purchase virtual inventory including animations, clothing items and furniture in SecondLife. The physical and virtual cannot be separated into discrete realms, nor can they be made to mirror each other equally. The intent is for GestureCloud's systems to function as reciprocal circuits, rather than virtual ones that supplant the physical.

Future GestureCloud projects will utilize this hybrid approach and take place in settings that engage local artists and working communities, particularly those whose forms of work, object-making, and craftsmanship are disappearing. Gesture is a form of cultural production that can be endangered and jeopardized, therefore location-based 3D imaging will have documentary and archival applications.

In January 2014, collaborator Judith Doyle will be teaching a workshop titled GestureLab at the National Institute of Design in Bangalore, India. The workshop will address the residency's theme – the Moving Image in India. The project will begin with a workshop that identifies community-specific gestures of labour in factories or communities. These will then be recorded on location, with 3D depth cameras and digital video. The residency will culminate in an expanded cinema installation incorporating these documentary materials.

The goal of returning value to the workers who generated gesture prompted GestureCloud to experiment with hybrid forms of value, including self-representation and long-distance exchange. These issues will be explored in the upcoming residency in India, and in another new project - a site-specific installation to be mounted in a Beijing factory. In this work, GestureCloud intends to implement local community portals for collaboration. These will contribute to the editorial development of a dictionary publication to organize and archive gesture.

References and Notes

1. The lead programmer during this residency was Jim Ruxton, working alongside technicians Ken Leung, Wang Liming, Tian Yue, and Ian Murray. The residency was funded by the Canada Council for the Arts.

2. Mechanical Turk users post jobs – what the service refers to as Human Intelligence Tasks – that are completed by remote workers, usually for very little pay. The service has produced a large and cheap workforce that functions in a decentralized manner.

3. For further details about this residency, see http://www.readingpictures.com/gesturecloud/.

4. For video documentation of GestureCloud's exhibition at Gendai Gallery, see: http://vimeo.com/20168035.

5. For video documentation of GestureCloud's interactive installation at Art Beijing, see: http://vimeo.com/67425782.

6. Marta Braun, *Picturing Time: The Work of Etienne-Jules Marey (1830-1904)* (Chicago: University of Chicago Press, 1994).

7. Braun [6].

CRUMB DOCTORAL RESEARCH: REFLECTIONS ON CREATING AND EXHIBITING DIGITAL ART

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Abstract

Based on doctoral research undertaken at CRUMB, the online resource for curators of media arts, this paper gathers together knowledge from different experiences of producing and presenting digital arts, from the perspectives of both curators/producers and artists. Suzy O'Hara reflects on art, technology, and the commercial digital sector, Marialaura Ghidini discusses hybrid models of offline and online curating, Dominic Smith writes about models of open source production compared to participative systems in new media art, Victoria Bradbury investigates the performativity of code, and Roddy Hunter identifies curatorial models of practice that articulate the principles of The Eternal Network.

Keywords: New media art, curating, production, exhibiting, participation, audience, performativity

In this paper, curators, producers and artists from CRUMB - the resource for curators of media art - share knowledge from different experiences of creating and presenting digital art projects. In response to ISEA2013's theme, 'Resistance is Futile', this paper (resulting from a shared panel of presentations) is concerned with how art allows us to imaginatively experience and critically reflect on the implications of new technologies and digital media in our everyday lives, from databases and information visualisation to the way people act in a social network.

CRUMB was co-founded in 2000 by Sarah Cook and Beryl Graham. Over the years it has sought to, on one hand, enhance the professional development of curators engaging with the ever-changing field of new media and digital art by sharing practical knowledge, and on the other, to support masters-level, doctoral, and post-doctoral research into the field of new media art and curating by identifying new methods and ways of working. The authors - currently engaged in doctoral research or having completed PhDs with CRUMB – all use established methodologies of research through art practice as well as new methodologies from curatorial practice. In the following discussion they share the use of case studies in order to analyse both the history of others people's projects, and their own series of projects. Some of the research presented here is in-progress, including interim findings and identification of patterns of practice.

Suzy O'Hara, for example, has identified differences between commercial digital and artistic sectors in producing or commissioning work which centres on values, time and money. Marialaura Ghidini has identified the ways in which online and offline iterations of art have close or distant relationships, particularly in relation to exhibitions and publications. Dominic Smith, through his Open Source projects, has identified the importance of complex systems of crediting authorship, and the key practice of both instigating projects, and developing projects instigated by others. Victoria Bradbury has been exploring elements of performativity in her artworks, and has analysed factors of translation and language in particular. Roddy Hunter has researched the relationship between historical and contemporary practice in networked curatorial practice, and has "re-modelled" past networked pieces as performance.

It is through their affiliation with CRUMB that these research practices present ways of working which aim to fit with the particular characteristics of new media and digital art, and it is hoped that these collective findings will be of use to fellow practitioners.

Collaborations between the digital and artistic sectors: how convergent, digital, technological platforms are informing curatorial practice for physical and digital spaces

Suzy O'Hara

The evolution of digital culture has brought us 'pervasive media' and 'ubiquitous computing', emerging fields that combine new technologies with rich media, experience design and user context. These technologies, coupled with the convergence of media platforms in the commercial digital sector, has led to the surfacing of a hybrid art ecology, which is nurturing the cross-fertilization between collaborators from the commercial creative media and technology sectors, and public art worlds. Suzy's research analyses the growth of, and tensions arising from, strategic alliances between these two sectors.

In the media art field, it has been widely recognised that collaborations that bridge cultural boundaries have provided practical ways for each discipline to develop [1]. The Baltan Laboratories and Kitchen Budapest collaboration are two exemplary labs that critically reflect upon and share experiences and the methodologies they applied throughout each phase of their collaboration chronologically, to assist others interested in different forms of production and collaboration [2]. There are many more examples of experimental environments and platforms which have generated deep, new knowledge in this area, including;

Fig. 1 ***Dear Angel*** **(2013) by Stevie Ronnie, installation shot in Globe Gallery June 2013. (Photograph © Colin Davison, Rosella Studios)**

creative media labs, media focused organisations and galleries, electronic art festivals and symposiums (examples of which include; Eyebeam, Furtherfield, Abandon Normal Devices [AND] Festival and ISEA).

Over the past ten years, the interdisciplinary 'open lab' space has emerged as a model for facilitating creative collaborations with the commercial creative media and technology field. Spaces such as The Pervasive Media Studio, Media Lab Prado and Fabrica (Benetton Communication Research Centre), have begun to significantly blur the lines between commercial, cultural and research fields. The digital technology sector has also witnessed a rapid proliferation of business-led interfaces that successfully harness the power of the global network to engage and mobilise new 'networked' audiences for culture via the Internet, including: You Tube, Vimeo, Google Art Project and Kickstarter. These developments have forced the wider art field to reflect upon how it can engage with technology in a meaningful, purposeful way that will, in the near future, see its artists, venues (both offline and increasingly online) and audiences thrive.

Simultaneously, through the significant work of Beryl Graham and Sarah Cook, co-founders of CRUMB and other curators, academics and artists, there has never been such appreciation, understanding or exposure within contemporary art organisations for artwork that: 'is made using electronic media technology and that displays any or all of the three behaviours of interactivity, connectivity, and computability in any combination' [3].

By mapping the histories, systems, behaviours and terminologies of new media art onto those more familiar to curators of art, these practitioners and researchers began to address the issues of translation between the technology and art world. Thus, corollaries within languages, systems and terms relating to new media art and its evolving categories of behaviours and the art world constitute the bridge that link 'Turing-land' and 'Duchamp- land' proposed by Lev Manovich in 1996 [4].

A key element of Suzy's 'CRUMB' research methodology is to critically reflect upon the methodologies she employs in the curation of a series of live case studies and a sharing of the outcomes that are generated. 'Dear Angel' was the first of this series of practical, curatorial case studies. Suzy presented an exhibition of new commissions by both media and non-media artists, within a traditional white cube gallery space. The exhibition examined curatorial issues relating to: online and offline contemporary communication tools and platforms; opportunities for mass, audience participation afforded by digital technologies in the production and experience of art; and contemporary engagement with 'place' in the context of an evolving digitally pervasive society. 'Dear Angel' allowed Suzy to focus on exploring how those engaged with the wider arts sector (and its audiences) are currently utilizing and engaging with developing digital technologies, and the art that is being produced and distributed in this realm.

Early identified differences between the commercial digital and public art sectors when producing or commissioning artwork centre upon values, time and money. Future case studies (which will include a commercial technology partner) will provide Suzy with an opportunity to focus on the impact of these differences on curatorial practice and the wider arts world, and in so doing, continue to progress understanding and address issues of translation between the two.

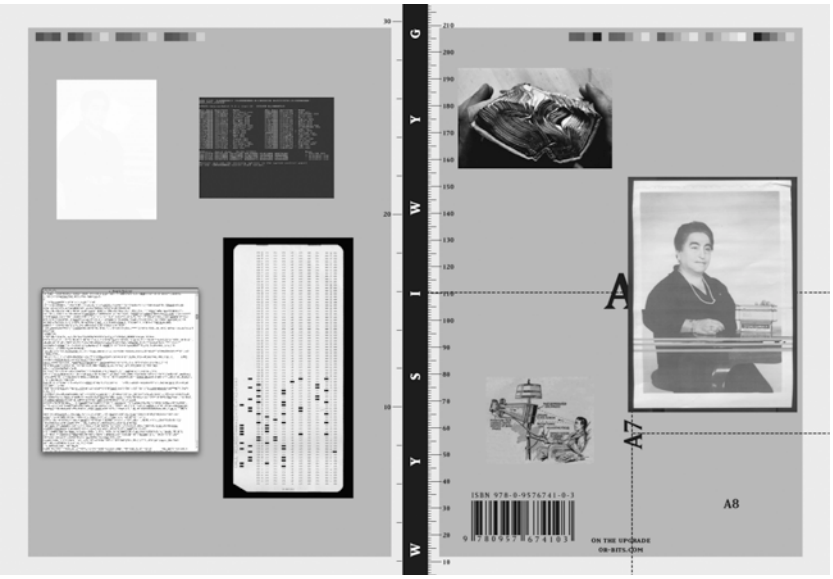

Fig. 2 ***On the Upgrade – WYSIWYG*** **(2013), with artworks by Jamie Allen, Renee Carmichael, David Horvitz, IOCOSE, Michael Kargl, Sara Nunes Fernandes, Julia Tcharfas, Maria Theodoraki, Richard Sides and interviews with the featured artists, published by or-bits.**

Hybrid curatorial models: Working in-between the online and offline

Marialaura Ghidini

In the field of contemporary curatorial work spanning the past 10 years, websites have not only been adopted as display platforms but also as sites of distribution, encouraging the bringing together of online and offline modes of operation. Curators have taken advantage of the distributive properties inherent in web platforms to re-formulate formats and re-appropriate forms of communication that can be located in-between the online and offline. Thus, the "moving across sites" [5], and working with multiple platforms and their inherent systems of dissemination, are some of the predominant features of such hybrid models. It is to be noted that this hybridity is rooted in the everyday, in the quotidian modes of communication – and production – that have arisen with and after Web 2.0, which has increasingly provided us with ubiquitous and simplified web-based tools [6]. An example of practice highlighting this interweaving is *curatingYouTube.net*, a project run by Robert Sakrowski which operates by exploiting the system provided by the video sharing platform YouTube to organise online group exhibitions, but also offline projects such as the radio broadcast series Acoustic Journeys.

In her doctoral research with CRUMB, Marialaura looks at the changing conditions that the adoption of web-based platforms has brought about within the field of curatorial practice. Her research focuses on case studies which employ websites in conjunction with other forms of curatorial work

offline, such as gallery exhibitions, time-based events and print publishing, with the aim to investigate the "trajectories they generate from the inside to the outside" [7], and the whats and hows of what she has termed hybrid curatorial models operating in between the online and offline. The first stage of this research involves analysing the specificities of modes of display, production and distribution online over the past 10 years. Through merging theory, observation [8], practice and action, she is analysing this field of work in relation to four elements: interface design, or "organisational aesthetics" [9], the form of the content and its aesthetics [10] and the socio-cultural phenomena, or "logics" [11] emerging from and around current web-based technology. This research is entwined with her curatorial practice, specifically the work with or-bits.com [12], a web-based curatorial platform which supports and promotes artistic practices and research around online production, display and distribution. This is undertaken through the organisation of online exhibitions and the presentation of critical writing on its blog, but also 'offsite' projects, such as gallery exhibitions, events and print publishing. Via the curatorial experiments of or-bits.com, she has been observing the workings, implications and possibilities of curating across sites and adopting multiple platforms for the display and dissemination of artworks. The recent Print on Demand (POD) book project, *On the Upgrade – WYSIWYG*, which includes new commissioned artworks by artists featured in previous or-bits.com online exhibitions, explores the transition between the web interface and the book interface and the artistic processes of translation that occurs when moving between these two sites of display and engagement, as well as the potentials and limits of POD services and distribution.

Exploring the hybridity of this field of work requires a search for nomenclature, taxonomy and categorisation. As noted above, the multiform methodological approach adopted by Marialaura merges theory, observation, practice and action. This has been key to developing a research method that is not only tied to curatorial studies, but also opens up to investigation the role of the Web as a mass medium which impacts and is impacted by socio-political and economic structures that are embedded in our everyday lives.

Through locating and analysing these new models of curatorial practice, this research aims to point out how their characteristics derive from the changes in the way in which contemporary art is produced, distributed and supported. These transformations are related to the variable and distributive nature of the contemporary art object and the act of production, which Marialaura sees are rooted in the conceptual art practices of the late sixties and seventies. This research has identified how such transformations, in turn, are transforming the way in which the support structure of contemporary art functions in relation to the spaces and places that have conventionally housed, nurtured and promoted the work and practices of contemporary artists, such as the museum and public gallery space.

Open source ways of working Dominic Smith

Dominic's PhD thesis with CRUMB [13] concerned models of open source production compared to participative systems in new media art. He began this research at a time when open source was of interest amongst artists and arts groups for its potential to provide a new model for artistic practice [14]. He became a participant in its associated communities whilst adopting behaviours and practices as they could best be applied to the arts. This interaction took place across a mixture of offline and online spaces, engaging with what Tiziana Terranova describes as the "peculiar semi-fluid mechanics of network space" [15].

One such project that was iterated throughout his research was the *RIE* (*Random Information Exchange*), which was an exploration into social, participatory engagement and iterative working practices. He toured this project facilitating and supporting participation.

RIE examined whether the nature of the open source tools and process used were reflected in the artefacts created, i.e. would the outcomes have open attributes. Two things became apparent

Fig. 3 The first version of the *Shredder 0.2*, presented as part of Kate Rich's Feral Trade Café at AV10.

from the behaviour of the project participants. Firstly, the freedom inherent in the open source tools used made it possible to create a networked situation where new ideas and work could flow easily, in an almost Zen like state similar to that which is identified in The Jargon File (2004) as "hack mode"[16]. It also became apparent through the gatekeeper role he took on during iterations of *RIE* and further research [17] that artists have a strong desire to lead and gatekeep when engaging with open source. This led to a later period of practice-based research via *The Shredder*.

Julian Priest, David Merritt and Adam Hyde originally developed *The Shredder* as part of the Geekosystem [18] project. The core idea was that by shredding proprietary computer manuals and mixing the paper with coffee grounds (the two staple components of a geek's day) the material can be made useful again as a medium for plant growth.

The process of making his own iteration of *The Shredder* became a useful investigation into what happens when an artist iterates another artist's project. Priest agreed to Dominic's iteration and passed on a simple set of instructions. He worked with a mycologist to devise an alternate approach, forking the original process. Together they developed a system that used the mix to grow edible mushrooms.

This project and others developed during Dominic's research with CRUMB illustrate the numerous ways of producing work that makes use of open source principles. But when sharing, distributing and protecting work under the term open source, one enters a complex area in which the differing approaches in the variety of licenses can render any single definition of open source as subjective. Through successes and failures in Dominic's attempts to adopt open source principles in his own work he was able to show that artists can apply the term open source to aspects of their practice, but there are key elements that must be adhered to, such as licensing, a public repository, release cycles and free distribution of code. These elements create a meaningful framework for successful collaboration and sharing. *The Shredder* is a good example of this approach to success and failure in research practice. It had a repository in the form of a wiki for sharing code (in the form of notes, resources and method), a release cycle and free distribution in the form of the installation packs Dominic developed. These three elements are considered a successful attempt to adopt open source principles. However this project lacked the adoption of a specific open source license. This limited wider participation, as there was no formal framework for group behaviour. The use of an open source license creates a recursive situation in which the necessary elements occur for successful adoption of open source principles.

The performativity of code
Victoria Bradbury

As an artist/researcher with CRUMB, Victoria is investigating the performative aspects of code in the context of participatory installation art. Her approach involves analysing artists' works and relevant literature, starting from Inke Arns' phrase 'the performativity of code' [19], interviewing artists, and creating and reflecting on several new artworks.

In order to process the data as it is collected, Victoria wrote a Processing sketch that allowed her to build diagrams around her four major areas of research: Instructions, Body, Code and Object. She then broke these topics into two-part comparisons such as Performative Code/Performative Body. By situating artists' works and literature within the diagrams, Victoria is able to locate case studies by identifying pieces that fall into the intersections of these topics.

Beijing-based artist Fei Jun's recent body of work is situated in the middle of her categories. In his *798 Talk Show*, Fei Jun sets up a situation for participant-performance through a mobile phone interface and a publicly projected game space. Visitors are invited to choose a character and move through a rendering of the 798 art district while virtually live-chatting with neighbouring others whose identity may be a mystery. In *Gesture Cloud*, Fei Jun and Judith Doyle capture human work and gesture through a custom motion capture interface that exchanges coded action between Toronto and Beijing [20].

In 2012, Victoria spent seven months in China where her project *Toast* emerged. This interactive work draws upon the idea of a toast, a social code enacted at Chinese meals or banquets that allows guests and hosts to express gratitude to one another. Victoria selected the toast as a performative gesture with a pre-established context with which participants in China would already be familiar. *Toast* includes instructions that ask participants to speak a toast or tribute into a microphone in either Chinese or English. This speech is then processed by code that converts it to text, translates it into the opposite language, and finally places this translation in a speech bubble that appears next to the participant's live image. Victoria tested *Toast* in a variety of venues including Shanghai's Xinchejian Makerspace and an open studio exhibition in Feijiacun district,

Fig. 4 *Toast* by Victoria Bradbury, Feijiacun Open Studio Exhibition, Beijing China, December 1 2012, (© Victoria Bradbury)

Beijing. In the Feijiacun iteration, participants performed their toast to an image of an empty dining table as they imagined friends or colleagues receiving their words. The translation that returned was usually far from the speaker's original intent, causing sometimes humorous or awkward juxtapositions and allowing for a variety of interpretations in the final display of the speech.

Thus far, "problems" with code and "problems" with human interactors have become evident. With code, the interaction is often simple and scripted. David M. Berry writes that computer languages (unlike the body) are limited in expressiveness to what a computer can understand, and notes that information about the world has to be mediated (or discarded) in order for it to be represented by a computer [21]. Humans, however, are capable of complex communication and reflection. In Avante Garde performance, Gunter Berghaus asks, "is every interaction with a media artwork indeed a performance?" [22].

Through a practical approach that involves testing this research through her own projects while reflecting on the work of others, Victoria has identified that characteristics of translation and language are important to consider when computer code and codes of human engagement are enacted together. She is able to then analyse what is happening at the moment that code and object meet participant.

Video breakfasting together, if you wish (after Robert Filliou) Roddy Hunter

At CRUMB, Roddy is identifying and developing curatorial models of practice after globalisation that articulate the principles of *The Eternal Network*, created by artists Robert Filliou and George Brecht in 1968, in which *the network itself is the artwork*. More than solely a means of distribution or medium of production, *The Eternal Network* became a conceptual context for 'permanent creation' [23]. Roddy's research explores the attractiveness of networks as decentralized or distributed environments bypassing institutional curatorial spaces. There is often a political as well as aesthetic dimension to the attractiveness of networks-as-artworks. This may now be undermined by a dependence of these networks upon the Internet, argued to be 'the most material and visible sign of globalisation' [24]. Lovink [25] observes that the 'pace [of globalisation] has increased with the advent of new technologies, especially in the area of telecommunications' and so artists, activists and commercial, corporate players alike have employed online networks in search of their respective 'utopias'. Lovink elaborates that 'we need to develop a long-term view on how networked technologies should and should not be embedded in political and cultural practices' [26].

How far has the 'globalism' of communication sought by Filliou and others been supplanted by 'globalisation' in its neoliberal, doctrinal sense? [27]. How can we rethink curatorial strategies in respect of the network-as-artwork's media of production, means of distribution and experience of reception? In short, how can we find ways to curate *The Eternal Network* after globalisation?

As a practising artist with a long history of performance work, one who considers new media curating as a creative and critical cross-artform activity, Roddy is conducting experiments which re-model Filliou's distance artworks that, while networked, (insofar as they involved remote participation) did not always require verification of transmission (*Telepathic Music*, 1977-9) or even real-time engagement. Filliou seemed fond of creating allegories of telepresence in video works such as *Video Dinner*, *Video Breakfasting Together, If You Wish* and *Video Breakfasting with Roy Kiyooka* (1979). These were very lo-fi works in which Filliou, in a pre-recorded video via a TV monitor, discusses his various interests with a spectator who plays along with the pretence that the discussion is 'live'. While contemporaries of Filliou such as Roy Ascott were fully engaged in exploring new technologies to broaden possibilities for 'telematic exchange', Filliou seemed to lack capacity or desire to deal with technologies to the same extent. For ISEA 2013, Roddy gave a performance-presentation via Skype which remodelled those video works of Filliou's mentioned above, and borrowed text from another (*Travelling Light – It's a Dance Really*, 1979). It was 05:00 AM where Roddy was and 2:00 PM the same day at ISEA in Sydney. Roddy asked the audience how old they were, whether they were happy, what they felt about love and shared plans to host *The All Day Video Breakfast* (www.thealldayvideobreakfast.info) as a global telematic event on 17 January 2014, the date Filliou proposed as 'Art's Birthday'. Roddy also took a group photograph and self-portrait which he tweeted following the discussion.

Fig. 5 Roddy Hunter, *Video Breakfasting Together, If You Wish (after Robert Filliou)* (2013)

These researchers, all based within the CRUMB research unit, have adopted methods of art and curatorial practice to investigate aspects of technology and culture in their work. By using their own projects, alongside case studies of others' works, they are able to analyse and compare different ways of working. While their subjects and projects are varied -- online and offline platforms; open source systems; commercial and artistic commissions; performance and coded software installations; re-enacted networked experiments – they share the ability to identify characteristics inherent to new media and the digital, and the interface between the work of art and the audience. Their works - whether artistic

or curatorial – allow audiences to imaginatively experience and critically reflect on the changing manifestations of new technologies and digital media in art.

References and Notes

1. Sara Diamond, *A tool for collaborative online dialogue CODE Zebra OS*, PhD thesis, (London, UK: University of London, 2003).

2. Phohman, Angela, and Melinda Sipos, *Beyond Data*, (Eindhoven, NL: Baltan Labratories, 2012)

3. Beryl Graham and Sarah Cook, *Rethinking Curating: Art After New Media*, (Cambridge, MA: MIT Press, 2010).

4. Manovich, Lev, *The Death of Computer Art*, (1996), <http://www.thenetnet.com/schmeb/schmeb12.html>, accessed 14 November 2013.

5. Rosalind Krauss, *A Voyage on The North Sea*. (London, UK: Thames & Hudson, 2000).

6. Geert Lovink briefly and aptly describes the development of the Web in four stages stating that the rebirth of the web into the Web 2.0 and "its evolution into a mass medium" after the dot.com crash is characterised by "three distinguished features: it is easy to use, it facilitates sociality, and it provides users with free publishing and production platforms that allow them to upload content in any form". Geert Lovink, *Networks Without a Cause* (Cambridge, UK: Polity Press, 2011).

7. Michel de Certau, *Spatial Stories. In The Practice of Everyday Life* (Berkeley, CA: University of California Press, Ed. 2002).

8. Sarah Cook and Beryl Graham suggest to look at the "behaviour of the artworks" thus concentrating on the process rather than the object, the outcome, when curating and discussing "new media" art. Sarah Cook and Beryl Graham, *Rethinking Curating* (Cambridge, MA: MIT Press, 2010)

9. Olia Goriunova, *Art Platforms and Cultural Production on the Internet* (Oxford, UK: Routledge, 2011).

10. Media critic Vito Campanelli has carried out extensive research into the form and content on the Web along with its relationship with the offline in its book Web Aesthetics. Campanelli's aim is to "understand the relationships between human beings and the Web" in a time in which "digital technology encompasses contemporary existence" and thus has to be understood as part of a "whole media complex" for which "offline phenomena" can often be analysed and discussed in relation to it. Vito Campanelli, *Web Aesthetics. How Digital Media Affect Culture and Society* (Rotterdam, NL: Nai Publishers, 2011).

11. Lovink [2]

12. or-bits.com's mission is to support the production of new works and writing and instigate an exploration of the creative and critical possibilities of the web as language, medium and subject. Its activity spans from web-based exhibitions to related offsite, curatorial collaborations and talks. <http://www.or-bits.com>

13. Dominic Smith, *Models Of Open Source Production Compared To Participative Systems In New Media Art*, PhD thesis, (Sunderland, UK: University of Sunderland, 2011).

14. S. Albert, *Open Source and Collective Art Practice* (1999), <http://www.twenteenthcentury.com/saul/os.htm>, accessed: 20 May 2011.

15. T. Terranova, *Network Culture: Politics For the Information Age.* (London, UK: Pluto Press, 2004).

16. The Jargon File, *Hack mode* (2004), http://www.catb.org/jargon/html/H/hack-mode.html, accessed: 18 April 2010.

17. Dominic Smith, *Interview with Michael Mandiberg*, (2008), <http://www.crumbweb.org/getInterviewDetail.php?id=31&ts=1372431102&op=3&sublink=7>, accessed 25 June 2013.

18. Julian Priest, David Merritt and Adam Hyde, *A Geekosystem*, (2008), <http://www.physicsroom.org.nz/gallery/2008/ageekosystem/>, accessed: 5 July 2013.

19. Inke Arns, *Read_me, Run_me, Execute_me: Software and Its Discontents: or It's the Performativity of Code, Stupid!* (2004), <http://www.runme.org/project/+executeme/>, accessed 5 July 2013.

20. Fei Jun, interviewed by: Victoria Bradbury [in person] (Central Academy of Fine Arts Media Lab: 13th August, 2012).

21. David M. Berry, *The Philosophy of Software: Code and Mediation in the Digital Age*, (New York: Palgrave Macmillan, 2011).

22. Gunter Berghaus, *Avante-Garde Performance: Live Events and Electronic Technologies*, (New York: Palgrave Macmillan, 2005).

23. Robert Filliou, *From Political to Poetical Economy*, (Vancouver, BC: Morris and Helen Belkin Gallery, 1996).

24. Lev Manovich, *The Language of New Media*, (Cambridge, MA: MIT Press, 2001).

25. Geert Lovink, *A Ramble through Theories of Globalization*, (2002), <http://geertlovink.org/texts/a-ramble-through-theories-of-globalization/>, accessed: 5 July 2013.

26. Geert Lovink, *Networks Without a Cause: A Critique of Social Media* (Cambridge, UK: Polity, 2012).

27. Noam Chomsky, *Profit Over People: Neoliberalism and Global Order* (New York: Seven Stories Press, 1999).

HUMPY: AN EARLY AUSTRALIAN ARCHITECTURAL PROJECTION

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Abstract

In Australia's Bicentennial year 1988, which marked 200 years of European colonisation, an important artistic collaboration occurred between Ian de Gruchy and Krzysztof Wodiczko. Their site specific installation *Humpy* commented on the ongoing politics of Indigenous dispossession and loss of place. They are artists who helped to develop the practice of projecting large-scale images onto architecture. While the work was critically ignored at the time, it has become increasingly relevant as historians, architects and artists research and reference Indigenous architectural forms. The ongoing currency of the artist's political commentary on Indigenous loss of place is another important element of the work's continuing resonance.

Keywords: Australian Indigenous architecture, architectural projection, Australian media art, place, loss of place, media art history, colonisation, Ian de Gruchy, Krzysztof Wodiczko

Introduction

Humpy is an early Australian architectural projection that continues to hold resonance 24 years after its temporary installation at the Adelaide Festival in Australia's Bicentennial year 1988, which marked 200 years of European colonisation. While large-scale outdoor projections are now a common form, in the 1980s this new medium was being developed. Polish American artist Krzysztof Wodiczko and Australian artist Ian de Gruchy, who collaborated for a seven year period during which they created *Humpy*, were among the pioneers of this form. In this particular work, a temporary site-specific projection of an Indigenous 'ethno-architectural' humpy structure made from makeshift materials is mapped on to the modernist architecture of the Adelaide Festival Centre.

The makeshift humpy is an overlay of traditional architectural structure and colonial found materials of corrugated iron and milled wood. In the triangular form, supported by a forked post and central pole, we can see traditional structures such as that illustrated in Figure 1 from New South Wales in 1868. It is fairly close to the form presented in *Humpy* in which, through the projected image, the building is re-clad with galvanized sheet, tarpaulins and other makeshift materials.

Fig. 1. Aboriginal people outside a dwelling at Cobran, New South Wales, 1868 (Reproduced courtesy of Museum Victoria. Photo © unrecorded, XP2063).

In subject matter, Wodiczko and de Gruchy*'s Humpy* explores Australian history and identity and the ongoing uncanny moments of post-colonial identity. In it we experience a mediated perspective of a particular place in which a no longer visible history of the site is made visible. In the dialogue about the particularities of place a wider narrative of Indigenous loss of place and the ongoing politics of this loss of place is uncovered.

The humpy is a home linked to traditional Indigenous forms of architecture and yet decentred through forces of the colonising culture. In this hybrid form we see layers of loss: of land, of place, of language, of culture and of life in the violence of the frontier. And yet there is also an extraordinary spirit of resilience expressed by Indigenous people in making do with available materials and traditional knowledge evident in the hybridisation between form and materials.

In this paper I examine the way *Humpy* draws from both traditional Australian Indigenous architecture, and foregrounds contemporary architectural works where media is embedded in the architectural form of a building or media becomes an embedded electronic skin. I did not experience the work at the time, but rather came across it in the documentation and archival record of de Gruchy's and Wodiczko's individual practices. In my work as a media artist and writer I became interested in *Humpy* as an artistic reference and early example of architectural projection. I was also struck by the ongoing political currency of the work 24 years on from its creation.

prehistory

The dispossession of Indigenous Australians from their particular countries, and ongoing Indigenous and non-Indigenous relationships to place, arise in the work. From 1968, when prominent Australian anthropologist William Edward Hanley Stanner identified 'the great Australian silence' to characterise the structural gap in historical discourse about the relationship between 'ourselves and aborigines,' the debate about what happened between coloniser and colonised in terms of frontier conflict and relationships between Aborigines and settlers has developed [1]. In 2003 historian Tim Rowse questioned the focus of that debate, saying:

"…it is arguable that the current controversy about the extent and causes of frontier violence does not matter much because it is incidental to the really important story that indigenous people lost ownership and sovereignty without ever consenting to that loss. I want to suggest that the grounds for Indigenous grievance rest on that uncontradicted story, not on any particular account of...colonial settlement [2]."

Historians such as Peter Read have delved into Australians' sense of place and belonging, set against the backdrop of Indigenous dispossession and loss of place[3]. In *Belonging* he asks, "How can we non-Indigenous Australians justify our continuous presence and our

Fig. 2. Krzysztof Wodiczko and Ian de Gruchy, *Humpy*, 1988 (© courtesy of the artists.)

love for this country while the Indigenous people remain dispossessed and their history unacknowledged? [4]." It's a difficult question for many people, one he explores in conversation with Australians of varied backgrounds and with reference to the work of Australian artists, poets and writers. Read also explores the question personally through his sense of place and attachment to the Northern Beaches of Sydney/ the Gai-mariagal country of his friend Dennis Foley.

In 1988, the year of the Bicentennial, there were protests around the country on Australia Day/ Invasion Day. Commemorated each year on the 26th of January, the day the First Fleet landed on the shores of Botany Bay. The Bicentennial celebrations focused on a re-enactment of the landing of the tall ships of the first fleet performed in Sydney Harbour to a crowd estimated at 2 million [5]. In opposition to the notion that Australia was only discovered 200 years ago and not occupied by Aboriginal groups for 40,000 years prior to the establishment of the British colony, the Aboriginal flag was flown at Mrs Macquarie's Point on Sydney Harbour and at other locations around the city. A large-scale protest of more than 40,000 people, including Aborigines from across the country and non-Indigenous supporters, marched through Sydney and rallied in Hyde Park in what was the largest march in Sydney since the Vietnam moratorium [6]. The slogan "white Australia has a black history" was used in the protests [7], pointing out the short view of white history privileged in the celebrations.

Humpy is set against this scene of Indigenous people's loss of place and Australians' questioning of their relationship to place during the Bicentennial year.

Site and history

Ian de Gruchy's description of the project states that the Festival Centre was built over an Indigenous settlement and that the work was created to highlight this [8]. An Indigenous camp, which later evolved into a town camp as Adelaide developed, existed on the site. It was known as Pinky Flats and was a favoured camping and hunting ground for possum, water fowl and other game [9]. Pinky Flats was also a favourite drinking spot during the Depression for both Indigenous and non-Indigenous people. The site name is possibly derived from *pingko* (bilby) in Kaurna, the Indigenous language spoken in Adelaide up until 1929, or from 'pinky', a colloquial term for cheap red wine [10]. In choosing the site, de Gruchy drew on his local knowledge as an Adelaide resident:

"I was well aware that Pinky Flat was a site of original settlement. When you live in Adelaide long enough you know what the history of the Torrens is, ...it's a beautiful spot along the river and it was always known as Pinky Flat and that had a resonance for me. The work was about turning a high culture site into a memory of its past and drew stark treatment to the people who had lived on Pinky Flat [11]."

Designed by architect John Morphett [12], the Festival Centre building at Elder Park overlooking the river Torrens was built over the period 1970-1973 on the site of Pinky Flats. The distinctive white geometric triangulated dome roofs of the centre provided a unique projection surface for the artists. de Gruchy describes the building as Adelaide's answer to the Sydney Opera House with the knowledge that the

Fig. 3. Wolfgang Sievers, *Exterior view with a person on the steps of Festival Hall, Adelaide*, 1973, (Reproduced courtesy of National Library of Australia. Photo © Wolfgang Sievers.)

Fig. 4. Images given to Ian de Gruchy used as reference for *Humpy* (© Reproduced ccourtesy of Ian de Gruchy. Photo © David Kerr.)

Festival Centre had opened some months before the Opera House [13]. de Gruchy describes the building as "form following function" with its skin following the shells of the concert hall and theatres [Fig.3].
With its smooth skin the building provided a perfect projection surface on which to temporarily reconfigure the buildings architectural form through projected image [14]. In Wodiczko and de Gruchy's projected humpy [Fig.2], the triangular peaked roof of the festival centre is visually matched with the triangular peaked shape of a makeshift humpy's roof supported by a twisted tree trunk that is used as structural frame for the dwelling's entry.

Australian Indigenous Architecture

In recent years multi-disciplinary researcher of architecture/anthropology Paul Memmott has surveyed the Indigenous architecture of Australia. Memmott describes the first generation of Australian Indigenous architects as exploring and drawing from the variety of forms and structures of Indigenous humpies in their writing and architectural work. For example architect Alison Page of the Tharawal people of La Perouse, Sydney, has said of classical Aboriginal Architecture: "Buildings were traditionally used as a skin, as living, breathing, extensions of the body. No matter what form they adopted, they were receptive, flexible and sensitive, and constantly renewing [15]."

In the context of *Humpy* this re-skinning happens electronically, through projected textures of corrugated iron, and canvas sheeting resurfacing the roof plane of the modernist festival building. The project involved re-materialising the structure into a makeshift vernacular architecture composed of found materials laid over a wooden frame. de Gruchy has said "I was very interested in this whole relationship of how the galvanized iron actually lived on the building as a skin [16]."

Memmott's comprehensive study into the Aboriginal architecture of Australia describes the transformation of traditional 'ethno-architectural' structures into the shacks and humpies of the town camp. Traditional building structures were merged with found colonial materials, such as sheets of corrugated iron. Whilst the appearance of Indigenous architecture changed over time, the spatial arrangements of town camps were in many cases based on traditional camp formations. In essence, the 'fringe settlement' or town camp had evolved architecturally and socially from the traditional camp [17].

Countering the popularly held belief that Aborigines did not construct permanent homes and only sheltered in temporary camps of makeshift lean-tos and shelters, Memmott describes the diversity of Aboriginal architectural forms. A wide variety of structural materials was utilised, including stone, whale bone, and sapling structures and cladding materials such as bark, grasses, reeds and palm leaves. Most tribal groups employed up to seven or eight shelter types dependent on available materials, climate and duration of stay [18]. Sadly, early colonists often misread the seasonal nature of the occupation of camps and impermanent architecture as a lack of connection or attachment to place [19].

Following on from Memmot's study of Aboriginal architecture, Indigenous architect, Kevin O'Brien of the Meriam people of Murray Islands, sees the potential of drawing from the Aboriginal architectural traditions: "For me it is now a matter of construction. A utilitarian approach to construction exemplified by minimal structure; effective cladding extracted from materials of that Country" [20]. In his exhibition *Finding Country – A Primer* (2009) he asked "how do we empty the city to reveal country?," a position that is central to his work [21].

This idea of emptying the city to reveal invisible country is effectively what de Gruchy's and Wodiczko's *Humpy* does; an architectural structure of the city is erased through a process of digital recladding, revealing relationships to traditional architectural form and inherent relationships to climate, traditional architectural structures and country.

The reference images for *Humpy* [Fig. 4] were taken in Central Australia and reflect traditional architectures found in that environment. de Gruchy has said that he was inspired to make the work after seeing photographs of makeshift humpy structures from the Central Australian communities of Yuendumu and Papunya photographed by friend and fellow artist Dave Kerr [22] [Fig. 4]. de Gruchy and Wodiczko used these photographs as reference material [23].

Therefore, while *Humpy* refers to the history of a particular site, Pinky Flats, the reference images used do not reflect Indigenous architecture from the Adelaide area. Rather *Humpy* stands in for Indigenous architecture as a whole. A historical example which depicts particular seasonal architecture from the Adelaide area is Eugene Von Guerard's drawing, *Winter Encampment in Wurlies of divisions of the tribes from Lake Bonney and Lake Victoria in the Parkland near Adelaide* [Fig. 5]. In this image Von Guerard illustrates domes

Fig. 5. Eugène von Guérard, *Winter encampments in wurlies of divisions of the tribes from Lake Bonney and Lake Victoria in the parkland near Adelaide,* 1858, pen and ink, wash and pencil, (Reproduced courtesy National Gallery of Victoria, Melbourne.)

that comprise a more robust closed structure suited to wet and cold weather with an internal fire used for heating. These sort of closed structures were used in the winter in Southern Australia in addition to open windbreaks and shade structures in the summer [24].

Another historical image related to the Adelaide area is George French Angas's etching; *Native Hut on Koorong* (1844) [Fig. 6], in which a similar rounded architectural form to that portrayed by Von Guerard is illustrated. However this structure is more open at the front and looks more like a shelter against the wind rather than wet, cold weather. The huts were built on the southern shores to face the north-east to provide shelter from cold gale winds from the south and west [25].

At face value the humpy, in all of its particular ethno-architectural and hybridised forms, can be read as a symbol of the dispossession of Indigenous people from their land and culture; how they were pushed from their traditional lands to the fringes of the colonising European's settlements. Conversely, the humpy can also be seen as a symbol of resistance to assimilating into white culture and ways. In one way, the life of the Aboriginal town camper can be regarded as a cultural triumph. Town camps provided a setting with sufficient autonomy to maintain and practice Aboriginal culture, something that was suppressed to a significant extent in the government settlements [26]. The humpy and town camp existed in a liminal zone between the white world and the black world, where often the white world was built over the black world, with towns and cattle stations typically sited on significant areas where water was accessible.

Fig. 6. George French Angas, *Native hut on Koorong,* Watercolour, 1844, (Reproduced courtesy of the South Australian Museum Archives.)

The removal of humpies and shanty-towns from urban areas that occurred in the twentieth century is a severing of connection between Indigenous peoples and their traditional lands. This occurred forcibly in some instances, to claim land for development [27], and in other cases voluntarily, to improve living conditions [28]. The perceptions of self-built camps and structures as being unclean and unhealthy also contributed to decisions to displace Aboriginal people from them, to government run compounds and settlements [29].

The control of Aboriginal communities and land is still unfortunately highly contested. Indigenous people only own or control 16 per cent of land in Australia, 98 percent of which is in very remote areas [30]. In the past decade government policy from both major parties dealing with Aboriginal land and lives has come under fire for being racially discriminatory and breaching human rights. The Howard government's military style operation and move to take control of Aboriginal Land in the *Northern Territory National Emergency Response Act* of 2007 [31] was widely criticised as an attempt to assume control of Aboriginal land and lives [32]. The Federal legislation and intervention came after the release of the Northern Territory Government's *Ampe Akelyernemane Meke Mekarle* 'Little Children are Sacred' report [33]. However, once the federal election was over and power changed hands, the Rudd and Gillard Labor governments have, to the dismay of many, continued the intervention in the Northern Territory and as of July 2012 have voted to extend the legislation for a further 10 years with the *Stronger Futures Policy* [34]. Both the intervention and *Stronger Futures* have received criticism as being incompatible with the UN Declaration on the Rights of Indigenous Peoples and continuing race based legislation [35]. Whilst a full discussion of these issues falls outside the scope of this paper it is important background for an appreciation of the ongoing potency and political currency of Wodiczko and de Gruchy's *Humpy*.

State vs Nomadic Space

In *Humpy*, a nomadic architectural structure is temporarily imposed over a permanent architectural form, recalling Delezue and Guattari's notions of 'state space' and 'nomad space' in their *Traite*

Fig. 7. Realities: united, *Media Façade*, Kunsthaus Graz, Austria, 2003, (Photo © Harry Schiffer)

de nomadologie; La machine de guerre. Vidler describes this contestation of space in the following terms:

"A sedentary space that is consciously parcelled out, closed, and divided by institutions of power would then be contrasted to the smooth, flowing, unbounded space of nomadism; in western contexts, the former has always attempted to bring the latter under control" [36].

This contestation of space in Wodiczko and de Gruchy's work is reversed and temporarily 'nomad' space reclaims space from the 'state space'; trumping the form of the cultural institution under the cover of darkness.

Media Skins

Wodiczko's architectural projection works typically treat the building anthropomorphically. This strategy is one that the artist has used in many other projections in the 1980s, and in 1999 for the *Hiroshima Projection*

where the hands and voices of Hiroshima survivors were projected onto the Atomic Bomb Memorial Dome, Hiroshima. In this work, survivors' hands were projected at the foot of the building, and the tower and dome of the building become the personified torso and head of the survivor. The body of the survivor therefore becomes a public body embodying and personifying the witnesses and survivors of a war atrocity on a previously unheralded scale.

What is different about *Humpy* and makes it unique among Wodiczko's projection works is that architecture is projected onto architecture. The humpy projection reskins the Adelaide Festival Building by projecting composited media of an architectural form once found at the site onto the present day structure. And through this process of reskinning, the physical architecture of the building is rematerialised in an act of politically charged remembrance.
In some ways this process of reskinning the building also foregrounds modern architectural works such as the biomorphic Kunsthaus Graz completed by architects Peter Cook and Colin Fournier in Austria in 2003. The BIX *media façade*, designed by Berlin designers realities:united, merges media with architecture to form a programmable electronic skin in which low resolution images are drawn on its surface with individual computer programmed lamps forming a pixelated image on the skin of the building [Figure 7]. A surveying eye looks out from the BIX *media façade* building in a modern rendition of Wodiczko's technical strategies. There are also clear visual and thematic links with the work of Wodiczko, particularly his Bundeshaus projection from 1985 in Bern, Switzerland [Fig. 8], which also utilises images of a single eye [37]. More generally the two pieces are linked by similar strategies of personifying a building and underlying themes of structures of power and surveillance in capitalist societies.

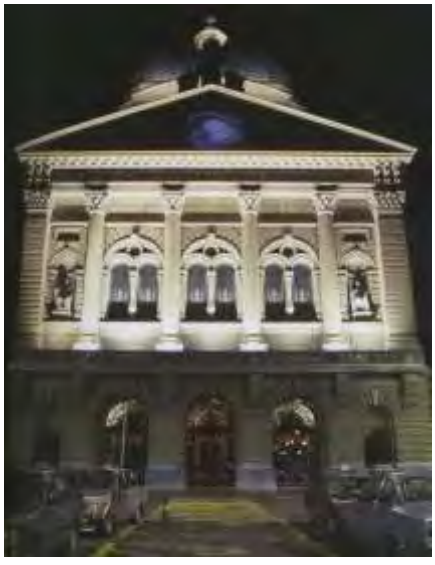

Fig. 8. Krzysztof Wodiczko, *Bundeshaus Projection*, Bern Switzerland, 1985, (© Courtesy of the artist.)

Conclusion

More than a quarter of a century on, *Humpy* points to continuing political debates and the difficult living conditions many Indigenous Australians experience. As a form of ethno-architecture, the humpy has recently been historically explored in its richly varied forms and continues to be fertile ground for architects and artists to draw from in both material and mediated forms.

The concerns of Wodiczko and deGruchy regarding Indigenous loss of place and ongoing disadvantage are referenced to a particular site's history. Their use of composited photographic media to reconfigure the present architecture of the site is an effective tactic. As an immersive media experience, *Humpy* re-positions the viewer in time and space, thereby allowing an invisible repressed history to become visible.

References and Notes

1. S. G. Foster, Bain Attwood, and Australia National Museum of, *Frontier conflict : the Australian experience / edited by Bain Attwood and S G Foster* (Canberra : National Museum of Australia: 2003), p.1.

2. Foster, Attwood [1] p. 23.

3. Peter Read, *Returning to nothing: the meaning of lost places* (Cambridge; Melbourne: Cambridge University Press, 1996).

4. Peter Read, *Belonging: Australians, place and Aboriginal ownership* (Cambridge; Melbourne: Cambridge University Press, 2000), p.1.

5. "1988: The Bicentenary," National Australia Day Council, <http://www.australiaday.org.au/australia-day/history/1988-the-bicentenary.aspx>.

6. "Indigenous Protest, 1988 Australian Bicentenary," Museum Victoria, <http://museumvictoria.com.au/collections/themes/2835/indigenous-protest-1988-australian-bicentenary>.

7. For a comparative account of the media coverage in the Sydney Morning Herald of the Bicentennial and 1938 Sesquicentenary celebrations see Gary Foley, "The Sydney Morning Herald and Representation of the 1988 Bicentennial," The Koori History Website, <http://pandora.nla.gov.au/pan/15182/20050125-0000/www.kooriweb.org/foley/essays/essay_11.html>

8. Ian de Gruchy, "Humpy," <http://www.artprojection.com.au/html/urban.htm>.

9. The University of Adelaide, "Tarndanya Womma," The University of Adelaide, <http://www.adelaide.edu.au/kwp/placenames/council/areas/map26.html>.

10. The University of Adelaide, "Kaurna Warra Pintyandi / Kaurna Language in the City of Adelaide," The University of Adelaide, <http://www.adelaide.edu.au/kwp/projects/language/>.

11. Ian de Gruchy, *Recorded interview with author* (Melbourne: 2012).

12. Morphett was a founding member of the Hassel Group. Adelaide Festival Centre, "Adelaide Festival Centre History," <http://www.adelaidefestivalcentre.com.au/afc/history.php>

13. de Gruchy [12].

14. de Gruchy [12].

15. Paul Memmot, *Gunyah Goondie + Wurley : the Aboriginal architecture of Australia / Paul Memmot* (St Lucia, Qld. :University of Queensland Press, 2007), p. 304.

16. de Gruchy [12].

17. Memmot [16] p. 266.

18. Memmot [16] p. 11.

19. Memmot [16].

20. Kevin O'Brien, "For Architecture and Country," *Artlink* 32, no. 2 (2012): p. 62.

21. O'Brien [21].

22. Kerr was working at the Adelaide Museum at the time.

23. de Gruchy [12].

24. Memmot [16] p. 9.

25. Robert Edwards, "The Kaurna People of the Adelaide Plains," ed. South Australian Museum (South Australian Museum, 1972), p.16.

26. Memmot [16] p.153.

27. Read [4] p.23.

28. Read [4] p.28.

29. Memmot [16] p.75.

30. Australian Government, "Overcoming Indigenous Disadvantage - Overview," ed. Productivity Commission (2011), p. 50.

31.Commonwealth of Australia, "The Northern Territory National Emergency Response ACT (NO. 129, 2007)."

32. Stephanie Peatling, "Social Crusade a Land Grab: Welfare Groups," *The Sydney Morning Herald*, 27 June 2007.

33. Rex Wild and Pat Anderson, " Ampe Akelyernemane Meke Mekarle "Little Children are Sacred"," (2007).

34. "Stronger Futures in the Northern Territory," Department of Families, Housing, Community Services and Indigenous Affairs, <http://www.fahcsia.gov.au/our-responsibilities/indigenous-australians/programs-services/stronger-futures-in-the-northern-territory-0>

35. "Federal Government must amend Stronger Futures laws to protect Aboriginal rights in Northern Territory," Human Rights Law Centre, <http://www.hrlc.org.au/stronger-futures-in-the-northern-territory-bill-2011>

36. Anthony Vidler, "Vagabond Architecture," in *The architectural uncanny : essays in the modern unhomely* (Cambridge, Mass.: MIT Press, 1992), p. 214.

37. The Bundeshaus projection used a series of slides of an eye looking at nearby banks, the city and down at the national gold vault stored under the building and finally up to the mountains and the "pure Calvanist sky". Duncan McCorquodale, *Krzysztof Wodiczko*, London: Black Dog Publishing, 2011, p. 76.

REPEATING THE PAST: LESSONS FOR VISUALISATION FROM THE HISTORY OF COMPUTER ART

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Abstract

The development of critical discourse and experimental practices in computer art of the 1960s and 1970s was informed by new forms of collaboration between artists, scientists and institutions. This paper acknowledges the debt owed by modern visualization practice to developments of this period but suggests that much of the artistic and philosophical legacy has been largely ignored in this area. It is argued that criticality in visualization practice should be informed by a number of aspects of 1960s and 1970s computer art practice, including implications for collaborative practice, thinking about mediation and the integration of aesthetics with life experience.

Keywords: visualization, computer art, media archaeology, design, collaboration, experience.

Data visualization is both a language and context of representation and communication which has enjoyed a relatively recent explosion out of its traditional fields of statistics and analysis into areas as diverse as advocacy, journalism, design and art. Recent accounts [1,2] have highlighted a lack of critical discourse around visualization. This suggests that this is an area with the exciting potential to explore new implications and directions for the field. There is also, however, a risk that such a rapid expansion overlooks existing contributions, both theoretical and practical.

In the midst of this expansion of academic territory, what lessons can be learned from the past? The application of methods or technology to new fields is not a new phenomenon and media art can look to its own history to draw some parallels. Already, studies have examined the computer art of the 1960s and 1970s in particular to document the emergence of new modes of thinking, mediation and expression of the time [3].

This paper will discuss the legacy of early computer art for later directions in art, design, and Human Computer Interaction (HCI), and ask what this might imply for visualization practice.

Paradigms and Networks: Where to Start?

Any attempt to locate a definite starting point with regards to the establishment of either computer based art or visualization suffers from some immediate problems: to identify a watershed point before which things were or were not either creative artworks or were or were not computers risks merely reifying disciplinary assumptions about the nature of those distinctions - the very thing that such studies are supposed to challenge. The variety of early computational devices, such as Babbage's and Ada Lovelace's Analytical Engine (conceived around 1834), the Jacquard Loom (1801), and The Ferranti Mark 1 (1951) all articulate different definitions of computation. Since the focus of this paper is to provide a useful stimulus for visualization practice, it seems consistent to engage with computers from the point at which they began to support graphical displays or outputs and also began, if not to enter the home, then at least to be accessible to some degree outside the research lab. This point coincides with the exhibitions described below. I examine this 'beginning' of computation not only as a period of interdisciplinary collaboration but also because of the debt that modern visualization technologies owe to technical developments here.

At the very end of the 1960s and beginning of the 1970s, three seminal exhibitions took place in London and New York. Jasia Reichardt's 1968, Institute of Contemporary Arts show 'Cybernetic Serendipity' was soon followed by 'The Machine as Seen at the End of the Mechanical Age' at MOMA curated by K G Pontus Hultén. The latter, while not featuring computers, nonetheless added to both atmosphere and debate on computer based art. Lastly and perhaps most controversially 'Software', Jack Burnham's contribution at the Jewish Museum in New York still resonates as a problematic, provocative rite of passage for art and technology.

In summary, two concurrent historical events concern us: The development of new paradigms of computer programming and the exhibition of seminal computer art which, I suggest, was influenced by ideas expressed in the former.

Ideological Cores

Crucially, the timing of the exhibitions listed above coincides with the coming age of flexibility in computing enabled by expressive and articulate programming languages. These in turn paved the way for graphical user interfaces. Object Oriented Programming (OOP) in the form of Allan Kay's Small Talk was a breakthrough in inseparably techno-creative terms. Although the first public release of the language 'SmallTalk' would not appear for ten years after the exhibitions took place [4], it was effectively born alongside the three exhibitions described above. Programmers increasingly thought in ideational or visual terms through their programs. As Casey Alt has pointed out: "computation became a medium when the concepts of medium and interface were implicitly embedded in computation at the material level of the programming language itself, an event I locate in the emergence of object oriented programming itself"[5].

OOP was the development which allowed artists and programmers to truly think through and with computers as they underwent a transition from tool to medium. It is true to say that visualization practice as we know it would certainly not exist without this development and, as Whitelaw [6] has pointed out, the conceptual organization of information into formal structures (called ontologies), made possible by OOP, has strong analogues with philosophical ontologies. It is not an exaggeration to say that the ideological core of visualization, even now instantiates a concept technically realized in this period. Visualizations are based on visions of the organization of information into discrete but interacting units, each with interfaces to one another, for example through such devices as search filters. This is, in fact, the essence of OOP: the power to create independent code objects with the capacity for independent interaction with each other.

I emphasize this techno-historical point not for nostalgia's sake but to underscore the point that visualization is technically and conceptually founded on object orientation. It is at the level of data ontology, not interface, that the most crucial decisions are made by designers. The ways in which data objects are composed and interact with one another constitutes the performativity of a visualization: it determines its action.

With the collaborations that came with 'Software' and 'Cybernetic Serendipity' came access for artists to lower levels of computational technology. By using the term 'low' I refer to the distinction in computer science of low and high level programming languages. Low-level programming languages operate very close to the basic functionality of computers. Operations such as memory management or manipulation are described in fine detail by the programmer. In contrast to this, high level languages abstract common operations (such as the stages of

saving a file to disk) for the sake of convenience.

I have described how the most fundamental concept of visualization systems, the data ontology, was a product of developments which allowed users to formulate conceptual abstractions [7] and by doing so, achieve a new kind of expressivity. I suggest however that this movement has also resulted in a mounting lack of criticality over the nature of mediation in visualization. In a sense, visualization has been its own worst enemy. The expressivity afforded by abstraction has emphasized the design of smooth interactivity and fashionable styling. The job of visualization has come to be oriented to the front end (the interface) to the detriment of the back end (the ontology and computation).

A focus on fine points of style and usability has also occluded more fundamental developmental questions for the field. By 'developmental questions' I mean those which seek to contextualize visualization in relation to other forms of cultural production, which interrogate its most basic visual/physical forms, and which question and experiment with the forms of agency it embodies in different networks. I suggest that such questions are articulated best at the furthest edges of what can be called visualization practice. Many of the works in the exhibitions mentioned earlier were agnostic to the label of 'art' but pursued individual research questions. This afforded an expanded and inclusive sense of creative possibility which later proved to be seminal for both art and design. For instance *Seek* [8], produced by the Architecture Machine Group at M.I.T., had both practical and metaphorical dimensions. It was at once an experiment in sensing and adaptive behavior, and a figurative gesture towards a world of integration between humans and computers, hence their statement, 'if computers are to be our friends, they must understand our metaphors' [9].

Definitions of art were both influenced and subverted by ideas from new sciences, such as Norbert Weiner's cybernetics and the Pragmatist philosophy espoused by John Dewey [10]. We can describe a period of art and computing characterized by a number of factors: a strong interest in systems and their permutations (from cybernetics and systems art), a desire to more closely interweave art practice with everyday life (from Dewey), and a new sense of mediated expressivity.

Convoluted Collaboration

In the 'Software' show, many works that incorporated programming were created through collaboration and sponsorship. For example this was true of *Labrynth: An Interactive Catalogue*, by Ned Woodman and Theodore H. Nelson with assistance from Scott Bradner (Art & Technology Inc. Boston), Digital Equipment Corporation, which was an early hypertext experiment. It was also true of Agnes Denes' *Matrix of Knowledge and Trigonal Ballet* (1970), which was created with assistance from Members of the R.E.S.I.S.T.O.R.S. Pennington N.J John Levine, Nat Kuhne, Peter Eichenberger and from Theodore Nelson [11]. This kind of collaboration gave a convoluted kind of agency to artists. On the one hand, their capacity to engage with and shape public consciousness about the emerging medium of computers was enabled. On the other hand, their reliance on corporate sponsorship or technical assistance financially and practically curtailed the possibilities engendered by this expansion into new realms of art making.

Whatever the problems such collaborations had, their occurrence signaled a new kind of integration of creative thinking and technological possibilities. Burnham described the whole process as an integrated, aesthetic whole: 'this is a different age in which we are beginning to read esthetics into budgets, planning procedures, and priorities - and not so much into finished products'[12]. For visualization practitioners now, as for artists then, the implication is that it is important to consider the entire production process as one of aesthetic continuity, rather than focusing only on the finished design. Collaboration can be thought of as taking place not only between different roles, but as something which should exist between every stage of the visualization pipeline.

Creating Contexts

Tufte's book *The Visual Display of Quantitative Information* [13] offers (before its unfortunate proscriptive turn towards the end) a candid description of the way that early visualizers (such as Playfair, Minard, Apianus) created languages, syntax, lexis, and indeed whole contexts around their work. Their contribution was technical and innovative, for instance in Playfair's development of the bar chart [14], as well as expressive. Indeed, the expressivity of these early works relied on an interrogation of basic forms and data processing and representation. In this sense, the defining feature of the most seminal visualizations was their autopoetic quality - their ability to create something - themselves, a medium - out of nothing. Their responsiveness to, and engagement with the world stretched and created definitions. It is therefore ironic that examples such as the Cholera outbreak map by John Snow [15] or Minard's Napoleonic death march [16] are trotted out with such torpid regularity at visualization events to demonstrate good interface design rather than as embodiments of new kinds of knowledge.

A key problem for visualization to overcome is its self-referentiality, that is, researchers' emphasis on perfecting a decontextualized vision of interface design. The latter halves of otherwise interesting papers from visualization conferences are too often filled with narrowly defined usability studies. I suggest that what is absent is a focus on lived experience. This situation is comparable to that faced by first wave HCI research:

"First Wave HCI was seen as having a technological focus on interactive applications running on workstations engaged with by individual users. First Wave HCI predominately used the methods and theories of experimental cognitive psychology to understand such scenarios" [17].

A transition has occurred in HCI from a focus on task-oriented users, to those in working in social settings and more recently to broader life experience:

"the Third Wave is characterized by non-work settings and topics such as lived-experience, intimacy, pleasure and embodiment. […] For many writers, this combination of ubiquitous technology and interest in user-experience requires a reorientation of our research methods" [18].

This orientation towards a dialogue or co-extensiveness with quotidian experience is strongly reminiscent of 1960s conceptual art practices which sought to blur the boundaries between art and life. A focus on performativity was foundational to this: I have previously argued that, '…the main contribution of this period was a focus on formal ways in which art could be said to act rather than represent.' [19]

The “action outside the frame” (i.e. the capacity of artwork to transcend its immediate context) also found its expression in computer art of the 1960s and 1970s. Burnham’s Catalogue essay [20] for ‘Software’ makes for provocative reading not least because it pays little attention to specific art objects and talks at length about art’s function in a changing world:

“Software is about experiencing without the mental cues of art history. Instead it is saying: ‘sense your responses when you perceive in a new way or interact with something or someone in an unusual situation’. For this reason Software regards the perceived appearance of the art object as a fraction of the entire communication structure surrounding any art” [21].

In Theory and Practice

The most interesting work and, in both senses of this word, ‘critical’ writing on visualization (for example, Whitelaw [22], Sack [23]) is ‘extrospective’ and inclusive. Sack, for instance, rejects a limitation of visualization in art contexts to a role of 'prettying up' or making readable existing data sets. Crucially he pushes visualization practices into dialogue with other fields, including the politics of administration and bureaucracy. Much of the work discussed by Sack (such as *Index 01*, by Art and Language [24]) is visualization in only the loosest sense of the word, but it is at this juncture that visualization work becomes its most crucial and agential.

Conclusions and Future Work

This paper has sketched a partial and selective account of visualization. Its core argument is that visualization's chief stumbling point has two main (related) elements. First: a focus on style, layout and usability occludes more fundamental questions of context and agency. These are related to an unhelpful separation of front and back ends, which undermines the critical potential of data structures (ontologies) and processes. Second, visualization theory and practice is not sufficiently informed by lessons from other related disciplines, and needs to take an experiential turn, following Dewey’s [25] proposed aesthetic continuity between art and everyday life.

The implication of this disjuncture, I suggest, is that visualization practitioners must be educated and must develop in circumstances which are truly transdisciplinary. This transdisciplinarity should not only entail contact and dialogue with other researchers, but should involve actively prototyping, developing and speculating about visualization’s role in, and connection to, other disciplines, real life scenarios and the creation of new strains of research.

References and Notes

1. Viégas, Fernanda B, and Martin Wattenberg. "Artistic data visualization: Beyond visual analytics." Online Communities and Social Computing (Springer, 2007) 182-191.

2. Dörk, Marian. "Critical InfoVis: exploring the politics of visualization." CHI'13 Extended Abstracts on Human Factors in Computing Systems (ACM, 2013).

3. Gere, Charlie, Nicholas Lambert, and Catherine Mason. White heat cold logic: British computer art 1960-1980 (MIT Press, 2008).

4. Kay, Allan. "The Early History of SmallTalk" (ACM SIGPLAN notices 8, no. 3, 1993).

5. Alt, Casey. "Objects of Our Affection: How Object Orientation made Computers a Medium." In Media Archeology: Approaches, Applications and Implications, edited by Jussi Parikka and Huhtamo Errki (University of California, 2011) pp.278-301.

6. Whitelaw, Mitchell, Mark Guglielmetti, and Troy Innocent. "Strange ontologies in digital culture." Computers in Entertainment 7, no. 1 (2009).

7. Alt [5].

8. Architecture and Machine Group, M.I.T. in "Software, Information Technology: its new meaning for art." Edited by Theodore H Nelson, Nicholas Negroponte and Les Levine (1970).

9. Burnham, Jack, in "Software, Information Technology: its new meaning for art." Edited by Theodore H Nelson, Nicholas Negroponte and Les Levine (1970).

10. Dewey, John. Art as Experience. (Toronto: Perigee, 2005).

11. Nelson Theodore H, Nicholas Negroponte and Les Levine Software, Information Technology: its new meaning for art." (1970).

12. Burnham [9].

13. Tufte, Edward R. The visual display of quantitative information. (Cheshire, CT: Graphics press, 1983).

14. Tufte [12] p.33.

15. Snow, John. "Cholera Map." Fielding School of Public Health. 1854. http://www.ph.ucla.edu/epi/snow/snowmap1_1854_lge.htm (accessed 7 7, 2013).

16. Tufte [12] p.41.

17. Bowers, John. "The logic of annotated portfolios: communicating the value of'research through design." Designing Interactive Systems (ACM, 2012) p.68.

18. Bowers [17] p.68.

19. Schofield, Tom, Marian Dörk, and Martyn Dade-Robertson. "Indexicality and Visualization: Exploring Analogies with Art, Cinema and Photography ." 9th ACM Creativity and Cognition. (Sydney: ACM, 2013) p.177.

20. Burnham [3].

21. Burnham [3] pp.10-14.

22. Whitelaw [6].

23. Sack, Warren. "Aesthetics of information visualization." In Context Providers: Conditions of Meaning in Media Arts, edited by Margot Lovejoy, Christiane Paul, Viktorija Vesna Bulajić and Victoria Vesna, 123. (Chicago: University of Chicago Press, 2011).

24. Language, Art and. Index 01. Lisson Gallery, London.

25. Dewey [10].

TRACES – 'READING' THE ENVIRONMENT

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Abstract

This paper looks particularly at informal and implicit sources of information in our environment, how we can read this kind of information, and how the information has come about. The paper focuses on implicit information and 'reading the environment', with examples from practice, and presenting an art project that investigates this notion through an interactive video installation. This installation, called 'Traces', presented interactive videos and photographs of two types of human-made traces, revealing past behaviours and/or intentions. It took for instance the skidmarks of cars on roads as input for a process of video manipulation and a recorded sonification.

Keywords: traces, implicit, peripheral, multimodal, interaction, environment.

Information is present all around us, not only the human made, intentional or accidental representations, but also the unintended and implicit. Some of this information we are not aware of. We live in a dynamic environment, constantly changing by the forces of nature, animals, growth, and human action. In this paper the three main modes of communication, knowledge representation, and interaction are described. These modes are the *manipulative* (physical interaction), *iconic* (mimicking) and the *symbolic* (abstract).

Not all of the information in our environment will be recognised as such by all perceivers, it depends on their individual knowledge, experience, approaches, values and mindset. This ecological reciprocal relationship between people and their environment is the basis of much of the work by J. J. Gibson[1, 2], including the concept of *affordances*. Affordances are an important notion and perhaps due to the ecological nature (what an object affords depends on the perceiver's knowledge, abilities etc.) it seems only recently to have become a topic discussed in semiotic literature [3]. Affordances always has been an important notion for the design disciplines, for instance through the work of Donald Norman [4] and Bill Gaver [5]. The notion of affordances is relevant in guiding and leading the user when interacting with an object or system. Affordances suggest potential usage.

The role of an affordance in the manipulative mode can be compared with the role of a written instruction is in the symbolic mode, or the function of a pictogram in the iconic mode.

In this paper I focus on the peripheral, implicit and unconscious modes of interaction, which can be applied in the process of designing for interaction. These modes are illustrated with a number of examples in the next section. This forms the basis of the "Traces" interactive audiovisual installation developed by the author, as a means of researching the interpretation of implicit information in the environment.

Reading the environment

The implicit modes of interaction are best understood in an ecological approach, where meaning and potential can be communicated only if certain interactions occur between entities in the ecology. Affordances are a good example of implicit interaction, potentially informing a person (or animal) of a possible use of the object. In a way it is about "tuning in" to the environment. The examples I use in lectures show this tuning in, aiming to be opening up the eyes, ears and other senses, encouraging people to find the hidden clues and information in their environments. Most importantly, this supports the students to apply this knowledge in their design processes. I have been using examples from other disciplines, for instance detectives who find clues in the environment to solve crimes, or the film The Tracker by Rolf de Heer, which contains strong examples of the superior ability of the Australian Aborigines to read the natural environment.

Fig. 1. The work of Naoto Fukasawa

Naoto Fukasawa is a Japanese designer who is known for his attention to these hidden clues in the environment and turned them into design input [6]. He has conducted a design workshop since 1998 called "without thought" which was about the unconscious responses of people to clues and affordances in their environment. One of Fukasawa's observations was that people writing messages using mobile or smart phones in public space, use the omnipresent guiding bumps on the pavement intended to aid the sight impaired, to find their way. He gives several examples of these kinds of unintended usage, and even how affordances can be perceived that subvert the intended use of an object. This could be seen as an inappropriate affordance, such as the metal Braille signs' horizontal surface and texture which 'affords' extinguishing a cigarette!

The picture in Fig. 1 shows one of his most famous designs, a CD player for Muji. It mimics a kitchen or bathroom fan, deliberately subverting the expectations of the user. The most interesting feature is the cord, which asks to be pulled, and this affordance is reinforced by the user's tacit knowledge of how to switch on a kitchen fan. It is not a false affordance: the playing of the disc starts and stops by pulling the cord.

In the sonic modality, an excellent example of tuning in to the environment can be found in the work of Canadian composer and scholar Murray Schafer [7]. He argues for better listening and awareness of the sounds in the world, not only music. He uses the term Soundscape to describe this. The current trend of people listening to heavily compressed MP3 versions of music, the pathological 'iPod ears' (recurring ear infections), and this tendency to actually shut out the environmental sounds are all problems that Schafer anticipated.

In the following paragraphs a number of examples of reading the environment are presented.

Animal traces

Normally animals leave few traces that we can perceive. They do however leave olfactory traces (sometimes involun-

Fig. 2. Animal traces revealed by snow

tarily), which other animals can pick up and follow. In a snowy landscape however the imprints of animals become visible (the picture in Fig. 2 is taken in the Belgian Ardennes). The other picture in Fig. 2 shows the presence of voluntary olfactory traces, the dog urine, which had stained the snow yellow, making the invisible visible.

When lots of animals use certain trails, the tracks become visible as in the pictures below in Fig. 3. The picture at the bottom of Fig. 3 tells a little story. It is the narrative of traces, revealing that a bird has landed, to catch a clam.

Fig. 3. Traces in nature

Desire lines

People often leave traces by repeated walks along made up tracks, not unlike the animal tracks above. They are sometimes called 'lines of desire', as they express the desire of the people to establish a track in a certain location. Many people can indicate their preference for a path, which gets established by their cumulative actions [8]. These tracks people create for instance in public parks as alternatives to the designed footpaths, designing with their feet. In a way it is the aggregated expression of many people saying: "the path is in the wrong place", and could ideally be input for a (re-)design process.

This principle can also be applied to interface design [9], indeed we see some software learning from our repeated actions or mistakes.

Fig. 4. Traces reflecting people's desires and past behaviours

An emerging path, maintained by the feet of many walkers, can still be ignored by town planners. In other cases however such desire lines will become de facto paths, and accepted by planners who turn it into an official path (a well known one for people in the Netherlands is the track from the train station in Eindhoven to the university campus). In urban planning and landscape gardening it has become an accepted design practice albeit applied in rare cases, to approach a landscape as a 'tabula rasa' and let the people assist in establishing the paths.

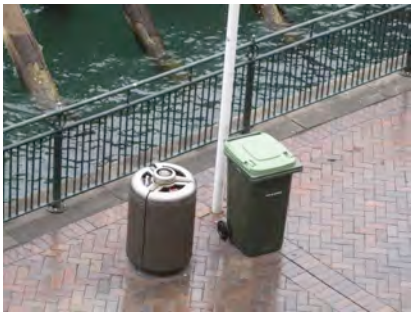
Another example is shown in Fig. 4. It is a spatial narrative, found on the way from a station to a university in Amsterdam. The pictures are taken over a period of 2.5 years, and show various iterations in the development of a shortcut by pedestrians, and the planners' responses to obstruct the making of the path. Eventually a low fence is placed to protect the flowers that were put there to discourage people to create a shortcut.

Implicit responses to designs

People respond to the design of their environments in many implicit ways. A good example is the response to missing bins in stations or parks, where the rubbish will be piled up neatly on the spot that is evident from the accumulated responses of the audience. In the same way as the ad-hoc design of people's desired paths, people express a certain need implicitly here.

There are many of these clues in the environment. It is important as a planner or designer not to ignore these signs, however much they may hurt the pride, and take them as input for design processes. In Figure 5 is an example, of the main ferry station in Sydney. The bin on the left is the official bin, anchored in the pavement, well designed both aesthetically as well as functionally. It lacks the capacity to deal with the amount of rubbish the people coming off the ferries need to dispose off – the ad-hoc placement of the bin on the right reveals this shortcoming.

Fig. 5. "the bin is too small"



The footprints in Figure 6 (note there are two different imprints!) reveal possible anger at the lift button. This may also have been a response to a common mistake made by users, that the lift button and the icon next to it are almost identical, making the latter superfluous. Often people try to press the icon, and get frustrated.

Fig. 6. "the lift takes too long"

All these examples show how people express themselves in the manipulative mode of interaction, often in implicit ways, rather than through the iconic and symbolic modes which tend to be more explicit.

Traces - the road as canvas

To provoke people to become aware of certain traces in their environment an interactive video installation was developed for the curated gallery at the design faculty at UTS in June 2010. The installation presents examples of the interaction modes as described in the background section of this paper.

In addition to my academic research and development of theoretical frameworks for interface design [10], I often include artistic explorations in my research approach, as it opens up new ways of presenting and engaging audiences in the questions that are investigated. The reflections of the work and discussion of the results of the underlying research questions posed are generally presented in academic publications [11, 12].

In the installations in this exhibition there were a number of leads and elements, reflecting a fascination with the traces in our environment - traces of past behaviours, traces of use, traces of invisible structures around us, traces which can make perceivable the electronic ecology we live in. The aim of the exhibition was to encourage visitors to open up their senses to the hidden fabric revealed through the traces, by zooming in, changing perspective, altering viewpoints, and focusing in different ways.

The installation took two examples of traces found in the environment, one rural and one urban. They reveal past behaviours through certain expressions, or hidden infrastructure respectively.

The installation was a result of the author's research and design approach which aims to make the invisible seen, the inaudible reach our ears, and the intangible touched. In other words, the design approach is about 'making physical' our surrounding virtual world of computers, networks, electronic circuits, radio waves etc. While it is convenient for those developing the contemporary technologies to keep things unclear, inherently concealing its many flaws, for the users it is important that technologies are demystified. It is key to the approach of the electronic ecology which emphasises *interaction* rather than exclusion.

Pavement Painting

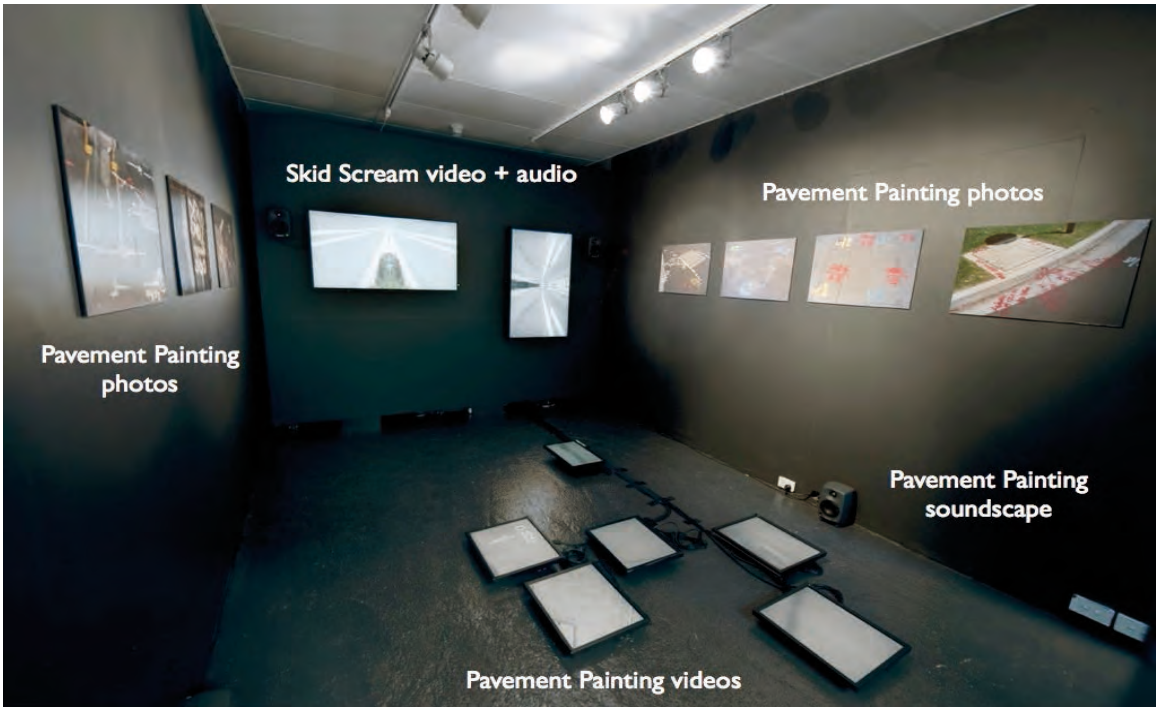
Perhaps it was the outsider's perspective (being Dutch - in my own country people who spray paint on the pavement get arrested), that brought a fascination with the markings found around building sites on pavements and roads. Unintentionally, traces of underlying technological infrastructure below the pavements and streets are brought to our perception through this kind of "builders' graffiti". It is still full of mystifying jargon, clearly not intended to be understood by us but it is hard to ignore in its bright (and accidentally often quite beautiful) graffito-writing. The mode of expression is mostly symbolic, and occasionally iconic. Over the years I have collected many images of these *pavement paintings.* Out of the hundreds of images, seven photographs were selected and printed which were put on the walls, and five videos played on screens on the floor, accompanied by a soundscape on two speakers. The videos were made by following the more elaborate and extended pavement paintings I encountered, and displaying them on the floor seemed appropriate as the video screens mimicking the street tiles.

Skid Scream

The image material for *Skid Scream* came out of observing the skid marks on roads in certain areas. It was as if the street has been treated as a canvas, and the car tires as a brush. The traces left seem to be a by-product of the high powered cars as extension of the drivers. It is a sinister form of expression in this process, but when isolated afterwards it results in fascinating images. I followed the lines on the roads filming them, chasing the curves and figures produced. They have created patters in space and time, that would have pleased Paul Klee or Wassily Kandinsky. In the spirit of Klee's notion of 'taking a line for a walk', La Monte Young's famous Fluxus piece with the single instruction 'draw a straight line and follow it', and graphical scores such as John Cage's composition Ryoanji, I then followed, complemented, contrasted and translated the shapes into music. Using feedback guitar with extended playing techniques (slide, e-bow and digital pitch change pedal) the skid mark curves were interpreted in continuous glissandi ('skid screams'), recorded without overdubs. Using the extended playing techniques it was possible to follow two lines at the same time. In the installation there were six video fragments, each with their own sound track, distributed over two screens and two speakers. On each screen the video was mirrored, on a vertical (landscape) screen on the left and a vertical (portrait) screen on the right, to accentuate the movements of the lines.

Furthermore, the images subtly responded to audience movements in the space through position sensors mapped to slight deformations of the image. A video screen on the floor, which showed a close-up of a skid mark followed as a line, linked the floor screens to the screens on the wall.

Fig. 7 Traces installation, with Pavement Painting elements and Skid Scream screens.



Discussion and future work

The message I am intending to get across-with this paper is that there are many ways of interacting and information representation that utilise the peripheral and the informal, rather than the explicit and focal. By presenting a theoretical overview about multimodal interaction, and by giving examples of reading the environment, I hope to have conveyed the significant potential of these particularly underused modes. The main purpose of this endeavour is to encourage designers and developers to apply these modes in the design of interfaces. The 'radiation' of electronic information can be seen as an essential part of any design of a digital system.

From the advantage of being a relative newcomer in the country I now live in, which enables me to see things differently and notice different things in our everyday environment, the "Traces" interactive video installation was developed. Some of the interesting feedback was that many people have been struck by the pavement paintings or builder's graffiti presence. There is still the element of vandalism in it for me, even though some of the imagery is rather striking. The spray painting doesn't occur just on the tarmac, there seems to be no inhibition to mark on granite or stone surfaces. This is in line with the local habit of digging up pavements and replacing brick or granite tiles with tarmac afterwards, contributing to the urban scars. In a recent article in the local newspaper [13] one of the responsible people claimed the signs wear away quickly, but there is evidence that they are still clearly visible even after several years. The article also elaborates on the meaning of the signs, accentuating their categorisation in the symbolic mode of communication (colours and jargon) but that was, although interesting, not the focus of my project. My aim was to bring the implicit hidden structures under the attention, from which the audience was encouraged to explore further and for instance work out the colour coding.

The skid marks remain a fascinating yet elusive phenomenon. From the installation and presentations I did about it in the faculty, I gathered feedback about the process of 'doing donuts'. I have noticed of course that the skid marks mainly occur in areas where there is potential for young people to hang around bored and finding this a way of entertaining themselves. As such, the trace is a reflection of social-cultural behaviour related to a particular demographic. Apparently it involves joy-riding in stolen cars in some cases. However fascinating and sensational in their imagined processes of making, how these skid mark traces came about is not the most important issue for me to explore. This is more the domain of the contemporary Sydney artist Shaun Gladwell [14, 15], whose fascinating work engages strongly with street culture and extending its potential for expression in various video works. My main message is that there is a link between the trace and past behaviours, and like with the interpretation of the builder graffiti, to encourage the audience to work out further layers of meaning for themselves. They are a bit like crop circles, just a little more interesting in shape. This is why I added the layer of sonic interpretations of the curves, they seemed to posses a musical quality in the presentation. It is still a tantalising possibility though to investigate the sounds originally made in the process…..

For the opening of the exhibition, some of the sonifications were performed live by the author on electric guitar and Jos Mulder on electric piano. For the closing event the installation was extended with several further spatial video works in the adjacent Interactivation Studio. This emphasised the ongoing development of the work, both as an artistic exploration as well as a continuing input from this and other practices into the development of the theoretical framework and insights applicable to design practices. The intention of this work is to find new insights through this cross-disciplinary approach.

Fig. 8. Still from interactive video, as result of manipulations of the tire marks footage.

References

1. J. J. Gibson, *The Senses Considered as Perceptual Systems*, (Houghton Miffling, Boston, 1966)

2. J. J. Gibson, *The Ecological Approach to Visual Perception*. (Houghton Mifflin, Boston MA, 1979)

3. Günther Kress, *Multimodality – a social semiotic approach to contemporary communication.* (Routledge, 2010)

4. Donald Norman, *The Design of Everyday Things* (Doubleday, 1990)

5. Bill Gaver, "Technology Affordances". In: P*roceedings of the CHI conference*,(New Orleans, Louisiana, 1991)

6. Naoto Fukasawa et al., *Naoto Fukasawa.* (Phaidon, 2007)

7. R. Murray Schafer, *The Soundscape – our sonic environment and the tuning of the world.* (Destiny Books / Knopf, 1994 edition, 1977).

8. Jan Gehl *Life Between Buildings – using public space*. Translated by Jo Koch from the Danish text (1971) (Island Press, Washington DC, 2011 Edition, 1987) pp. 133 – 145.

9. Lon Barfield, *The User Interface – concepts and design*. (Addison Wesley, 1993) pp. 230.

10. Bert Bongers and Gerrit van der Veer. "Towards a Multimodal Interaction Space - Categorisation and Applications." *Journal of Personal and Ubiquitous Computing*. Vol. 11, No. 8, 207 pp. 609-619

11. Bert Bongers, "Interactive Video Projections as Augmented Environments." *International Journal of Art and Technology*. Vol. 5. No. 1, 2012

12. Bert Bongers, "The Projector as Instrument". *Journal of Personal and Ubiquitous Computing*, Springer Verlag, Vol 16, No. 1, 2012

13. Amanda Hoh, *Sydney street scribbles tell a secret story*. Sydney Morning Herald, 20/11 2013. on line with video: www.smh.com.au/nsw/sydney-street-scribbles-tell-a-secret-story-20131120-2xvci.html

14. Blair French (Ed.), *Shaun Gladwell -Videowork* Exhibition catalogue (Artspace, Sydney, 2007).

15. Sarah Tutton (Ed.), *Shaun Gladwell – Stereo Sequences*. Exhibition catalogue. (ACMI Australian Centre for the Moving Image, Melbourne 2011).

GLOBAL MIND FIELD – A CYBERNETIC PERSPECTIVE

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Abstract

This paper examines the process and outcomes of a workshop event Global Mind FIELD presented at *ISEA2013*, Sydney. The workshop was conducted and facilitated by Karen Casey and Harry Sokol, with assistants Damian Smith and James Power. The researchers aimed to initiate and test for instances of neural synchrony between participants using creative visual stimulus, enabled by proprietary software program Viseeg (Sokol/Casey) and wireless EEG (electroencephalograph) headsets (Emotiv). The paper further examines to what extent the process of neuro-feedback and the resulting neural synchrony produced through the 'hard' and 'soft' interfaces can be viewed as indicators of a cybernetic mode of practice.

Keywords: Neuroscience, EEG, Brainwaves, Neurofeedback, Cybernetics, Neural synchrony

Introduction

Global Mind FIELD is a development of the ongoing Global Mind Project, an arts and cognitive neuroscience initiative developed by artist Karen Casey in collaboration with software designer Harry Sokol. Drawing on a prior research investigation into creative brainwave activity, conducted by Casey in 2003 at the Brain Sciences Institute in Melbourne, Global Mind Project is at once an exploration of technological possibilities for generative hybrid art forms and an interrogation of consciousness and creativity. At the centre of the Global Mind Project is a digital effects and animation software / interface Viseeg, developed by Sokol with Casey, which audiovisually interprets real time neural data.

To date artworks developed in the context of Global Mind Project were entirely artist driven and did not involve direct audience interaction. However, they were devised with the idea of eliciting related brainwave activity in the viewer, and it has always been a key objective to create future works that involved audience interactivity through neuro-feedback [1]. Works such as *Meditation Wall*, 2011[2] and *Dream Zone*, 2012 [3] for example, were relatively 'one way' affairs to the extent that pre-recorded brainwaves were used to generate artworks that were viewed by audiences in a conventional subject-object sense. On the other hand, *Spectacle of the Mind*, 2010 was a performance event featuring artists Stelarc, Domenico de Clario and Jill Orr, which harnessed the brainwave activity of these well-known performers. As a stepping-stone to interactivity, *Dream Zone* involved Casey generating a feedback loop in the process of recording her brainwave data, thereby positioning herself as both spectator and creator of the work.
Following these pieces, and in an effort to further develop artworks that harnessed neuro-feedback techniques amongst audience participants, Casey conceived of a workshop process that would require pairs of individuals wearing Emotiv neuro-headsets to engage in partnered exercises while observing on-screen visual effects created with or affected by their EEG data. The material would change or vary when neural synchrony occurred between the participating pair, thereby providing a visual queue that could be registered by the subject's brain.

In the logic of neuro-feedback, the brain naturally seeks stimulus and will register when a frequency range, such as *Alpha* (8-13 Hz) or *Theta* (4-7Hz), is correlative with external information. Throughout the workshop the more the brain aligned with a predetermined goal as programmed with the Viseeg software (in this case synchrony with a partner), the more feedback it received, thus creating a neural feedback loop.

The title *Global Mind FIELD* was a way of evoking the idea of a 'field' of consciousness; the field being the sum total of all the contributing minds, both in a specific context such as the workshop itself, but also more generally across the whole of human consciousness, be it temporally or geographically. The idea of a 'consciousness field' raises a number of complex questions, and unsurprisingly it has been a source of deep fascination throughout a range of disciplines, not least of all psychology, philosophy of mind and many spiritual traditions. Global Mind Project engages with the notion of this field, as was highlighted by arts writer Dr Julie Clarke in her essay 'Spectacle of the Mind' [4] (2009), where she states: "Casey's 'Global Mind Project' seeks to reveal how mind extension, enabled by technology, floods the receptive field and generates an inter-textual dialogue of fluidity, continuity and reciprocity that unites us all and displaces the boundary between artists and audience, mind and world" [4]. From the position of the artist however, the urge to create artworks is not only a question of philosophy. It equally takes shape around a feeling of connection – a sensation of being linked to others and the world, both physically and mentally.

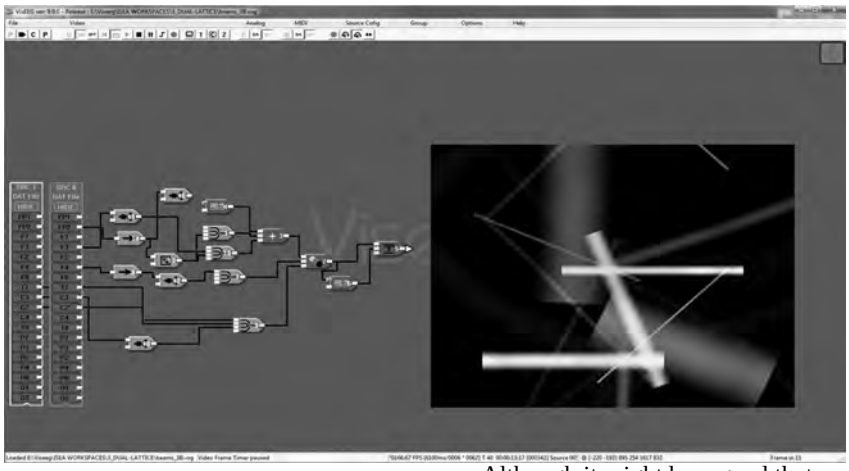
Fig 1. Stelarc, *Spectacle of the Mind* 2010. Photo © Malcolm Cross

While the artworks produced through Global Mind Project are reliant on sophisticated software and technology, the project has more broadly been driven by an interest in three interlinking areas: creativity, cognition and the connections that arise and multiply when groups of people are engaged in creative pursuits. This triad of creativity, cognition and connection has come into focus through observing creative practitioners over many years, especially in collaborative and group settings. While this has arisen through personal experience and reflection, the authors have looked to a range of sources as a means of contextualizing some of the drivers behind Global Mind Project. Physicist and philosopher David Bohm's essential theory of the "unbroken wholeness of the totality of existence as an undivided flowing movement without borders" [5], for example, has resonance with the 'connecting', 'synchronizing', 'interrelating' features of the Global Mind Project. At a more immediate level, however, the simple desire to establish relationships through creative endeavor and to explore the potentials within those relationships remains very much to the fore.

Workshop

In conducting the workshops the research question was twofold: Firstly, can interpersonal neural synchrony be achieved and witnessed while it is occurring? Or to borrow a familiar phrase, can we observe when two people are 'on the same wavelength'? Secondly, can creatively conducive brainwave activity be cultivated and enhanced via neuro-feedback techniques?

Fig 2. Viseeg dual participant workspace



The motivating factor behind these questions is grounded in creative process, and more importantly, creative inspiration. Creative thinkers, artists and scientists alike often speak of those 'Aha' or 'Eureka' moments when inspiration suddenly sharpens or crystallizes into focus. Though by no means universal, such moments can be both heightened and accelerated when realised through the interactions of two or more people. Artistically therefore, the workshop was designed as a situational arrangement, through which moments of synchrony might be witnessed precisely as they were happening. In this way instances of neural synchrony were the intangible 'artifacts' produced in the workshop while the 'tangible' on-screen imagery was merely a conduit to that formation.

The workshop consisted of a morning and afternoon group, of twenty-two participants in total, with two being casual observers only. Following a brief overview of the Global Mind Project workshop attendees were introduced to the concept of neuro-feedback, provided with Emotiv headsets and paired together at a laptop containing a series of visual mental exercises. The visualisations, as determined by Viseeg software, are constructed as a series of programmed 'workspaces' with specific 'fixed' predetermined settings and certain variable parameters, which are affected by the various streams of input data, in this case both participant EEG data and stored imagery. The fixed components generally relate to the specificities of form and action while the variable data controls effects such as spatial/directional orientation and visual surfaces, colours and effects.

Although it might be argued that some form of visual data mapping might be crucial to the interpretation and therefore success of EEG driven work such as this, it was not our intention for either the aesthetics or the reception of the work to be overtly influenced by schematic representations of actual data. This was partly because it is not in keeping with the objectives of Global Mind Project and also because it would have been counterproductive, given that the intention was to engage in a free flowing observational process of creative and connected interaction as it occurred. For the purpose of these exercises, however, and to give participants a good indication that the desired goal was achieved, some simple graphic elements were employed, such as stylized oscilloscope effects, floating discs and intertwining trails, in such a way that indicated when synchrony occurred.

The aesthetic parameters as they are programmed and defined by the Viseeg software were determined either partially or entirely by the raw EEG data of participants. EEG data calculations were done on a percentage basis in order to establish a base reading and account for the variables in different subjects. According to Dr Geoff Mackellar, CEO of Emotiv Research, who attended the first workshop session, neural simultaneity calculated at a variable of 0.5% would be within an acceptable range to be considered as synchrony.

In addition to frequency settings, the data was isolated according to regional areas of the brain, such as left / right hemisphere, frontal, temporal and occipital lobes. The brainwave frequencies Alpha and Theta [6] were alternately designated for the purpose of the exercises. Heightened creative mental states, and in particular creative inspiration and improvisation, are associated with elevated Theta frequency activity.

Although the notion of artistic creativity being a right brain dominated process has been questioned in recent times, it is still generally considered that the right side of the brain is responsible for many of the cognitive functions associated with inspiration and intuitive creative thought processes. According to neuroscientist Professor Allan Snyder, Centre for the Mind, University of Sydney, transcranial magnetic stimulation of the left anterior temporal lobe can temporarily inhibit analytical reasoning processes, enhancing activity in the right temporal region of the brain, thus causing heightened creative and intuitive states not unlike that of artistic savants [7]. So while participants were monitored across the whole of their brain regions, for the purpose of the stimulating creatively conducive brainwave activity, attention was also directed to right hemisphere activity for several exercises.

These parameters set the stage for registering regionally specific brainwave frequencies and neural synchrony; however such factors alone were not enough to ensure that all of the workshop data was captured. Rather, a number of unforeseen technical issues diminished the amount of recorded information. Problems associated with the headset signal prevented the loading of alternative workspaces by participants; a factor that will be rectified in the future. Limitations notwithstanding, the available samples by no means repudiated the idea that two individuals using visualization effects as stimulus in a neuro-feedback process can result in neural synchrony between participants. Using this setup we find it is entirely possible to indexically signify (rather than 'observe' in the proper sense) neural synchrony in real time using digital visualization techniques.

While the size of the groups was insufficient to formulate definitive conclusions about neural synchrony, the results were characterized by surprisingly high instances of correlative brainwave activi-

ty, ranging from prolonged passages to fleeting and sporadic. At least one of the participants was circumspect about the exercises, stating, “I still felt my responses were quite random most of the time and that left me wondering about the exercises and/or the equipment.” Conversely, another was strongly convinced, saying they were “Fascinated that the brainwaves could be controlled visually and as I discussed the same interests [with my partner] our brainwaves synchronized” [8]. Curiously, as the post-workshop surveys revealed, where most were ‘pleased’ with the resulting neural synchrony this did not necessarily translate into feelings of ‘rapport’ with their partners.

Cybernetics and the Global Mind

ISEA2013 proved to be an especially productive context in which to present and conduct the workshops and to consider the work of other artists and researchers. One such perspective that came to our notice was that of artist, theorist and historian Stephen Jones, who presented the paper ‘Cybernetics, Conversation and Interactive Art’ as part of ISEA’s Latin American Forum.

Jones highlights the importance of 'conversation' as a contributing factor by which cybernetics [9] finds its proper meaning, suggesting that cybernetics is “about systems 'talking' to each Other”. [10] Jones further states that "information has to change something within the 'receiver' while the response or the 'feedback' they provide has to change something in the original 'sender', thus modulating / moderating their response".

On listening to Jones' definition it occurred to the authors that one project that conformed to the cybernetic model was the recently conducted *Global Mind FIELD* workshops, precisely because the project involved a sequence of systems engaging in different forms of communication that were both intelligible to the systems and affected change in those systems. In *Global Mind FIELD* the interacting systems were both organic and inorganic, consisting of A) the Viseeg software, B) the Emotiv Epoch neuro-headsets and C) the brains of the human participants (specifically the electrical signals emanating from within the cerebrum). Within the arrangement the headsets acted as relay stations and were not therefore subject to any real change. In contrast, the screen based visual emanations produced by the Viseeg software changed in form and behavior when neural synchrony was detected, while the neural activity of the participants adapted to the situation, seeking to sustain the feedback incentive. We therefore see that the combination of systems, interaction, comprehension and change characterized this arrangement as cybernetic process.

Fig 3. Harry Sokol & Karen Casey with workshop participants 2013. Photo © Damian Smith

Contextualizing *Global Mind FIELD* within the arena of cybernetic art presents an occasion to consider the work alongside other cybernetic practitioners and to learn from their experience. For example, Gordon Pask’s, *The Colloquy of Mobiles*, 1968 [11], which Jones featured in his presentation, was conceived as a ‘social system’, whereby the ‘male’ and ‘female’ components interacted with each other and also with audience members, who in turn affected changes within the sculptural systems. In his introduction to the show, Pask wrote: “An aesthetically potent environment encourages the hearer or viewer to explore it, to learn about it, to form an hierarchy of concepts that refer to it; further it guides his exploration; in a sense, it makes him participate in, or at any rate see himself reflected in, the environment”[12]. Pask, it seems, was talking about a process not unlike neurofeedback, but also about our natural tendency to be excited by aesthetically rich environments, which turn stimulate and heighten our keenness of mind. This close association between cybernetic systems on the one hand and the workings and tendencies of the human mind on the other was alluded to by Jones through mention of the experimental musician Stan Ostoja-Kotowski (1922-1994) who was not only engaging with cybernetics as early as the 1970s but was considering ways to enact brainwave activated cybernetic projects as well.

While the evolution of ‘Global Mind Project’ has occurred at a distance from other artists working in this arena, arising instead out of Casey’s earlier interests with projects such as *Dreaming Chamber*, 1999 [13] and *Meditation in Alpha* 2004, we note nonetheless both a rich pre-modern history and contemporary field of arts and neuroscience crossovers, which should be acknowledged here [14]. In our examination of artists working with similar themes we recognise the 2003 work by Mariko Mori, *Wave UFO* [15] that united and immersed three participants at a time in a visual interpretation of their brainwaves, and the recent collaboration project from Marina Abramovic, Dr. Suzanne Dikker and Matthias Oostrik, *Measuring the Magic of Mutual Gaze*, 2011 [16]. This project visualises synchronous neural activity that occurs between couples while they are looking into each other’s eyes (which in itself provides a form of neural feedback).

While Abramovic’s project is driven by feelings of empathy and mutual connection, *Global Mind FIELD* is determined by visual stimulus as a direct result of participants being able to measure or gage their responses through neu-

ro-feedback. As our observations attest, synchrony in this instance was not specifically linked to reciprocal feelings but rather to the suggestion of a desired outcome.

Conclusion

Global Mind FIELD was designed to be both an exercise in neural synchrony using creative visualization, and a situational process for enhancing creatively conducive brainwave activity; however, due to technical issues and time constraints a decision was made to focus on the neural synchrony aspect for the workshop. The responses from participants and the evidence captured suggest that neural feedback is achievable through visual devices as incentive triggers, wherein the brain will 'detect' and respond to the visual queues accordingly. While the aim of the project was to extend an ongoing investigation of the interplay between 'creativity', 'cognition' and 'connection', the multi-system components used in *Global Mind FIELD* can also be seen as a cybernetic mode of visual art practice.

In developing the neuro software interface Viseeg, Global Mind Project has attempted to capitalize on recent developments within the field of neuro technologies such as the Emotiv Epoch headset and also in the arena of neuroscience generally. In light of the combined developments since the late 1960s in art practices incorporating both neuro-interfaces and alternatively practices that make use of cybernetic methodologies, Global Mind Project is revealed as intersecting with both arenas of practice. As Global Mind Project progresses it is intended that future artworks will advance the cybernetic attributes of *Global Mind FIELD* with a view to involving multiple participants in co-creative visual, auditory and performance strategies.

Lastly, while it is possible to observe the brain's electrical activity, it remains impossible and most likely improbable that we might ever observe the processes that constitute mind, other than in the solitary confines of our own inner universe. The actions that constitute mind nonetheless can be indexically signified, deduced and communicated convincingly to others. While creativity is not alone as a signifier of mind, it maintains nonetheless a rather potent position, precisely because it serves to unite a constellation of processes and to bring into existence forms and concepts that were previously unavailable to our awareness.

References and Notes

1 Neurofeedback, sometimes referred to as neurotheraphy or neurobiofeedback, was pioneered in 1962 by American researcher Dr Joe Kamiya. Neurofeedback works by providing or denying stimulus (usually auditory) to the brain when certain *in vivo* frequencies are present, thereby establishing an 'incentive' by which specified frequencies might be cultivated or inhibited.

2 O. Sahin, *ISEA2011 Istanbul Uncontainable*, exh.cat. (LEA Volume 18 Issue 5, 2011) <http://www.leoalmanac.org/wp-content/uploads/2012/08/ISEA2011Uncontainable-Casey.pdf>

3 P. McKay and A. Slack-Smith.National *New Media Art Award 2012, exh.cat.* (Brisbane, AUS.: Queensland Art Gallery 2012).

4 J. Clarke, *Spectacle of the mind - Global Mind Project*, exh.cat. (Melbourne, AUS.: Federation Square, 2010).

5 David Bohm, *Wholeness and the Implicate Order*, (London, UK.: Routledge, 1980).

6 Neurohealth Associates, *The Science of Brainwaves*, 2004, <http://www.nhahealth.com/science.htm>, accessed 1 September 2013

7 Allan Snyder, *Explaining and inducing savant skills: privileged access to lower level, less-processed information*, Phil. Trans. R. Soc. B (2009) 364 p.1399 <http://rstb.royalsocietypublishing.org/content/364/1522/1399.full#sec-10>.

8 K. Casey, *Global Mind FIELD - Workshop Survey*, contributor de-identified, 2013.

9 Although a relatively recent area of research, Cybernetics has a complex pre -modern history dating to Plato's 'First Alchibiades', where the term 'kybernetikos' (*κυβερνητικός)*, 'good at steering' was introduced to convey a concept of 'governance'. Though the term is popularly associated with hybrid human/machines, it is correctly used to describe regulatory systems, their structures, constraints and possibilities. The term was coined by American mathematician Norbert Weiner in 1948, when he published *Cybernetics: Or Control and Communication in the Animal and the Machine.* (Cambridge, USA, Paris, FR.: MIT & Hermann & Cie Press, 1948). In the context of the Latin American forum Stephen Jones focused on the work of Anthony Stafford Beer and Fernando Flores, who worked for the Salvador Allende administration in Chile in the early 1970s and applied cybernetic theories to governance and industry.

10 Stephen Jones, *Cybernetics, Conversation and Interactive Art*, Latin American Forum, ISEA2013 <http://www.isea2013.org/events/latin-american-forum-presents-1/>, accessed 30 June 2013.

11 See: Rosen (undated) <http://www.medienkunstnetz.de/works/colloquy-of-mobiles/>, accessed 30 June 2013.

12 Gordon Pask sited in Peter Bentley, David Corne (eds), *Creative Evolutionary Systems*, p235, (Burlington, USA.: Morgan Kaufmann, 2001).

13 M. Neale, *Beyond the Future the Third Asia Pacific Triennial of Contemporary Art*, exh. cat. (Brisbane, AUS.: Queensland Art Gallery, 1999).

14 Composer Alvin Lucier's (b.1935) important *Music for solo performer*, 1965 is one of the earliest pieces of music, for instance, that responds to alpha brainwaves, detected through electrodes attached to the scalp. Again in the music arena, David Rosenboom (b.1947) was an early user of neurofeedback. (See for instance, *Brainwave Music*, A.R.C., 1976 - EM, 2007). In recent years there has been a proliferation of both sound and visual artists working in the field, and significant symposiums such as 'Tangible Feelings' at the Centre for Digital Cultures and Technology, Brussels in 2011. Included were works and papers by practitioners such as Peter Beyls, Christophe De Boeck (*Staalhemel*), Thierry Castermans (*Numediart*), Mattia Casalegno & Enzo Varriale (*Unstable Empathy*), Alexis Chazard (*Post traumatic voyager*), Kiel Long (*The static organ*), Luciana Haill (*IBVA*) and Valery Vermeulen (*EMO-Synth*). <http://www.imal.org/activity/tangible-feelings>, accessed 1 July 2013.Notable also is Stephen Barrass and Diane Whitmer's *Baroque Duet for Cello, Violin, Two Hearts (ECG) and Two Minds (EEG)*, which premiered at the University of Pompeu Fabra, Barcelona, 2010.

15 Public Art Fund (2003),<http://www.publicartfund.org/view/exhibitions/5825_wave_ufo>, accessed 1 July 2004.

16 Soft Control (2012), <http://kiblix.org/kiblix2012/softcontrol/?p=4>, accessed 1 March 2013.

EXQUISITE, APART:
REMOTENESS AND/AS RESISTANCE

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Abstract

It has become routine to characterise digital art as indicative of an assumed universal shift from 'traditional' practices towards novel forms of cultural production, interaction and consumption. Frequently, running parallel to this is the assertion that space, time and distance have been compressed, subsumed, augmented, eliminated or are unable to resist being replaced by relations, experiences or symbolic values. This collective paper is based on a panel presentation at ISEA 2013. It discussed five different research approaches that address theoretical, practical, philosophical and artistic possibilities of engaging with the realities of distance, remoteness or 'exquisite apartness' as locii of resistance.

Keywords: distance, remoteness, resistance, pacific, digital art, mobility, academic sites.

Last, loneliest, loveliest …

Last, loneliest, loveliest, exquisite, apart
On us, on us the unswerving season smiles,
Who wonder 'mid our fern why men depart
To seek the Happy Isles. [1]

Written at the high point of the British imperial globalization project, Rudyard Kipling's romanticisation of physical remoteness – apartness - and the experiential qualities of isolation, difference and beauty it evokes, remains at the core of pervasive existential narratives of identity that link individuals, institutions and industries across a diverse range of creative and cultural practices in New Zealand and the South Pacific.

In our own age, it has become routine to assert that, with the emergence of digital technologies, time, space and distance have been compressed, subsumed, augmented or eliminated by relations, experiences or symbolic values. From this viewpoint also, the various modalities of digital art are frequently characterized as indicative of an assumed universal shift from 'traditional' practices towards novel or socially-mediated forms of immaterial cultural production and consumption.

Yet, for New Zealand, the most remote OECD country, with an agriculture-based economy and small population, "the enormity of the globe" remains a significant factor. New Zealand culture has historically been shaped by the profound experience of remoteness; simultaneously material (distance from population centres, markets, cosmopolitan culture, industry, raw materials, pollution, audiences) and immaterial (metropolitan discourses, ideas, social networks, cultural capital). At the same time, this isolation also offers access to new forms of cultural capital (e.g. the rhetorics of nature, environmental purity, sustainability, self-reliance or cultural distinctiveness).

... exotic, apart

Angela Tiatia grew up between the small village of Fagamalo in Samoa, where her mother was raised, and Auckland, home to the world's largest Polynesian population. In 2012, she moved to Sydney with her husband and son. Tiatia's work emerges from this new in-between space; informed by research, which she describes as inward, into the ancestral homeland, but also outward looking, to the larger, cosmopolitan cities of the world. The three projects presented here offer nuanced, ambivalent perspectives on how the Pacific has been and continues to be viewed from such locales.

For over two centuries, the Pacific, in the Western imagination, has been synonymous with the notion of paradise. The European Romantic fascination with exoticism and remoteness of time, place and culture, created a rise in the production and demand of images of beautiful topless girls and women being depicted as sexual objects.

Tiatia appropriates a central, ubiquitous motif of these constructed images, the hibiscus flower. Not only an iconic and misrepresented image of beauty and nature, it also functioned as a signal of female sexual availability for Western men, depending on which ear it is worn behind.

The video work *Hibiscus Rosa Sinensis* (2010) [Fig. 1] challenges this idea. In a filmed performance, the artist herself is gradually revealed, slowly and deliberately devouring a perfect red hibiscus flower, the Pacific Islander artist becoming present, visible and dominant.

The place of women in the contemporary globalisation project is again taken up in a second video work, *Edging and Seaming* (2013) [2]. (no new paragraph)On the right hand side of a split

Fig. 1 Angela Tiatia, *Hibiscus Rosa Sinensis* (2010) © Angela Tiatia

screen, a woman is seen over-locking edges of baby muslin cloths in the garage at her home that has been her place of work for the past 35 years. The woman is Tiatia's mother, one of a generation of Pacific Island migrants to New Zealand in the 1950s and 1960s, initially welcomed as part of an immigration policy designed to stimulate manufacturing industries. There was a backlash against these migrants in the 1970s, whenPacific Islanders were represented as taking jobs away from New Zealanders. This culminated in the infamous and terrifying "dawn raids' by police to return "overstayers" back to the islands. In the 1990s companies began moving work offshore - resulting in job losses. In a moving image in *Edging and Seaming*, the mother is filmed sewing her final 10 bundles of work for the manufacturer that is moving production to cheaper contractors in China. (no new paragraph).On the left-hand side of the screen we see a large a clothing factory in Guangzhou, China that manufactures for NZ, Australia and US companies. On her very first trip to Guangzhou, the artist had the opportunity to speak with some factory workers, and heard their stories of moving from rural China to the cities for work in order to send money back home to their families. The familiarity of these stories provided a striking reminder of those same feelings and emotions - hope, longing, pride, fear and responsibility – that had filled the stories of her mother's generation migrating from the Pacific to the cities of New Zealand. So this is not a polemical work about the exploitation in the factories – but more about how people, a world apart, are yet connected by a common

Fig.2 Angela Tiatia, Neo Colonial Extracts (2011) © Angela Tiatia

migrant story and their shared economic power/vulnerability.

The effects of globalization – such as the movement of populations from rural to urban centers - are well documented. This work addresses the internal impacts of globalization – the psychological impacts and changes in social structures in the rural areas. Globalisation affects the body where the individual becomes mechanized and machine-like. And unfortunately, in the end the workers are dispensable as corporations themselves migrate, like humans, from one remote part of the globe to another in search of cheap labor.

The third of Tiatia's works explores the notion of the remote place itself as consumable. .For the modern explorer, the excitement of the remote and the exotic is increasingly mediated through the language of advertising, and experienced as comfort and leisure. Paradise is yours – it's just a flight away ….

Neo-Colonial Extracts (2011) [Fig.2] is set in the failed Sheraton Resort, in Vaimaanga, Rarotonga, Cook Islands [3]. The NZ$122 million resort development, with allegations of Italian Mafia involvement, was stalled in 1998 following the arrest of several key people involved. As guarantors, the Cook Island Government was almost financially crippled by the abandoned development - the balance totaling approximately half of the nation's debt.

The work explores the impact of tourism and foreign investment in remote places such as the Pacific – where, on one hand, it provides desperately needed income and jobs, but on the other, it affects the locals' cultural and occupational identities as the options for work become limited to work as servants, cleaners, gardeners or security guards for holiday makers.

Tiatia's documentation brings the current reality of the abandoned resort into slow focus. The incomplete, and now derelict, luxury chalets are reclaimed by the vegetation of an erstwhile paradise. Exhibited as a dual projection, footage of the decaying resort is coupled with a single long take of a nearby tour boat pictured floating, solitary and unused. Also exhibited is material evidence of the scale of the debt - purchase agreements, bank statements and architectural plans found onsite by the artist. As a solemn memorial to the Cook Island's tourism industry, *Neo-colonial Extracts* reflects upon the consequences of globalisation on a developing island nation. For Tiatia, this situation has all the guises of imperial colonialism – except instead of national sovereignty being suppressed, we now experience personal sovereignty being suppressed by the new colonials - the corporation. At another level, the imagery of this resort that was never finished also evokes a sense of a nation swept up in the promises of corporations, and other shadowy global figures. Whether national sovereignty, in this context, is suppressed is moot. Yet it is almost certainly compromised.

Erewhon Calling

Clinton Watkins' work engages with affect through the construction of layered immersive experiences of sound, colour and scale. In opening his presentation with his early video work, *Continuous Ship #1* (2005) [4], Watkins alludes not only to common New Zealand themes of sea and landscape, but also to spatio-temporal distancing and the 'world wide webs' of earlier centuries; the maritime shipping lanes and Pacific navigation routes that made the remote European and Pacific settlements of New Zealand possible.

The moving images of huge cargo vessels crossing Auckland's Waitemata Harbour show no discernible evidence of human presence. The affective impression is of vast, flat bands of intense colour. The work recalls national flags or the abstract expressionism of Ellsworth Kelly or Mark Rothko, and is accompanied by a visceral noise that adds to an almost sublime sense of isolation and unease.

The title of Watkins' mixed-media ISEA presentation came from Bruce Russell's 2012 book on experimental sound in New Zealand. [5] The title, *Erewhon Calling,* mashes up the Clash's 1979 album *London Calling,* a reference to the metropolitan broadcasting of culture to the remote outposts of empire, with Samual Butler's 1872 satirical utopian novel *Erewhon, or over the range*. A reversal of *nowhere,* Butler's work has been cited as the first contribution to literature by a resident of New Zealand, a place synonymous with 'the far corners of the earth'. The confluence of recorded sound and remote transmission has also been a key concern of Watkin's own work.

In Butler's book, the land of Erewhon depends for its security on both its distance from civilization, and on the presence of a field of stone sculptures that chanelled the wind to generate such 'horrible noise' that 'however brave a man may be, he could never stand such a concert '. As Bruce Russell wryly observes,,this might also describe the experience of listening to contemporary New Zealand experiments in sound [6].

Watkins explicates the processes of experimental audio production in this

Fig. 3 Clinton Watkins, from Erewhon Calling (2012).

peripheral cultural setting; a DIY, low-fi, analogue approach to practice, historical ly necessitated by scarcity of resources, now adopted for the purposes of, in Watkins' terms, "capturing the experience of electricity through music" and "sculpturing" sound using self-made electronic devices.

The DIY ethic extends to modes of distribution. "A man on the South Island", Watkins tells us, produces handmade records; cheap, lo-fidelity, good for 100 plays – a recognizably New Zealand aesthetic; quirky, odd and yet strangely iconic [7].

Remoteness and mobility

Laurent Antonczak is a multicultural entrepreneur, provocateur and academic researcher working across Digital Strategies (branding, visual communication, social media, transmedia, information architecture) and emerging technologies (web & mobile devices). He is co-founder, with Max Schlesser, of the Mobile Innovation Network Aotearoa (MINA) and operates globally, with particular interests in New Zealand, France and Japan.

MINA's *24 hours/24 frames* project is described as "a collaborative documentation of the mundane". It records daily life at one-hour intervals to make a two minute narrative linking people in disparate global locations.

Antonczak draws on this work to develop remote learning programs and collaborative studios organized across institutions and time zones in Europe, the Americas and the Pacific. The difficulties of working in disparate location and time zones also afford new opportunities to develop novel pedagogies. As Antonczac notes, students work in remote time frames anyway ... often fulfilling assignments at 4a.m, while he sleeps Recent projects explore the potential for mobile devices to connect Maori youth to continuing oral traditions of storytelling, and contribute to language preservation.

The civic potential of Antonczac's work resurfaces again in *E'Vaine Toa* (2012), which was filmed and edited on location in Rarotonga. Working in collaboration with the Cook Islands National Council for Women, a mobile documentary captures the voice of women and encourages their participation in governance and leadership [8].

The Liminality of Remoteness

"We should not be defined by the smallness of our islands but in the greatness of our oceans. We are the sea. We are the ocean. Oceania is us" [9].

Andrea Eimke, a German national living for the past twenty years on Atiu in the Cook Islands, investigates notions of liminality and hybridity from the interstitial perspective of the migrant.

Homi Bhabha describes Liminality as that "fantastic location of cultural difference where new expressive cultural identities continually open out, performatively" and the "paradox of hybridity" as "a gesture of translation that 'keeps open' the question of what is to be (German, or Pasifika, etc)." [10]

Atiu has an area of only 27 square km, yet it is the third largest of the Cook Islands, with a population of around four hundred and fifty people in five villages. One hundred are under the age of 18, and approximately two hundred and thirty are over 60, including one Philipino, one British, two Germans and three European New Zealanders.

Even though the influences of British Missionaries and New Zealand officials remain present in today's dress style, architecture and administration of the remote island, many daily-life activities remain little changed since before the first European contacts in the late eighteenth and early nineteenth centuries. The country has been independent since 1965, connected in free association to New Zealand, which grants all Cook Islanders citizenship. Invaders, preachers, traders, whalers and adventurers have passed through the islands and left behind their marks, in spiritual, material or genetic forms.

Eimke's work examines how the space between two cultures is experienced, and explores ways in which this might be visually expressed through the construction of fibre and textile art works. Material elements from European and Polynesian cultures such as cloth, fibres, and thread, and non-material elements like concepts and rituals, are investigated
for their potential to transcend the

Fig. 4 Andrea Eimke, Third Space II (2011-13). © Andrea Eimke

boundaries of their original culture to reveal the liminal space as source of energy and change.

Eimke's pre-migratory knowledge of the history and techniques of European Lace revealed striking similarities to the production of Polynesian bark cloth. Both materials served as precious commodities in their respective parts of the world, gifted as tokens of respect between islands/countries, tribes and families.

Eimke's first work on liminality, *Third Space* (2010), was installed at the Takamoa Theological College's Mission house, the first stone house on Rarotonga, constructed in the early 19th century under the direction of European missionaries.

The work combines Polynesian bark cloth with European gauze, a woven cloth, and interfacing, a non-woven material, stitched together with machine-sewn lace. 24 panels of different widths and lengths are suspended from the 3.50 metres high ceiling in a space of 6x 6metres. Visitors are invited to enter the space and walk between the panels, their presence and interaction with the panels completing the work. The daylight and fresh breeze entering the exquisitely restored old house, combined with the sound of bird songs and hymns that frequently filled the space, created the perfect environment for the light-weight textiles.

An expanded version, *Third Space II* (2011-13) was shown as part of the Love Lace exhibition, at the Powerhouse Museum in Sydney.. Here, allowing the viewers to walk in between the panels-was not possible and the installation had to be enclosed by a railing.

A fan provided only slight air movement, and the recorded clicking sound of Atiu swiftlets, skillfully installed by the Powerhouse sound engineer, replaced the natural bird songs. The black walls and the sound of the swiftlets who use their clicking as echo-location in the darkness of Anatakitaki Cave on Atiu resulted in an impression quite different from that left by the original version.

Concluding remarks

In addressing issues of distance from, and resistance to, global art discourses, the panel participants also implicitly recognised the "place" of academic institutions – as influential sites or intersections of local and globally-inflected practices. Panel members are themselves situated within academies that increasingly "locate" (what counts as) art; by setting agendas, validating credentials, resisting / complying, fostering/constraining, structuring, legitimizing, or valorizing emerging ecologies of research and practice. It is perhaps ironic to recall, at this point in our institutional trajectory, that the historical, pre-digital, Modernist project grew from a resistance to the academicisation of art that had occurred in the nineteenth century.

Yet, as institutions increasingly open themselves to various forms of engagements with stakeholders, communities and industries, we would do well to recall the Dean of Architecture at Columbia University – and New Zealander – Mark Wigley's provocative reminder that, as both artists and intellectuals,

" *.. we have to maintain vigilantly the space of doubt, questioning and so on. That is the space of the university … a place disconnected from the pragmatic realities of the world in order that individuals can open themselves up to other possibilities … and to the unknown future of society"* [11].

References and Notes

1. Rudyard Kipling, *The Song of the Cities: Auckland* (c.1895)

2. Angela Tiatia, Edging and Seaming (2013)

http://www.citygallery.org.nz/exhibition/angela-tiatia-edging-and-seaming

3. Angela Tiatia, Neo-Colonial Extracts (2011)

http://www.youtube.com/watch?v=882AkUqqvAw

4.http://blip.tv/frieze/clinton-watkins-cont-ship-1-2648348

5. Bruce Russell (ed.), *Erehwon Calling: Experimental Sound in New Zealand* (Auckland, NZ: Audio Foundation CMR, 2012)

6. Russell [5] p.12

7. A reference to Peter King, the owner of King Records Worldwide, Ashburton, NZ. King makes lathe-cut records that are not necessarily that short-lived (his website claims the polycarbonate he uses has a higher longevity than vinyl, though this does seem unlikely).

http://peterkinglathecutrecords.co.nz/info.htm

8. http://vimeo.com/55147342

9. Epeli Hau'ofa, *We Are the Ocean: Selected Works* (Honolulu, University of Hawaii Press, 2008)

10. Homi Bhabha, *The Location of Culture* (London and New York: Routledge, 1994, p. 219).

11. Mark Wigley, interview with Charles Rice, UNSW, June 2004.

SHAPING CULTURAL AND CREATIVE SPACE: BEIJING AS A CASE STUDY

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Abstract

Supported by research and policy reform, China's creative and cultural industries have seen explosive growth in recent years and this rapid expansion is anticipated to have an unprecedented and far-reaching influence on the future of the country and its economy. Researchers from Cultural Development Institute (CDI) based at The Communication University of China (CUC) and The College of Fine Arts (COFA) at the University of New South Wales (UNSW) present recently generated data and discuss Beijing as a case study to provide an informed overview of the recent proliferation of art parks and creative clusters in the city.

Keywords: Creative and cultural industries, Beijing, China, urban space, creative clusters, art parks

Introduction

In the British Council report *Mapping the Creative Industries* Shelagh Wright, advisor to Britain's Creative and Cultural Economy Program, called for development strategies that, "…unleash the creative potential of all to respond to the far-reaching cultural, economic, social and technological shifts that we are living through" [1]. The report points to the crucial contribution mapping the cultural and creative economy can make at the interface between economics, technology and culture within a global context of increasing interconnectedness and complex challenges. This, Wright explains, "is shorthand for a whole series of analytic methods for collecting and presenting information on the range and scope of the creative industries" [2]. In a media saturated world in need of innovative ideas, the Cultural and Creative Industries (CCI) have been seen by many as offering the potential for creating new jobs, new economic drivers, new forms of wealth and well-being - and crucially, new cultures.

Although the emergence of CCI is widely acknowledged to have occurred in Britain, the vision has spread to diverse parts of the world, with particularly enthusiastic interest coming from the Asian region. Singapore, Korea, and both Mainland China and Hong Kong have all developed detailed analyses of their economies through this lens. Such initiatives have resulted in a range of policy mechanisms, including local economic development strategies, national industry policy and cultural policy implementation. In most instances this has been based on the UK model [3] rather than the more contested "Creative Class" model proposed by theorist Richard Florida [4]. Florida's premise that fostering an elite 'creative class' generates positive urban re-generation hasn't gained traction in China for example. The UK model embraced in Asia defines CCI as industries having individual creativity at their core. This has typically included: advertising, architecture, the art and antique market, crafts, design, fashion, film and video, the games industry, music, performing arts, publishing, software developers and television and radio. Naturally this listing has attracted "considerable debate" especially from those who argue that most, if not all, new products and services have "…elements of creativity and intellectual property embedded" and therefore the label 'creative' is somewhat arbitrary [5]. In China, creative industries have a much broader interpretation as any industry that is dynamic and moving forward in an innovative manner [6]. The aforementioned list therefore more correctly should be referred to as 'cultural industries' in the Chinese context.

Acknowledging those precedents, concerns, and differences, this paper describes current developments in China where CCI have attracted considerable attention from a government wishing to quantify its economic contribution and potential for shaping urban space to forge innovation and new industries. Co-written by researchers at The Cultural Development Institute (CDI) at The Communication University of China (CUC) in Beijing and The College of Fine Art (COFA) at The University of New South Wales (UNSW) in Sydney, we begin with an overview of China's embrace of the CCI as an important economic driver. Then, based on extensive quantitative data gathering carried out by CDI, we discuss this influence in reshaping urban space in Beijing. The concerns and focus of research in China means this data is focused on economics. CDI researchers drawing on their own original research discuss economic statistics and describe the broader strategic development underway in Beijing to establish itself as a "global city" [7], a goal seen as an important milestone in Beijing's development. The paper concludes with their observations about the challenges faced by Beijing in order to achieve this goal.

From 'Made in China' to 'Created in China'

In China the CCI are receiving significant support from the government due to the recognition that the industries generative value that is of benefit to the society, and their crucial potential as a driver of the economy. In Beijing and Shanghai, massive material and political resources have been devoted to what leaders term "*Chuangyi jingji*" (the creative economy) as a key strategic element for advancing urban development. As such, the cultural and creative sector is increasingly playing an important role in China's development strategy. China's Premiere, Hu Jintao, famously announced in 2006 his vision for the country to make the transition from "made in China" to "designed in China" [8]. Six years on, 2011 marked the year of the commencement of China's Twelfth Five-Year Plan [9] and, as described in *The Yearbook of China's Cultural Industries* 2011, this represents in terms of policy development, "…a new starting point in history" [10]. The preceding two years have seen a ground-breaking push for the cultural industries across China to become, "…the new forces driving the local economic growth, and gradually to be turned into the pillar industries of the national economy of the country" [11]. Supported by a raft of policies designed to promote and rapidly grow CCI related expansion, this is anticipated in government circles to have, "…an unprecedentedly far-reaching influence on the future of the country" [12].

On the 23rd of July 2010 the Political Bureau of the Central Committee of the Communist Party of China established the target of developing the full range of cultural industries in China as pillar industries of the national economy [13]. The impact of the changes has been swift, with local and regional authorities across China responding quickly to government directives to implement the policy, economic triggers and create suitable conditions to expedite rapid

change. The results, in economic terms, suggest cultural industry sectors in China are experiencing what has been described by The Institute of Cultural Industries in Beijing as "explosive growth". CUC researchers responsible for *The Yearbook of China's Cultural Industries* cite economic figures indicating revenues for the year exceeding some 953.6 billion *yuan,* with numerous industries (focusing particularly on the film, radio and television, press and publishing, new media, design and gaming sectors) exceeding previous trade records and experiencing higher levels of new enterprise entering the market [7]. The data published alludes to, "…the huge potential and bright prospect of the development of the emerging cultural industries of strategic importance…" [14].

However, soft power, especially in terms of cultural innovation, and the coordinated development of economy, society and environment, is urgently needed to refine Beijing's comprehensive influence and to realise its goal as an intelligent innovative, global city by 2050.

How to shape and change city culture? The case of Beijing

Following urban renewal strategies emerging from the United Kingdom and Western Europe, the "creative city" has become a key trend for city development globally, introducing important ways of thinking about how to regenerate the city [15]. Focusing on the clustering characteristics of the cultural and creative industry, creative spaces are seen in China as a new pattern for urban renaissance that leverages the dynamics of creativity and innovation. As a form of spatial organisation, urban cultural space forms an essential part of public life and plays an important role in guiding the construction of first-tier world cities. Beijing has therefore set the goal of establishing itself as "a cultural urban centre" and is working to establish itself as a significant CCI node in the global network. In order to thrive, urban cultural space not only needs a healthy external environment, but also suitable city locations, a tribe of creative professional inhabitants, and a suitable policy framework and development processes. Only with the appropriate internal and external prerequisites can the urban cultural space be fostered and expanded.

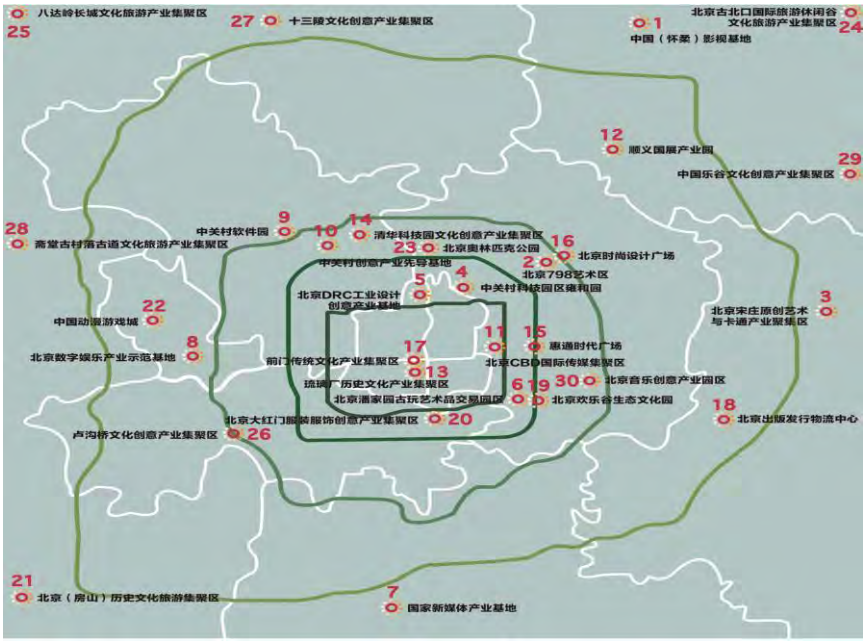

Fig 1: The spatial distribution of Beijing municipal-level cultural and creative industry gathering areas or zones. © The Culture Development Institute, The Communication University of China, Beijing.

1: China Movie Capital

2: 798 Art District

3: Songzhuang Artist Village

4: Zhongguancun Science and Technology Park

5: DRC Industrial Design & Creative Industries Park

6: Panjia Yuan Antique Market

7: National New Media Industries Park

8: Beijing Digital Entertainment Industries Park

9: Zhongquan Chun Software Park

10: Zhongquan Chun Creative Industries Park

11: The Beijing CBD International Media Gathering Area

12: Shunyi Exhibition Industry Park

13：Liulichang Cultural Industry Cluster

14：Tsinghua Science Park Cultural Creative Industry Gathering Zone

15：Huitong Times Square

16：Beijing Fashion Design Square

17：Qianmen Traditional Cultural Industry Cluster

18: Beijing Publishing Logistics Center

19: Beijing Happy Valley Ecological Cultural Park

20: Beijing Dahongmen Clothing Creative Industry Agglomeration Area

21：Beijing (Fangshan) Historical and Cultural Tourism Zone

22：Chinese Animation Game City

23：Beijing Olympic Park

24：Beijing international Tourism and Leisure Valley of Gubeikou Cultural Tourism Industry Cluster District

25：Badaling Great Wall Tourism Industry Cluster District

26：Lugou Bridge Cultural Creative Industry Gathering Area

27：Ming Dynasty Tombs Cultural Creative Industry Gathering Area

28：Ancient village road cultural tourism industry cluster district

29：China Music Valley Cultural Creative Industry Gathering Zone

30：Beijing Music Creative Industry Park

After decades of rapid development Beijing has now accumulated enough of a material base to credibly aspire to become a first-tier "global city". Two key factors can be considered to have contributed to current perceptions of Beijing as an international metropolis. The first is the Olympic Games in 2008, an event that greatly advanced Beijing's global standing, modernisation processes, and international competitiveness. The second is its strong performance during the global economic crisis.

In 2009, the proportion of Beijing's tertiary industries sector reached about

75%, very near to the global city standard baseline. The passenger throughput of Beijing International Airport has now surpassed 65 million per annum making it the world's fourth largest airport. According to railway and transportation planning authorities, Beijing's railway will cover about 561 kilometres by 2015. Therefore, in terms of its urbanisation, rates of employment in tertiary industries and infrastructure building, Beijing is now reaching the stage of a developed city, having finished the framework construction required of a modern international city.

As the key strategic emerging industry supporting the capital's economic development, the CCI in Beijing is contributing significantly to wide ranging and rapidly developing prosperity. The added economic value of CCI in 2010 is estimated at 169.7 billion yuan, rising by 152% from 2005, and equating to a GDP ratio of 12%. In 2012, large-scale CCI clusters certified by Beijing municipal government reported achieving revenue of 116.16 billion yuan, representing year-on-year growth of 11.8%. The proportion of the city's income attributable to the CCI is 15.7%, and employees in the sector reached 151 thousand people – a year-on-year growth of 6.1%.

Based on this background, Beijing is useful as a case study for understanding the evolution of urban cultural space, the impact of the cultural and creative industries, impact mechanisms due to diverse cultural resource types, and the different stages of development and the associated spatial organisation. Between 2006 and 2011 thirty cultural and creative industry zones were established and certified by Beijing's municipal government [16] officially to promote the whole industry.

Beijing's Cultural and Creative Industry Parks

Why should the cultural and creative industry parks be developed in Beijing? What should be considered first - the economic benefits and promotion of GDP, or the improvement of the city's cultural creativity and a focus on development of an innovation-oriented city? So far as the vigorous development of art zones in China is concerned, these cultural and creative spaces can provide a good environment for people with excellent talents to promote the development of a cultural creative industry. Hence, it is urgent and important to investigate decision-making methods and operational modes in cultural and creative industry spaces.

In its early development stage during the 1990s, Beijing's cultural creative space was characterised by sites such as Liulichang Painting and Calligraphy Street, Panjiayuan Antiques Market and Nanluoguxiang area. These sites have long histories and rich cultural connections to the historical heritage of the old downtown area of Beijing, which made them places of interest for tourists and also a space of leisure for local residents.

More importantly, these areas became a breeding ground for the cultural and creative activities of actors, directors, screenwriters and other artists, bringing together creative personalities and forming a catalyst for the formulation of ideas. Unsurprisingly these circumstances have lead to a burgeoning collective creativity. The material spaces of cultural heritage have become a hinge for creative ideas with individuals forming social networks that actually become the precondition for the creative process.

Since 2000, the development of art zones in Beijing has been vigorous, with 798 Art Zone (located on the site of the earlier 798 Factory) and Songzhuang Original Art Cluster representing typical examples. This has accelerated the development of cultural industries and contributed greatly to building a large contingent of talented people across the field of culture. There has also been an equal or growing emphasis on and awareness of green industries and lifestyles. Thanks to its convenient transportation, low cost of living and good social environment, Songzhuang, one of the small towns situated in east of Beijing, has attracted artists to work and live there. Therefore, Songzhuang has become the most important base for artists in the city and has informed and influenced the whole developing background of cultural and creative industries. The formation of Songzhuang, which has grown gradually from small-scale to large-scale, is a typical case for studies on the art industries' centralising features and could suggest a framework for cultural creative industry development in other cities and rural areas.

Landmark projects such as the "City Originality Complex" established by Beijing Cable 8 Group have been conceptualised in the form of an "urban oasis" or "cultural community" intended to fuse media, design, fashion and art enterprises to become a hub for the generation and realization of creative ideas. By August 2012, Beijing Cable 8 Group, the city's the first park operator had established eight cultural and creative clusters in succession with a total business area of 110,000 square meters. There are 300 large-scale cultural and creative firms assigned to the parks whose gross revenue has reached 17 billion yuan, generating taxes of 1 billion yuan for the city. These cultural and creative clusters have become symbolic of the industry in Beijing. They are viewed positively because of the improvement they have made to the physical environment and the contribution they have made to the cultural life of the city.

Since 2010 due to the ongoing integration of culture and technology, many traditional industrial clusters and high-tech parks are undergoing a transition to include newer forms of industry, including digital publishing, mobile multimedia, animation and game design, as well as cultural tourism. Examples of this emerging creative industry base include Zhongguancun Science and Technology Park, Shijingshan Digital Entertainment Industry Base, the cultural and creative hub Tsinghua Science Park, and The National New Media Industry Base in the Daxing district of Beijing. The "creative factories in Hutong alleys" concept cultivated by Zhongguancun Science and Technology Park has attracted more than 500 small and medium sized cultural and creative enterprises. By breaking through the original science and technology enterprise incubator model, the growing base of new cultural enterprises has integrated multiple functions of business service, entertainment and leisure, creative tourism. Furthermore, they provide useful templates for further cultural and creative development of Beijing through this internal renewal cycle.

To conclude, the cultural and creative enterprises described are concentrated in certain urban areas with proximity to creative industry parks or regions that are being established around the city of Beijing. Although the Beijing case confirms the mutual influence of CCI and urban space, it equally suggests the potential for further policy adjustments and the need for further research. CUC researchers hope the data gathered to date may give some guidance to Beijing and other cities on how to shape creative cities with a view to cultivating the cultural and creative industry clusters and parks through further space development and judicious regulation. This should be done in a manner that transforms the traditional industry park, and its mono business model, in order to attract inno-

vation orientated enterprises to settle in and create new opportunities for the cultural and creative industry to thrive.

Future prospects and challenges

However, the prospects for this are not yet clear because there remain many problems in China. The goal of using the development of cultural and creative industry to drive GDP growth is difficult and may not be achieved in a short period. Moreover, there are fears that constructing cultural and creative industry parks blindly may accelerate the formation of real estate bubbles, which can produce negative impacts on many aspects of the economy and culture and can even threaten social stability. The simple construction of the parks cannot in itself meet the multi-level development needs of the cultural and creative industry. What China requires is a clear framework to understand and analyse the creative economy so it may formulate explicit policies.

From a longer-term, global perspective, Beijing still has a long way to go to before it can become a developed global city like New York, Paris and Sydney. The city policy makers clearly understand the city's predicament. Beijing per capita GDP is still quite low and the city lacks appeal to many international organisations. As a cultural centre, historically and in a contemporary sense, its cultural influence still remains rooted in traditional areas and the city lacks world-renowned cultural organisations and cultural activities.

Although the city's science and technology research and development capability has reached an advanced level, when compared with other global cities, Beijing lags behind in independent intellectual property rights and additionally confronts huge pressures in coordinating appropriate development of population, resources and environment.

The arduous task for Beijing is to know how to build itself as a real innovative global city. Beijing authorities are planning to achieve this goal through the following procedures. The priority is to further develop the Zhongguancun Science Park to establish an international research and innovation centre to help drive the city's creative development. Secondly, Beijing will move to improve its economic openness and level of internationalisation by expanding global communications services, providing a stable business environment to international organisations, and encouraging favourable conditions for attracting international talent. Third, in building a more livable city, Beijing has the opportunity to perfect its urban infrastructure, the social pension system, medical treatment, and urban greening. The latter creates the opportunity for construction of a low-carbon city. In this respect Beijing will require rigorous research into the design and implementation of low-carbon transportation, a recycling economy, low-carbon community development, energy conservation and construction, renewable energy, low-carbon city space and comprehensive utilisation of water resources.

References and Notes

1. Pablo Rossell and Shelagh Wright ed., "Mapping the Creative Industries: A Toolkit," Creative and Cultural Economy Series **2,** (2010) British Council Creative Economy Unit.

2. Rossell and Wright [1].

3. Rossell and Wright [1].

4. Richard Florida, "Cities and the Creative Class", *Routledge*, 2005

5. Rossell and Wright [1].

6. This distinction was made by Brendan Harkin (Founder and Director of X Media Lab) during discussions in Beijing February 2013.

7. Saskia Sassen, "The Global City: Introducing a Concept," *The Brown Journal of World Affairs* **11,** Issue 2 (2005) pp. 27-43.

8. Justin McQuirk, "Beijing Design Week unloads crates full of Chinese creativity", *The Guardian*, (5 October 2012) <http://www.guardian.co.uk/artanddesign/2012/oct/04/beijing-design-week-chinese-creativity> accessed 8 November 2012.

9. The Delegation of the European Union in China *"China's Twelfth Five Year Plan - English translation",* <http://cbi.typepad.com/files/full-translation-5-yr-plan-2011-2015.doc> accessed 18 May 2011.

10. Zhang Chuwu, Yu Dengbing, Chen Fang Fang, Fu Li ed., "The Yearbook of China's Cultural Industries", *Ministry of Culture PRC,* (2011).

11. Zhang Chuwu, Yu Dengbing, Chen Fang Fang, Fu Li [10].

12. Zhang Chuwu, Yu Dengbing, Chen Fang Fang, Fu Li [10].

13. Zhang Chuwu, Yu Dengbing, Chen Fang Fang, Fu Li [10].

14. Zhang Chuwu, Yu Dengbing, Chen Fang Fang, Fu Li [10].

15. Rossell and Wright [1].

16. Beijing Municipal Government Website http://dict.cn/Beijing Municipal Government accessed 20 May 2013.

HYPEROBJECT: HOMELAND

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Abstract

This paper describes the conceptual underpinning, theoretical context and workflow of a haptic drawing hologram project, *Hyperobject: Homeland* which proposes that one's homeland is emergent as life experience. The social context of this project is the current extensive use of holographic maps in tactical battle visualisation by the military. The *Hyperobject: Homeland* project proposes a shift in our perception of what a homeland might be in the age of the hyperobject. By inviting viewers to take up the same military point of view above a hologram it allows contemplation of a visualisation of homeland as a type of 'common'.

Keywords: Hologram, Drawing.

The *Hyperobject: Homeland* project investigates the re-purposing of state-of-the-art holographic imaging technology currently deployed in high-level military pre-visualisation of battle sites, as a *theatre* for engaging with compassionate heuristics of homeland. It does so by examining the potential of subjective hand-made drawings of lifelines to evoke empathy when experienced though the fluency in scalability, orientation and resolution of digital holographic imagery. The content of these holographic images are made using Holoshop software (currently in development by the author in collaboration with the Holoshop research group). Holoshop software, interfaced with haptic devices such as the Phantom Premium 1.5, enables sensitive modulation of line drawing in three-dimensional space, which can be exported as a CG scene for a digital hologram. By using a 3D mesh made from the cast of a human palm as a haptic guide, line drawings are made in Holoshop by feeling along the lifeline "terrain". The virtual encounter between the artist and the subject via this haptic gesture is recorded as a three-dimensional lifeline in a holographic image. This process materialises the poignant act of drawing a virtual place in space which can house people separated by political divisions, as proposed in the final lines of Anna Akhmatova's poem *We Don't Know How To Say Goodbye.*

We don't know how to say goodbye:
we wander on, shoulder to shoulder.

Already the sun is going down;
you're moody, I am your shadow.

Let's step inside a church and watch
baptisms, marriages, masses for the dead.

Why are we different from the rest?
Outdoors again, each of us turns his head.

Or else let's sit in the graveyard
on the trampled snow, sighing to each other.

That stick in your hand is tracing places
in which we shall always be together.

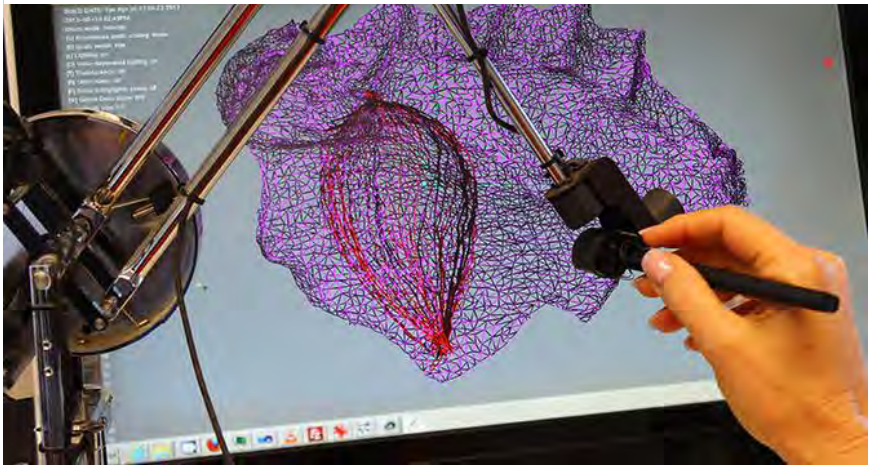
By inscribing holographic space with the poetry of this gesture, a new model of homeland, devoid of terrestrial territory but redolent with human experience, becomes conceptually, spatially and temporally existent.

Background

The US military has witnessed a rapid uptake of holographic three-dimensional mapping technologies in the last decade as a pre-visualisation strategy for enabling situational awareness of 'theatres of battle'. The widespread military adoption of holographic mapping technologies has facilitated attendant revolutionary advances in these technologies. The synthesis of telemetric LIDAR geospatial data with photographic and other contextual site information has enabled the production of high-resolution three-dimensional representations of complex terrains and combat environments in physical holographic maps called Tactical Digital Holograms [1]. TDH of military sites of interest are now readily available to US military personnel and this technology is effectively and fundamentally changing the contemporary application of battle visualisation and operational planning [2].

So far about 12,000 synthetic holographic images combining army-classified and unclassified data have been made for soldiers in Iraq and Afghanistan. These maps are capable of providing multiple viewers with a visual representation in *full* parallax, so that the image appears three-dimensional from all points of view. In this way, TDH are able to perform as idiosyncratic models of 'situation room' scenarios and provide a physical domain for the visualisation and heuristic strategies of engagement [3]. Small groups of soldiers cluster around these monochrome green holograms on a horizontal rotating turntable with a specially designed grasshopper lighting stand enabling enhanced situational awareness. TDH is a proven military technology for mission planning, strategy and pre-combat rehearsal, and within the *Hyperobject: Homeland* project, it is repurposed to engage viewers within an ecology of contemplation of homeland [4].

Fig. 1…. using Holoshop and the Phantom Premium 1.5 haptic interface to draw a lineform from repeated tracings along the lifeline of a human palm. © Paula Dawson



Orientation of Imagery

The radical developments in holographic mapping technology have been driven by what Weizman [5] describes as a vertical spatial turn of sovereignty and surveillance; that is, the construction of geospatial holographic maps of battle terrains. Along similar lines, Steyerl [6] understands conflict as simultaneous across multiple axes, united through technologies of geospatial stratification:

Vertical sovereignty splits space into stacked horizontal layers, separating not only airspace from ground, but also splitting ground from underground, and airspace into various lay-

ers. Different strata of community are divided from each other on a y-axis, multiplying sites of conflict and violence.

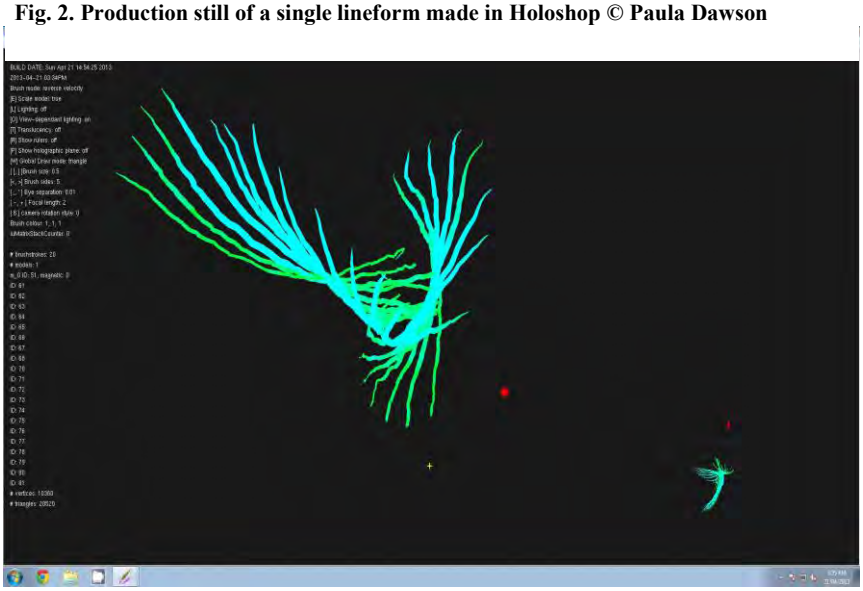
The pervasiveness of military geospatial mapping technologies coincides with obsessive surveillance regimes within entertainment and military industries which seek to displace the 'monocular vision' of linear perspective so predominant in Western thought and action. According to Steyerl, we are now sited in a "visual culture saturated by military and entertainment images, views from above" [7]. New visual paradigms being offered by emergent media shift our spatial and temporal orientation away from a flattened Cartesian plane of the singular and immobile spectator, replacing it with multifocal and nonlinear modes of seeing such as: multiple perspectives, divergent vanishing points, aerial views and distorted lines of sight [8]. Emergent aerial viewpoints exist as a mechanism of "hologrammatization" [9]. The holographic image displaces the perspectival paradigm of spatial representation and visual interpretation, bringing into play a new logic of spatial perception [10].

Scale, Point of View and Hyperobjects

These new representations of space allow for a greater diversification of our internal spatiotemporal thinking. The spatiotemporal disjunction precipitated by holographic technologies has great implications for our capacity to approach what Morton describes as 'ecological thought' – a 'thinking big' that represents a viable thought-path in the time of hyperobjects [11]. Morton describes hyperobjects as inherently contemporary *abstract* phenomena (for example, global warming, radioactive waste) that exist on grossly extended timescales, or are so stretched in terrestrial space as to be unavailable to immediate human experience. In this way, they are able to conceptually undermine normative ideas of time, space, and the 'object'. Furthermore, hyperobjects have emerged *precisely* because of the (ecological, military) crises under which we now operate, and so serve to alert humans to the ecological dilemmas defining the age in which we live. As Morton states, "The ecological crisis makes us aware of how interdependent everything is, and in that interdependence, the fundamental and critical need for care of others" [12].

Images such as the NASA image *Earthrise*, which depicts the earth rising like a miniature sun enveloped by the void, serve to displace our sense of centrality and offer a perspective from the outside [13]. New spatial representations afforded by holographic media (and enabled by aerial points of view) serve to shift our sense of spatial and temporal orientation by removing the ground [14]. The groundlessness of these new visual paradigms resonates with Morton's description of a globalised world of hyperobjects, in which there exists neither horizon background nor foreground against which people and objects can be defined. Rather, what replaces the ground is a vast and intimate mesh: "the interconnectedness of all living and nonliving things" with each point acting as the centre of a system, and its edge. The interconnected mesh "implies a radical intimacy with other beings" [15].

Fig. 2. Production still of a single lineform made in Holoshop © Paula Dawson



Navigation of Holographic Space

Compared to viewing multifocal holographic images, the dominance of normative, subject-oriented perspectives was attended by an expanded importance of linear time. In offering a visual projection forward in space and time, "a view on a calculable future" was provided [16]. According to Morton, this "fixation on place impedes a truly ecological view" [17]. Where normative linear perspectives allow for a 'navigable and predictable' space of calculated risk, the multifocal, de-centred, nonlinear and temporally accelerated perspectives offered by emergent holographic visualisation technologies suggest the possibility of a new paradigm of thought and spatiotemporal navigation [18]. Holographic images potentially allow for embodied experiences, which may allow us to approach abstract concepts and hypotheses. The holographic representational system, when free of the subject matter of specific terrestrial locations, provides an alternative way to visualise space and time. Attunement to affect is amplified in holographic space, which has the capacity to correlate "physiological psychological perception" [19].

Holographic imaging offers a means of visualising hyperobject scale ecology. Zielinski speaks of how the individual has no "access to the world's totality and experiences" but that media interfaces perform the spatiotemporal collapse and visual representation for them [20]. This collapse is nowhere more evident than in holographic space, which represents a shift from an objective, singular centred and linear perspective to multifocal, decentred (ungrounded) and pluri-subjective visions. Media also function as "spaces of action for constructed attempts to connect what is separated" [21]. By collapsing the boundaries between subject and object – and by opening into the mesh of interconnectedness, holographic space approaches a way of knowing defined by Serres as "entering into contact, directly, with things" [22].

This relational contact is carried by, rather than disrupted by the disjunction between the body, the media, and the things (world) it represents [23]. The body serves as the "means of communication" between and among them, such that the body – as a subjective instru-

ment – is always part of the relational equation of representation. As the digital motivates the total mobilisation of perception in temporally based media worlds, new modes of subjectivity are again (or still) required [24].

The decentring of our vision that occurs in holographic space could be interpreted as a precursor to the reshuffling of inherent structures of power, and the creation of "power-free spaces in media worlds" required for sharing [25]. A freeing of the immaterial object from its relations – and in particular, its relationship to violence - may allow for its reformulation as a 'neutral terrain' [26].

Under these conditions is it possible to visualise notions of compassion, hospitality, and care for others. As argued by Levi Bryant, an openness to the other is "an inescapable, ontological feature of the proper being of beings" [27], and begins to address Zielinski's call for social praxis in media worlds to engage a "politics permeated by the poetry of hospitality" [28]. Within this context, Holoshop serves to repurpose [29] military hologram technology, mapping neutral terrain [30] rather than the literal geographic terrain of battlefields.

Workflow

The Holoshop research project develops technologies that interface with the holographic medium. Conscious of military and industrial imaging processes [31]. Holoshop has been developed as a tool that reflects the workflow of contemporary drawing practice.

Over a period of two years, palms of people's hands from diverse cultural backgrounds and age groups were cast in silicone. The same palms which form the terrain of an earlier hologram, *Homeland* were again used in the *Hyperobject: Homeland* project [32]. People were asked to pose their hand as though they were holding a piece of light as silicone was poured into their palms. After twenty minutes an extremely detailed cast was gently peeled from the palm revealing a delicate and organic terrain. The silicone casts of the palms were then photographed and the images were assembled with Agisoft Photosynth into a 3D mesh and oriented so that the lifeline was a concave shape ready for drawing with the Phantom pen using Holoshop software.

Over the past four years several Holoshop software functions have been developed. In respect to line quality, the velocity of the stroke modulates the width of the line e.g. the line becomes wide when the gesture is slow, and narrow when it is fast. Reverse velocity has the opposite effect. In addition, three-dimensional line quality can be ribbon-like or tubular. Other features of importance include magnetic mode, where the haptic pen becomes magnetically attached to the mesh; and pressure mode, where the force of the pen on the virtual mesh surface produces a line of varying width.

However two new Holoshop features were specifically implemented in order to sensitively modulate contour inflections when tracing the path of the lifeline along the 3D mesh and to enable building grouped forms of lines. The first feature enables relative scalability between the visual and the touch aspect of the scene. Independently scalable frusta for touch and vision make it possible to increase the amount of sensitivity to touch so that every minute undulation of a lifeline pathway can be felt.

The second feature, the rotation axis, enables the building of a lineform from an aggregate of lines, one for each year of life, by altering the direction and orientation of the 3D palm mesh. The rotation axis feature enables setting an axis oriented relative to any line drawn in Holoshop. The rotation axis tool has a pre-visualisation function which shows where future lines will be according to alterations of the axis of rotation.

Each of the one hundred and fifty individual lineforms in the hologram were drawn using these unique Holoshop software tools. Some "older" lineforms with up to ninety lines were drawn along four different axes of rotation. This was intended to suggest shifts in focus and orientation experienced over a long lifetime. Spatial structures, some resembling shells and others nests emerged from repeated tracings along the same lifeline.

After each of the one hundred and fifty individual lineforms were drawn in Holoshop, they were exported separately as object files. These object files of the lineforms were in turn imported into Maya and arranged within a cubic volume which would be 1.2 x1.2 x 1.2 meters as a hologram. The distribution of the lineforms in the space ensured that when illuminated, the lineforms that were distant from the hologram plate would be blurred. The free floating placement of the lineforms is intended to evoke the distances between planets in a galaxy. Colours were applied to the lineforms, which resemble the palette of recent images taken from the Hubble telescope as a further suggestion of the ambiguous scale between the line on the palm of the hand and outer space. This fluidity of scale seeks to fragment the indexical relationship between military holographic images and real geographic sites.

The final Maya scene was uploaded to the Zebra Imaging web site where the image was slightly adjusted and viewed as a simulation of the hologram. Zebra Imaging, in Austin Texas, printed the image to four, 60 x 60cm tiles, which were shipped to Australia. The images were exhibited horizontally slightly above the floor level of COFA Space gallery at the College of Fine Arts, UNSW Sydney during ISEA 2013. The digital holograms were illuminated with Source 4 Jr theatrical lights from above centre.

The images of lineforms were altered significantly from their original

Fig. 3. Hyperobject: Homeland (2013), digital holographic print, 120cm x 120cm. © Paula Dawson. Photo © Oliver Strewe

drawing in Holoshop in order to be displayed as a hologram. The perfection of the CG forms were dissolved in a cloud of visual noise created from the high proportion of lineforms that were out of focus. This background noise became a soft cloud-like haze in which the lineforms floated, disintegrating as they came closer to the viewers' hands.

Conclusion

The term Homeland generally implies both inclusion and exclusion. The model of Homeland presented in *Hyperobject: Homeland* is instead entirely inclusive of all beings. This visulisation is made possible though the unique properties of the digital hologram and the representation of six thousand lifelines.

A lifeline is the embodied representation of an entire human life. The virtual interaction with each life happens twice in Hyperobject: Homeland. The first interaction involves the artist tracing along the lifeline and the second involves the viewer also interacting by reaching out to touch the holographic image. The spatial configuration of the line forms, their colour, blur, distortion and immateriality as digital holographic imagery, presents a visualisation of the collective communality inherent in all human life experience as a vast homeland. The space of the hologram encourages groups of people to collectively view and discuss its subject through tactile interaction. A reconceptualisation of Homeland at hyperobject scale is constructed expressing a paradigm of heightened empathy and compassion.

References and Notes

1. Holzbach, A. Smith; C. K. Tam; J. Riegler; J. J. Martin; M. (2008) *Evaluation of Holographic Technology in Close Air Support Mission Planning and Execution - Final Rept. Jun 2007-May 2008.*: Zebra Imaging Inc., Austin, TX.

2. Tan, M. (2012). 3-D Maps provide new edge in battle preparation. *Army Times*. Retrieved from http://www.armytimes.com/news/2012/03/army-3d-map-provides-edge-preparing-for-battle-030612/

3. Fuhrmann, S., Komogortsev, O. et al (2009). Investigating Hologram-Based Route Planning. *Transactions in GIS*, 13(S1).

4. Morton, T. (2010). *The Ecological Thought*. Cambridge, Mass.: Harvard University Press

5. Weizman, E. (2002). *The politics of verticality* http://www.opendemocracy.net/

6. Steyerl, H. (2011). In Free Fall: A Thought Experiment on Vertical Perspective. *e-flux*, 24(April).

7. Steyerl [6].

8. Steyerl [6].

9. Mbembe, A. (2003). Necropolitics. *Public Culture*, 15(1 Winter).

10. Zec, P. (1989). The Aesthetic message of Holography. *Leonardo*, 22(3,4), 425-430

11. Morton [4].

12. Morton [4].

13. Alphen, E. v. (2005) *Art in Mind: How Contemporary Images Shape Thought* London: University of Chicago Press.

14. Steyerl [6].

15. Morton [4].

16. Elsaesser, T. (2010). *The dimension of Depth and Objects Rushing Towards Us, Or: the Tail that Wags the Dog. A discourse on Digital 3-D cinema*. Paper presented at the eDIT Filmmaker's Festival, Frankfurt, Germany; Steyerl [6].

17. Morton [4].

18. Elsaesser [16]; Steyerl [6].

19. Zec [10].

20. Zielinski, S. (2006). *Deep time of the media: toward an archaeology of hearing and seeing by technical means*. Cambridge Mass.: MIT Press

21. Zielinksi [20].

22. Serres, M. (2000). *The Birth of Physics*. West Manchester: Clinamen Press

23. Merleau-Ponty, M., Lefort, C. (1968). *The visible and the invisible: followed by working notes*. Evanston Ill.: Northwestern University Press

24. Zielinksi [20].

25. Zielinksi [20].

26. Serres, M. (2000). *The Birth of Physics*. West Manchester: Clinamen Press

27. Bryant, L. R. (2011). *The Democracy of Objects*. Ann Arbor: University of Michigan Press.

28. Zielinksi [20].

29. Bolter, J.D. Grusin, R. (*1999*) *Remediation: Understanding New Media*. Cambridge: MIT Press.

30. Serres [26].

31. Tan [2].

32. Dawson, P., Takatsuka, M., (2012). "The Haptic Lines of Homeland," *Proceedings of the 9th International Symposium on Display Holography* (ISDH 2012), Media Lab, Massachusetts Institute of Technology, Cambridge Mass., USA 25-29 June 2012.

ELECTRONIC MUSIC IS HERE TO STAY – OR IS IT?

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Abstract

Musical composers frequently make use of new technologies in instrumentation. Whilst orchestral traditions remain strong and the instruments viable, what of the works of composers of electronic music where the sound sources have fallen into disrepair, obsolescence, or modern technology has changed the sound so that it bears no relation to the original?

Beyond collections of manuscripts and recordings, the practicalities of the re-performance of electronic music compositions have not been widely discussed, and no methodology for archiving the artefacts for re-performability exists. In time, as greater importance is placed on these works, the issue will become more difficult to retrospectively resolve.

Keywords: electronic music, archiving, preservation, complex objects.

Re-performance Project

Historically informed performance bases its credibility on three main tenets –

- period instruments and playing technique offer a different timbral content to modern equivalents;
- this is structural to the culture around the composer, no less important than the musical content;
- incorporating these features rather than presenting the piece in context with the current sounds and culture results in a stronger performance.

To understand what is required to successfully re-perform electronic music that is even only a handful of decades old, an attempt needs to be made to re-perform these works, one which involves investigating the sounds within the music, the sound sources and their construction, and testing digital archiving methodologies to re-create them using contemporary technology. This paper outlines such a project. It takes a technical and practical look at the digital curation requirements of electronic instruments and sound sources using music primarily from the 1980s – comparatively extremely recent times, while also nodding to earlier electronic musicians and composers by blending later pieces with earlier ones.

The pieces were chosen from the electronic-industrial genre, and are primarily by SPK, an Australian electronic/industrial band formed in the late 1970s and noted in more recent times due to the success of the group's mainstay, Graeme Revell, as a film soundtrack composer after the band's dissolution [1]. The selection of SPK was not based on the considered "significance" of their work, but on other criteria. Firstly, that this was an Australian group was deemed important, as little literature exists on Australian electronic music [2]. Second, the study required that the group be defunct, so that no developments of the technology used for the performance of the music had been undertaken. Nonetheless, as time passes and a new generation of composers and performers continue to develop from these roots, ongoing music and technology developments may demonstrate the artistic significance of this genre in music history.

The end result of the project was a performance of a number of SPK's works to an audience which included people who had seen SPK perform live in the past, as well as others familiar with the genre.

Archival Methodologies

Studies in the field of archiving have long been considered purely as methodologies of arranging history, but more recently are interpreted as "a dialogue between the present and the past" [3]. This concept is a key one in the interpretation of old technologies into a contemporary context, and requires an understanding of the cultural technological context, as well as desired outcomes of the creator. Preserving the ability to re-perform works, and not simply the output of performance (such as scores and recordings), is the major element of the archiving, curation and preservation of the performing arts [4].

For twentieth century works, the process of preserving the performability of these compositions is complex, involving not only electronic instruments of many varieties, but also computer media, hardware and software, for later composers working digitally. Giaretta has proposed that each "object" that is part of the composition, or assists in providing context to the work, would need to be identified and preserved, and this thinking is supported by a project undertaken by IRCAM and McGill University [5]. These objects might include: audio files, video files, composition notes, recordings of the work (both audio and video), details on sound generation methods (including synthesized or physical sound sources) and most importantly, details of any real-time processing, such that it might be re-developed in a later contemporary technology whilst retaining the same functionality.

For the composers of the mid to late twentieth century, these issues are compounded further by their temporal location on the cusp of the digital revolution. These musicians used analogue and early digital electronic devices as part of their sonic palette, and the archiving of these objects is more akin to museology than musicology. Much of the work already done on the preservation of twentieth century electronic music, such as the MUSTICA project [6], is principally related to the preservation of software, rather than hardware sound sources, digital data rather than analogue.

As with the preservation of digital data, three principal methodologies are available for the archiving of electronically encoded information:

- Migration – the migration of the digital artifacts to current technology. In a musical context, this might include sampling original instruments and sound sources as well as porting software source code to a new platform.
- Emulation – running obsolete software in emulation or as virtual systems on current digital hardware. This methodology would allow for the creation of analogue electronic instruments on contemporary digital platforms, including emulated vintage synthesizers.
- Re-interpretation – taking the essence of the digital information and reconstructing a version of it from that subset of data. This method could see the creation of "remixed" versions of compositions – a popular contemporary method, with successful recordings released of remixes of composers such as Steve Reich and Philip Glass.

Each of the methodologies requires a specific set of materials available to enable their success. The principal issue for this project is that of the lack of documentation on the specifics of instrumentation used by SPK for their recordings and live performances. Whilst problematic, it is also not an unusual situation with compositions of this genre, and provided a testing ground for the creation of sound sources by ear rather than authentic archival sources. This differs from a project undertaken in 2005 to convert the works of composer Jonathan Harvey from hardware instruments into software equivalents. In that instance the composer was able to provide details on the sound source hardware and configuration, leading to specific software being found or developed to produce virtualized performance instruments [7].

Whilst Giaretta in *Advanced Digital Preservation* describes a model using migration as the sole strategy for the successful archiving of digital information for the re-performance of a piece of electronic music, this has not been rigorously tested and indeed in wider digital preservation circles, there has been little comparison done of the three methodologies and their ability to produce usable, readable digital information.

Importantly, this methodology also pre-supposes that the information to be migrated is purely software, and the migration of hardware instruments may prove impossible without reference hardware to sample, or the ability to rebuild an instrument from scratch where schematics exist. There is also the possibility that the sounds in the work, whilst technology dependent, are not "synthesized". Examples of this can be found in many of the works of John Cage which make use of sounds - or their absence- on specified radio frequencies, now altered due to changes in radio spectrum use. A review of a recent concert of John Cage's Variations (I-VII) summarised the problem:

Few works have dated as quickly as those of Cage, and the banks of old reel-to-reel tape recorders, transistor radios and theremins still in use like Cuban cars mark him as the first 20th-century composer requiring historical performance practice. [8]

In the case of this project, attempts through local musicians, recording studios and instrument retailers to locate vintage instruments to sample within Western Australia were fruitless, so the Migration methodology could not be investigated. Instead, pieces were performed using Emulation and Re-interpretation methods. This was extremely unfortunate, as it has left the method recommended in historically informed performance uninvestigated. However it does highlight the potential difficulties in practice of authentically re-staging a piece of electronic music from only 30 years ago.

The value of following the Migration methodology was illustrated in 2008, when composer Marc-André Dalbavie was faced with the difficulties associated with attempting a re-performance of his Ars Electronica prize winning piece *Diadémes* from 1986. Dalbavie discovered that the absence of a working Yamaha TX 816 synthesizer and the lack of suitability of the software emulators, almost prevented the work from ever being presented as anything other than a recording in the future. Attempts were made to recreate the sounds using the Native Instruments FM Synthesis software synthesiser, FM7, however Dalbavie was unimpressed with the sounds and did not feel they were appropriate for his composition. A satisfactory solution was brought about by sampling a hastily repaired FM synthesizer located in France, and using the samples in lieu of the instrument. The presence of the composer in making decisions on the replacement instrumentation cannot be undervalued in this instance. It is clear that, should the composer not be present, an understanding of the context (both from a technology and cultural perspective) of the sound sources for the work at the time of its composition, and awareness of the ability of current technology to reproduce these components is central to the question of "what was the intended sound?" in attempting to curate or reproduce these performances.

Whilst much of the theory is from the appraisal areas of archives and museums, the final assessment of the success of the preservation methodologies for this project is based firmly in the study of performing arts and specifically, electronic music. To assess it as an archival project would not effectively test the theory's ability to deliver the sought result, and would only evaluate the ability of each methodology to collect information, not on the need for the type of information to make a composition re-performable.

Instrumentation and Musicians

Industrial musicians have often described their compositional process in terms of the equipment they use [9]. Tracing the instruments used by SPK was not as simple as referencing their own documentation however, as little exists today.

It was clear from listening to and viewing live and studio recordings by SPK that they made use of a variety of instrumentation – from very contemporary (at the time) analogue synthesizers and the first commercially available digital sampler, to found and built "junk" percussion. Their live show also featured electric bass guitar (though this is not apparent in their recordings).

Little documentation exists on the specifics of SPK's electronic instruments beyond some references to their use of the EMS Synthi [10], but aural and visual investigation of their recorded output provided enough information to identify their principle equipment. Video of the group performing live in Madrid [11] clearly shows the bass guitar and assorted industrial percussion, and also includes a keyboard identifiable as a Roland RS09 String Machine. Still photographs from other performances in the mid-1980s clearly show a Yamaha DX-7 synthesizer and a Fairlight CMI sampler in their backline. The presence of the Fairlight is significant in that it would have allowed them to move from tape-based sounds to digital samples, however it also represents a puzzle. The CMI pricing was approximately $65,000 in 1983 and was purchased principally by a small number of artists and studios with flourishing careers and sizeable incomes, which justified the extraordinary expense of the instrument. This is not an instrument that would be expected to be in the regular lineup for a band of SPK's popularity, so this photograph was an important part of putting together their instrumentation.

Notably, with the exception of the Yamaha DX-7, none of their electronic instruments included MIDI capabilities, though they would have been able to implement basic control voltage triggering from the drum machine to the EMS Synthi. Also aside from the dedicated sample based Fairlight CMI, no computers can be identified in their setup. The majority of the electronic instrumentation would have been played by hand with the ability to trigger some pre-prepared sequences on the EMS Synthi in real time. Whilst the Synthi and the String Machine were both

analogue synthesis instruments, they differed in one important area: the String Machine had a limited number of preset sounds not unlike an electric organ, whilst the Synthi was a truly flexible analogue synthesizer, potentially giving an artist the unlimited sound palette dreamed of by composers such as Russolo and Varése.

This project made extensive use of computers and software to recreate the pieces, as suits the methodologies of Emulation and Re-interpretation, making use of tools common to contemporary times. Two major Digital Audio Workstation products were used, Ableton Live and Cubase, on Apple MacBook Pro laptop computers.

Many software instruments were auditioned for use in this project, with the following chosen –

- PureMagnetik MachineKits (Linn Drum model)
- Soniccoutoure Synthi AKS
- PureMagnetik String Machines (RS-09 model)
- FXpansion DCAM Synth Squad (Amber, Strobe and Cypher models)

The FXpansion DCAM Synth Squad software stood out from the other software instruments. It models in software the hardware of a number of synthesizers and synthesis technologies – Amber is an Additive Synthesis plugin, Strobe a String Machine, and Cypher and FM Synthesizer. Whilst the other software synthesizers provided a collection of created patches, they offered few ways in which the user could alter those sounds or presets. DCAM Synth Squad, whilst authentically modeling vintage synthesis methods, gives the user full control over the sound produced. FXpansion are quite descriptive of their process of literally disassembling old synthesizers and rewriting the circuit in computer code. [12].

Consideration was given to why SPK had used a bass guitarist live, but there was little in their recordings of the instrument. Upon reflection it was realized that in the studio they may have multi tracked the EMS Synthi to provide both bass and lead lines in their music, and this was not possible to replicate live with only the one synthesizer.

The research on SPK's instrumentation is unique, but there was no opportunity to collect information on the specifics of sound patches that were used on those instruments.

In his blog, Stephen Mallinder of the band Cabaret Voltaire [13], provides responses from a number of music artists to the question "What do you feel has been lost as we have moved to predominantly digital forms of performance / playing live/ DJ'ing?" which include:

- "*The risk of technical failure. Living on the edge of the sequencer.*"
- *"Theatre"*
- *"We've lost that big performance experience, where you need many musicians / instruments to create all the individual elements. All this can now be done in a single box by a single musician."*
- *"Spectacle, seeing somebody hunched over a laptop is never very interesting"*

To address these issues, though much of the music for this performance would be generated and played by laptops, it was necessary to have a substantial amount of the music played live to provide theatre, and for the performers to play not just the instruments, but roles within the group. The risk of technical failure was still apparent (perhaps heightened in terms of complete failure being a possible end result) in the use of computer-controlled material, and in the inclusion of live instruments.

Archive This!

Though the intentions of the project were to investigate the requirements for archiving electronic music, the artifacts that might be left behind by this performance may not be useful for anyone in the future wishing to recreate it. Whilst the software files used in the project are available, they are in proprietary formats that realistically may not be readable in as little as 10 years.

Even during the development of the tracks, the two principal technologists of the project were unable to share files between two popular contemporary Digital Audio Workstation packages successfully. Whilst the software synthesizers worked in both DAW packages, again the format of these files is proprietary and changes are made to the codebase regularly to enhance functionality. Whilst documentation could be produced indicating exactly all of the settings of each part of the software synthesizer, this is complicated largely because of the painstaking nature of the process and the potential for errors in transcription.

Unless substantial effort is expended in creating this documentation it would seem that while it is possible to utilise the Emulation methodology to re-create a performance, the methodology is reliant on the ears of the new performers without specific technical, documentation of the sounds to re-stage works. This indicates one type of documentation that is needed but not often included with scores of works for composers to be confident that their compositions will sound as they intended into the future.

Re-interpretation of electronic music works also relies on sympathetic performers and though it is perhaps not intended to deliver sonically accurate renditions, this methodology requires a broad and detailed understanding of the culture and technology surrounding a composition to deliver a performance that is not simply a work played in out of time, but takes something of the original and re-interprets it for a contemporary audience.

Migration may then be the only current methodology that could deliver verifiably sonically accurate performances, though this methodology also comes with a potentially high level of difficulty to undertake. For the purposes of this investigation, it was not possible to source working instruments to sample and migrate, and this speaks to the chief difficulty faced when adopting migration as a methodology: the reliance on functioning original instruments from which to create the base sounds. However, assuming this barrier can be overcome, it points to an intriguing situation - where synthesis offers a limitless world of sound possibilities, sampling of these sounds to rebuild them may be the most promising technology to capture the ability to perform their music.

References and Notes

1. Internet Movie Database. (2012). Graeme Revell. <http://www.imdb.com/name/nm0006251/,> accessed 17 November 2012

2. Preist, G., Ed (2008). Audio Explorations in Australia. Sydney : University of NSW Press.

3. Craven, L. (2008). *What are Archives? Cultural and Theoretical Perspectives: A Reader*, Ashgate Publishing Ltd.

4. Giaretta, D. (2011). *Advanced digital preservation* doi:10.1007/978-3-642-16809-3: Springer

5. Jerome Barthelemy, Alain Bonardi, Raffaele Ciavarella, and Guillaume Boutard (2009). *Virtualization of real time audio processes : towards a musical notation of contemporary music.* Cultural Heritage on line. Empowering users: an active role for user communities.

6. Bachimont, B., Blanchette, J.-F., Gerzo, A., Swetland, A., Lescurieux, O., Morizet-Mahoudeaux, P., . . . Teasley, J. (2003). Preserving Interactive Digital Music: a report on the MUSTICA research initiative.

7. Bullock, J., & Coccioli, L. (2005). *Modernising live electronics technology in the works of Jonathan Harvey*. Paper presented at the International Computer Music Conference. https://s3-eu-west-1.amazonaws.com/papers/ICMC05-harvey-8.pdf

8. Buzacott, M. (2012). Tribute to the master of discord. *The Australian*.

9. Demers, J. (2010). *Listening through the Noise: the Aesthetics of Experimental Electronic Music*: Oxford University Press.

10. Lustmord. (2009). Lustmord and the EMS Synthi. <http://www.thesynthi.de/index.php?/archives/93-Lustmord-the-EMS-Synthi.html> accessed 24 May 2013

11. kigonjiro. (1983). SPK - The Sandstorm Method. <http://www.youtube.com/watch?v=Xk-wja1fwz8> accessed 24 May 2013

12. FXpansion (2009). An Introduction to DCAM Synth Squad. <http://www.youtube.com/watch?v=ukUtnjhqF6A> accessed 25 May 2013

13. Mallinder, S. (2013). <http://liveormemorex.blogspot.com.au/> accessed 21 May 2013

FROM INTERACTIVITY TO PLAYABILITY

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Abstract

This paper discusses the similarities and differences between participatory, interactive, and playable art. It suggests that computer games can provide novel perspectives on interactivity in interactive art. The paper also proposes that the implications of computer games to interactive art extend beyond whatever purpose and value computer games are perceived as having as products of popular culture.

Keywords: interactivity, play, games, ludology

Introduction

Museums and symposia have opened their doors to computer games. The MoMA collection in New York includes computer games, and for several years ISEA symposia have had sessions dedicated to games. This is not surprising, since computer games and interactive art share a number of characteristics related to, for example, their technological underpinnings. The relationship between an audience and an interactive artwork is in many respects similar to the relationship between a computer game and its player. These similarities can make it hard to formally distinguish between interactive artworks and computer games [1], and it is not surprising that the history of computer games can also be viewed as a history of interactive art, and vice versa [2].

Despite their similarities, computer games and interactive art seem to belong to different cultural spheres and are appreciated from different perspectives. Some scholars of new media art have expressed concerns about the infiltration of 'playful' impulses into new media art, [3], [4]. The separation is somewhat worrying, as the two phenomena have a lot to learn from each other in terms of strategies of audience engagement and meaning-making. The tensions that are at play between traditions of interactive art and computer games are supposedly due in part to how the phenomena we know as 'interactive art' and as 'games' become constructed in social settings, and the kind of cultural and conceptual baggage that are attached to the terms. As Chesher [5] puts it: "New media art offers forms of identity for gallery visitors that are very different from the identities that games offer players." However, in addition to explaining the tensions as social constructions, as Chesher does with the help of Bourdieu, I believe that it is also possible, to a meaningful extent, to trace the similarities and differences between interactive art and computer games to the technological affordances of the objects in question, and the kinds of human/ technology relations these affordances give rise to.

In this paper I propose, following Dinkla [6], to situate computer games on a historical trajectory, beginning at participatory art and moving on to interactivity. I suggest that this trajectory be extended in terms of a contemporary shift from interactivity to playability. Following my discussion of this shift, I will argue that the notion of 'playability' offers a vantage point for analysis and criticism of non-playable, merely 'interactive' artworks. Doing so will shed light on the differences and similarities between computer games and interactive art. My argument seeks to support the position that computer games, in the context of art, can be appreciated not only as yet another form of pop culture brought to museums, but more specifically in the tradition of interactive and new media art: as contributing to the re-evolution of interactive art. This will help facilitate reflection on whether the childish stigma that new media art discourse often imposes on computer games is justified.

Participation and Interaction

Dinkla proposed an art-historical trajectory from participation to interaction. Comparing interactive artworks to Kaprow's happenings, Dinkla suggested that the involvement of an interactive machine allows the artist to be removed from the reception situation. Dinkla suggested that with technology, it became possible to control the relationship between the artwork and the audience by 'machinic' means. The dialogue between the artwork and the audience in the reception situation, the very matter that Dinkla [7] views as the 'artistic material', was 'automatized'. In this setting, the machine assumed the authorial responsibility of events in the reception situation. This automatization is, according to Dinkla, what justifies talking about the shift from participation to interaction. Broadly speaking, the common ground that exists between the genres of interactive and participatory art rests upon the fact that they both live by the input from the audience. The audience must invest energy and effort into helping to realize the artists' vision. This gives us a working definition of interactivity in interactive art; if a work can be 'complete' even without any effort from the audience, it is perhaps best described as something else than Interactive. Thus, interactive and participatory artworks leave room for the audience: they afford being manipulated by the audience. This applies to computer games, too: it would probably be impossible, and make little sense, to analyze and critique a computer game without playing it. While computer games and interactive art share the mode of audience engagement described above, computer games commonly contain an element that is seldom found in interactive art, but whose prevalence in the context of games was pointed out already by Gadamer [8]: risk.

The emerging tradition of game studies has sought to conceptualize computer games mainly through an analogy to traditional games. In this 'ludological' reading, computer games can be conceptualized with the same terminology one may use for the description of traditional, 'non-digital' games: the 'risk' that is essential to game-play appears in ludological analysis of a computer game as manifested in, and facilitated by, rules, goals, challenges, winning condition, and so on.

However: there is no shortage of examples of computer 'games' that cannot be won, or lack other qualities that would justify the term 'game' – perhaps the most popular of these are the games in *The Sims* franchise [9]. It would seem unwise to force the concept of a 'game' onto *The Sims*, since it clearly manifests a form different from that of traditional games. Hence, it is not surprising that the analytic and critical capabilities of the 'ludological' position have been contested. Woods [10], for example, suggests that for the purpose of describing computer games, mountain climbing or Sudoku would be better analogies than traditional games. The parallel between computer games and traditional games might be beneficial for the project of introducing computer games as products of popular culture into museums and other institutions, for the sake of, for example, the preservation of cultural heritage and/or PR and marketing. However, the analogy to traditional, 'non-digital' games is problematic for the description of the shift from interactivity to playability. As I will show in the following, to limit the analysis to digital 'games' only would be to overlook the technological specificity of the ways in which playable artworks enhance the kind of audience engagement we may be

familiar with from the context of interactive art.

Playability and Significance

It might be tempting to assume that in the absence of goals, winning conditions and the like, the 'non-games' like *The Sims* would 'fall back' on being simply interactive. However, doing so would falsely assume that there was no risk in *The Sims*, and overlook perhaps the most important feature in the human / technology relation between the game and its player: the possibility for failure. This observation, that there are works which let their audiences fail, is what prompts me to propose a shift from interactivity to playability. It seems that failure can give us access to the aspects of computer games that make them stand out from interactive art, without the conceptual straitjacket of a 'game'. Instead of conceptualizing computer games as games per se, and making assumptions regarding the ontology of these objects, I seek to attach the description to the possibility of failure.

Consider, for example, *The Sims*. Players of *The Sims* can do a variety of things – they have a certain degree of freedom. On the surface, this seems to be the case with interactive art, too. For example, *Sono reMorphed* by Berndt Lintermann and Torsten Belschner [11] is an interactive installation which allows its audience to manipulate an audiovisual spectacle projected in 3D. No matter what I do in *Sono reMorphed*, I cannot fail. Any attempt to describe a standard against which my performance as a user of *Sono reMorphed* would be measured would necessarily make reference to the social setting of the exhibition situation, rather than to the aspects of the work itself. On the other hand, by letting its players fail, *The Sims* makes the players responsible for the freedom they enjoy.

Many of the things that the players can do in the game become meaningful in relation to this responsibility. If all of the Sims under the player's control (that is, the individual semi-autonomous characters in the player's family in *The Sims*) die, the game is over. Death is possible in multiple ways, including in a fire. Fires can start, for example, if a Sim cooks without knowing how to cook. To avoid starting a fire when cooking, the player must make the Sims learn how to cook from, for example, cookbooks. Cookbooks are contained in a bookshelf, which must be bought with money earned from having a job, which in turn can be obtained with a good enough education. Bookshelves, education, and so on. become meaningful in relation to the risk of failure. To be more specific, within playable works, failure lends significance to instrumental-rational ontologies. This mode of significance is something very seldom seen in interactive art. Of course, a player of *The Sims* may choose to decorate her Sim's home with bookshelves simply because of her idiosyncratic preference for bookshelves over aquariums, for example. This would compare to, for example, generating round shapes instead of spiky shapes in *Sono reMorphed*, however one of the most interesting differences between *The Sims* and *Sono reMorphed* is that in the latter no one kind of shape is 'better', 'more useful' or 'more dangerous' than any other. Thus, while *The Sims* is interactive like interactive art, like *Sono reMorphed* is interactive, it is also *playable*.

In Dinkla's account, interaction is, roughly put, automatized participation. Just as the possibility for participation is contained in interactivity, interactivity is contained in playability: if we extend the trajectory from interactivity to playability, it appears that playability is interaction in which the user is made responsible for the freedom she enjoys.

Playability as a Critical Perspective on Interactive Art

If we look at interactive art from the perspective of playability, it seems to be missing something. We can interact, but we have no reason whatsoever to interact in this way rather than that way. What is missing from interactive art is *purpose*.

Despite the promises of two-way feedback and audience participation made by the 'new media theory', interactive art still remains very much about artist-controlled representation: an authorially fixed representation which the audience is invited to interpret in any way they like – the kind of representation that is characteristic of art, in general. In interactive art, this representational – or perhaps better put, semiotic – fixity may come with some interactive concessions, for example that the audience may navigate through the work. It seems that in such cases, the openness of interpretation caused by the seemingly free interactivity is turned against itself: nothing matters and anything goes. Unless the audience is willing to benevolently interpret their (inter)actions in the way suggested by the artist, no action is more meaningful than another, so every action is meaningless (if an interactive artwork had a 'score' to indicate that the audience's actions matter, it would most likely be interpreted as an ironical reference to popular culture.) Thus, with a nod to Eskelinen [12], it is possible to suggest that in interactive art, 'action' is simply a means to access the 'content' of the work, whereas in playable art 'content' exists to make 'action' meaningful.

However, this critique might appear problematic from some perspectives. Having to attach purpose to acts of interaction and to evaluate users' choices may seem controversial, especially to those who hold that art is supposed to be multifaceted and open to interpretation. It seems possible to assume that playability dumbs down, or banalizes, interaction in interactive art: by making one aspect, for example, 'more useful' than another, the artist may be perceived as already restricting the range of interpretations.

Let us explore this possibility. Playable works often ask their audiences to engage in repetitive tasks, with the only reward being the possibility to continue engaging in repetitive tasks. This is often referred to as the 'paratelic' [13] nature of play, the feature which makes play stand out from most other animal activities. Here it brings forth the challenge of playability to traditional forms of interactivity: (inter)action is not a tool, but itself the very content of the work. By attaching purpose to aspects of interactivity and thus giving it an instrumental-rational meaning, playable works suggest interactivity as replacing 'image' or 'representation' as that which can be modulated: for example, in or out of focus, in black and white or technicolor, in standard or high definition, absent or present, and so on. *Tetris*, the puzzle game by Aleksej Pajitnov and Vadim Gerasimov [14] in which the player is supposed to keep a stack of blocks from reaching the top of the container, is open to various interpretations. It could be read, for example, as representing household chores [15]. However, a reading of *Tetris* as representing, for example, a loss of a loved one could not be sustained. The assumption that interpretation is constrained seems to hold true. However, the argument that playability is banal due to constrained interpretation overlooks the fact that while the instrumental-rational significance contained in playable works is the first one the player

must confront, it is not the only, let alone final, significance.

Instead of representing with simple audiovisual 'representations', playable works can be described as representing using alternative strategies. These are, for example, 'simulation' (e.g. [16]) and 'metaphor' (e.g. [17]), strategies which mean that playable works confront their audiences with conditions other than the human condition, conditions that need to be lived, experienced and, most importantly, experimented with by utilizing their instrumental-rational significance, instead of simply being seen or heard and interpreted at face value. In this regard, an important predecessor and a waypoint on the trajectory is Dieter Kiessling's *Continue* from 1997; a simulation of a condition in which resistance is futile [18].

Conclusions

It seems possible to extend Dinkla's trajectory onwards from interactivity to playability without endangering the cohesion of Dinkla's account. An implication of this extension for the creative practices which act upon interactive media is a call for bravery from those entrenched in institutionalized forms of interactive art. To make use of playability in the tradition of interactive art, practitioners need to be willing to experiment with new strategies of authorship and representation, and to withstand some institutional resistance. As computer games have entered the mainstream of media culture, it is likely that the majority of audiences for interactive art have had their first experiences of non-utilitarian computer interactivity with computer games. As Huhtamo [19] suggested, computer games have become an "internalized model for an interactive relationship with the media, influencing other forms of computerized and computer-mediated communication". These new audiences of interactive art, who have grown up with computer games, supposedly speak a novel and different language of interactivity, and thus will engender a different perspective on interactions with artworks. Hence, in this contemporary context, the art-elitist strategies of isolation, protectionism, and tendency to establish fences around 'serious' or 'pure' interactive art to protect it from computer games will not work forever.

Nowadays it is common to have gamer ghettoes in conferences, symposia and museums: even the highest echelons of the art world have opened their doors to computer games. At some point soon, these institutions will no longer be embarrassed about having done so. What will burst from these ghettoes is not necessarily only "game art [that] lives on the remainders of mainstream computer games", as Fuchs [20] suggests - that is, works that purposefully straddle the two traditions and thus risk appearing marginal from the perspectives of both interactive art and computer games. Instead, the emergence of playability will bring forth modes of audience engagement which call for re-thinking of what interactivity means for interactive art.

References and Notes

1. Chris Chesher, "How to tell apart computer games and new media art", in *Interaction: systems, practice and theory: Creativity and cognition symposium, conference proceedings* (University of Technology, Sydney, November 16-19, 2004).

2. Jason Wilson "'Participation TV': Videogame Archaeology and New Media Art", in M. Swalwell & J. Wilson, eds., *The Pleasures of Computer* Gaming: *Essays on Cultural History, Theory and Aesthetics* (Jefferson, NC: McFarland, 2008).

3. Daniel Palmer, "The Critical Ambivalence of Play in Media Art", in *Proceedings of ISEA2008* (Singapore: ISEA2008), pp. 365-7.

4. Olli Tapio Leino "Reconceptualising the Play-Element in Electronic Art", in *Proceedings of ISEA2011* (Istanbul: ISEA, 2011) <http://isea2011.sabanciuniv.edu/paper/re-conceptualising-play-element-electronic-art>

5. Chris Chesher, "How to tell apart computer games and new media art", in *Interaction: systems, practice and theory: Creativity and cognition symposium, conference proceedings* (University of Technology, Sydney, November 16-19, 2004), p. 7.

6. Söke Dinkla,"From Participation to Interaction. Toward the origins of interactive art", in L.H. Leeson, ed., *Clicking In! Hot Links to Digital Culture* (Seattle: Bay Press, 1996).

7. Söke Dinkla,"From Participation to Interaction. Toward the origins of interactive art", in L.H. Leeson, ed., *Clicking In! Hot Links to Digital Culture* (Seattle: Bay Press, 1996), p. 298.

8. Hans-Georg Gadamer, *Truth and Method* (London & New York: Routledge Classics, 2001), p. 106.

9. Maxis. *The Sims.* PC game (Electronic Arts, 2007).

10. Stewart Woods, "(Play) Ground Rules. The Social Contract and the Magic Circle", in *Observatorio (OBS*)*, **3**(1), 2009.

11. Berndt Lintermann & Torsten Belschner, *Sono reMorphed.* Interactive installation (2007).

12. Markku Eskelinen, "The Gaming Situation", in *Game Studies 1*(1), July 2007. <http://www.gamestudies.org/0101/eskelinen/>

13. Michael J. Apter, "A Structural-Phenomenology of Play", in M. Apter & J. Kerr, eds., *Adult Play. A Reversal Theory Approach* (Amsterdam & Lisse: Swets & Zeitlinger B.V., 1991), pp. 16-18.

14. Aleksej Pajitnov & Vadim Gerasimov, *Tetris.* Computer game, various platforms (various publishers, 1984).

15. Janet H. Murray, *Hamlet on the Holodeck. The Future of Narrative in Cyberspace* (New York, London, Toronto, Sydney & Singapore: The Free Press, 1997), p. 144.

16. Gonzalo Frasca, "Ludology meets narratology: Similitudes and differences between (video)games and narrative", *Parnasso* **3** (1999), pp. 365-371.

17. Sebastian Möring, "The Marriage: Love at sight, fear at play", paper presented at *Games, Cognition & Emotion Hamburg, July 5-6, 2013.*

18. Dieter Kiessling, *Continue*. Interactive installation (1997).

19. Erkki Huhtamo, "Game patch - the son of scratch", *Switch* **12** <http://switch.sjsu.edu/nextswitch/switch_engine/front/front.php?artc=119>

20. Mathias Fuchs, "Postvinyl", in S. Cubitt & P. Thomas, eds., *Re:live Media Art Histories 2009* (Melbourne: The University of Melbourne & Victorian College of Arts and Music, 2009), p. 43.

EXPANDED URBAN MEDIA: FROM DISCRETIZED SOCIAL COLLAGES TO CORRUGATED SOCIAL BRAIN

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Abstract

Big data, the mobile Internet, social media and the Internet of things (IOT) generate more information than ever but the aggregation of social intelligence remains far from realising it's potential. Two exemplary works, *mediated_moments* and *plasma_flow*, exhibited at Beijing's China Millennium Monument Museum of Digital Arts in 2012 model the scalable potential of urban media to weave itself into the city's social fabric, mapping and visualizing individuals' thinking/intelligence onto a mixed-reality urban canvas.

Keywords

Digital media, Smart Cities, China, urban space, data visualization, transcultural

Context and background

Saturated in digital air, cities cluster around resources representing various interests and agendas, creating inevitably complex systems. Big Data, the mobile Internet, social media and the Internet of Things (IoT) [1] are generating more information than ever, but the aggregation of social intelligence remains largely unexploited and is far from realising its apparent potential. The race to become a "smart city" has intensified across the world as cities vie to take advantage of the currency and availability of open data and new technologies to offer the potential for new services and innovation.

Early approaches to the Smart City concept have tended to be couched in terms of the purely technical at the expense of the human experience of living in cities. More recent understandings of what makes a smart city have focused on expanding definitions of 'smartness' to include knowledge cities, digital cities and eco-cities [2]. Mindful of the dangers of utopianism, overstatement and idealisation of what digital technologies might actually allow humans to achieve, this paper aims to stimulate reflection on the potential of expanded urban media to move beyond the entrancing imagery presented at art and light festivals and on architecture world wide, and instead try to engage media savvy citizens in constructive ways.

Every corner of our everyday life is now mediated. However, we lack an understanding of how to map 'the wisdom of the crowd' in a manner that all stakeholders can use to help facilitate more livable, sustainable cities. "Smart cities are cities of smart people. We must make sure we are open to finding ways to put this connected intelligence to best use…" [3]

Moreover, globally, unprecedented levels of interconnectivity imply there is considerable potential for people living in cities around the world to collaboratively address critical problems such as rapid urbanisation, air quality, food and water security, and aging populations. There remain serious challenges to the development of a shared vision about what more sustainable futures might look like [4]. With increasing attention from researchers and designers occurring worldwide, the deployment of digital media in cities *should* ideally be evolving toward an urban media that translates into constructive community and cultural engagement that benefits and empowers people beyond the banality of advertising [5].

The transcultural collaboration presented in this paper makes no claim for solving these myriad challenges, but offers reflection on prototypes that attempt to explore how curated social collaboration and urban informatics might create new forms of transformational public space. It is beyond the scope of the paper to provide a comprehensive analysis of the 'Smart City'. Rather, while referring to instances of recent innovations situated in China, we focus our attention on two works, *mediated_moments* and *plasma_flow* exhibited at the GeoCity Smart City International Information Design Exhibition at Beijing Design Week during 2012. We conclude by briefly discussing a research platform that has emerged from the ongoing development of these projects. Although a work in progress, the platform consists of a collaborative framework (*augmented_studio*) and an Interactive Media Platform (IMP) for designing participatory urban data visualisation for deployment in public space.

Hespanhol and Tomitsch cite McDonald, McCarthy et al. in observing that, "recent popularisation and widespread adoption of electronic displays, combined with the increasing affordability of tracking technologies like sensors and depth cameras, has created new opportunities for creating proactive environments" [6]. Bernstein, Klein and Malone [7] suggest that networks of humans and computers provide a capacity for accessing collective intelligence in transformative ways useful to education, industry, government and the arts. Leveraging the communication and processing capacity of networked computers, combined with human ingenuity and distributed cognition, our systems "are now routinely able to solve problems that would have been unthinkably difficult only a few short years ago" [8]. Aggregated geo-based information (mapping, geo-data, text, image, video, social media, and real time data) enable access to services that provide a more holistic perspective on urban ecosystems and our information societies.

There are now many instances of this emergent "'global brain' collectively representing the contributions of many millions of people and computers" [9]. Re-modulation of relations between people, and between people and machines, through design-led innovation around dynamic media woven into the urban fabric [10] will go some way to fostering unprecedented idea ecologies and higher levels of social sustainability, social wisdom and wellbeing. Social ingenuity reflects a natural spontaneity present in

Fig. 1: The Weibo Event Visualisation Analysis System, aka "WeiboVA Project" developed by Peking University Visualisation and Visual Analytics Group.

our cities. It represents society's intuitive reaction toward social, political and economic issues and conflicts without a designed skin, featuring no overdubs, effects or EQ, and is a pure, undistorted acoustic social sound and a viable social resource.

Visualising 'Smart' Beijing

We are also living in the era of rapid urbanization, a phenomenon of which China is an extreme example. With this comes many problems, including traffic congestion, pollution and overcrowding. The Chinese megacities have a particular significance for the planet given current trends within China and the forecast for future urbanisation. Within this complex, the immense scale of China's uptake of social media is illustrated by Sina Weibo reaching 100 million users in 1.5 years, compared to Facebook which took 3 years to achieve similar results [11]. Despite shifts in the market to other brands, in December 2012 Apple announced China sales of its iPhone 5 had reached two million units in the first three days of official trading [12]. In China, 66% of smartphone users make daily visits to social media compared with 57% in the UK. The percentage of users sharing data to social networks is 59% in China compared to 21% for UK users [13].

In order to understand the potential of this increasingly ubiquitous mediation, some Chinese artists, designers and data engineers are exploring forms of communication more suited to the paradigm of distributed and networked cognition.

Developed by PKUVIS, Peking University's Visualisation and Visual Analytics Group, The Weibo Event Visualisation Analysis System, aka "WeiboVA Project" [14] is capable of creating a visual representation of 'tweets' from a single event, a keyword, or a specific user. The system consists of two interfaces: a web-based online visualisation interface for public users and an offline visual analytic system providing additional analysis functions. The online interface provides an intuitive and powerful 'retweet' tree visualisation to inspire user creativity. The offline system collects public users' analysis results and is able to visualise and interpret Weibo events to deeper extent.

The visualization [Fig. 1] shows how a critical event-based Weibo 'tweet' (the center point in the diagram) spreads throughout weibo-sphere. Each node represents a retweet. The line represents the relationships in the information flow, revealing how the initial 'voice' is cascaded through the network and identify the critical 'side influencers' beside the main figure (see the top left and bottom left small circles clusters). The visualisation organises the chaotic noise of Weibo voices into social patterns through which we can navigate and "try to further 'smartly' channel the generation of social energy and motivate it into positive strands." [15].

Fig 2: The Skyscreen is 220 m long and 27 m wide and is suspended 24 m above a plaza between two new retail centers. (Photo: ©2013 Florian Frey // studiobaff.com)

Operating at the scale of public space, and an exemplar of the ubiquity of urban screens in urban China, 'The Place' [16] is a new retail destination in Beijing which features a suspended LED display with a screen area greater than the size of a soccer field. The Skyscreen [Fig 2] is 220 m long and 27 m wide and suspended 80 feet above a plaza between two new retail centers. The screens have the capacity to display vast video games, broadcast live and televised events, and advertise products. The potential for social interaction has been tentatively explored in events where visitors to the site have been able to upload photos of themselves or their friends.

China Millennium Monument Museum of Digital Art (CMoDA) - GeoCity Smart City

Opened in December 2011, the China Millennium Monument Museum of Digital Art (CMoDA) in Beijing is China's first museum for digital art and plays an important role as a key cultural incubator. Core to the museum's mission is the fostering of a contemporary international creative industry relevant to the emerging needs and challenges facing Chinese society. CMoDA exemplifies the prescience of China's move from 'made in China' to 'created in China'. The cultural and creative industries have been embraced domestically as pillar industries and are now considered key drivers of the Chinese economy. As such, they are enjoying considerable attention. By joining forces from media, art, technology and science the museum's agenda is to look at how information design might explore, showcase and apply Big Data to unveil new possibilities for cities and society.

This has led to the museum fostering an approach that is welcoming of the public, responsive, adaptive, cross channel, participatory, future friendly, and importantly - ready for the unknown. The CMoDA response has lead to The GeoCity Smart City International Information Design Exhibition, an initiative comprising an annual exhibition and a workshop and symposium program designed to create a platform for international collaborative and interdisciplinary research, dialogue and innovation in Beijing.

mediated_moments and *plasma_flow*

In 2012 Australian artist Brad Miller, creative producer and sound designer Ian McArthur, software developer Adam Hinshaw and Shanghai-based social media specialist Paul Adams collaborated with CMoDA's Deputy Director and Chief Curator Yang Lei to create two spectacular large-scale responsive data visualisations for the GeoCity Smart City Exhibition at Beijing Design Week. The two installations, *mediated_moments* and *plasma_flow* [Fig. 3] used very different approaches to the interrogation and visualization of data gathered from social media: they used crowdsourced social data to draw attention to issues related to mobility in Beijing.

mediated_moments is part of a series of installations produced by Miller, McArthur and Hinshaw to engage with folksonomies and visual patterns via the

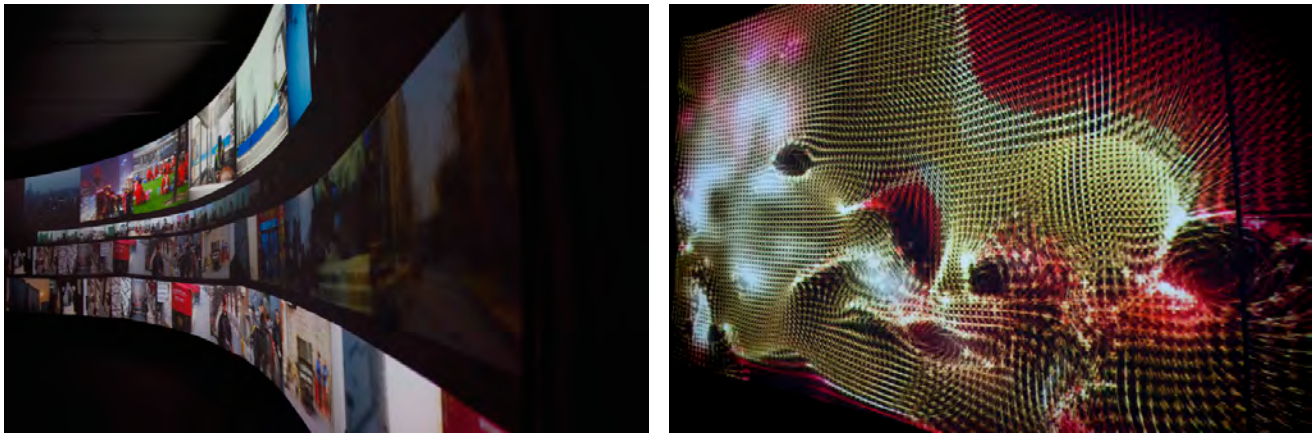

Fig 3: *mediated_moments* (left) and *plasma_flow* (right) as exhibited at the China Millennium Monument Museum of Digital Art 2012, Photo © Brad Miller (2012)

social media image repository Flickr. The work is a multi-channel visual and audio installation which renders a large quantity of digital images depicting information systems, communications, transport and the built environment of Beijing. The results of queries to the Flickr repository are activated using machine-vision technology mounted in the ceiling. *mediated_moments* has been described by Miller as a memory machine of sorts [17]. It tracks our relationships with people, things, places and scenarios via the use of streaming photographs and an algorithm developed to structure the flow of images unfurling in horizontal film-like strips, sometimes in different directions, triggered by the movement of a viewer, under sensors, in the exhibition space.

plasma_flow employs an entirely different model. It deploys fluid dynamic simulations [18] to visualise somatically engaging relations with the apparent flows of data and virtual others (when no live somatic input is available) defined by location and/or subject metadata scraped from the Chinese microblogging service Weibo with search queries on the thematics of the exhibition. The iteration of *plasma_flow* exhibited at CMoDA worked with the objective of graphing geo-relationships between current Weibo interactions into the plasma_flow virtual space. Tweets originating from the Beijing area are transposed, using location and time difference, into a directed force that is applied to the fluid simulation. The resulting movements are blended with those of the local participants [19].

The flow of data in these works is accompanied by a sonified audio environment. This is constructed from fragments of digital noise, field recordings and audio compositions [20] and processed by a sound patch (granular synthesis) that segments and reassembles them into new configurations, and responsive juxtapositions [21].

The emergence of *mediated_moments* and *plasma_flow* points to the scalable potential of urban media to merge into the urban social fabric, mapping and visualising individual's 'unconscious' thinking/intelligence onto a mixed-reality urban canvas. In the case of *mediated_moments*, the crowd generated content forms a new genre – "city film" – city story telling by the city dwellers themselves. The mobility of the city triggers the filmmaking and play back in a live, or 'living film' process. By contrast, *plasma_flow* creates a magic mirror to augment both physical mobility (locative audience movement) and online social media traffic (Weibo).

The *augmented_studio* framework and Interactive Media Platform (IMP) Toolkit

Both works described represent the nexus of a collaborative framework *(augmented_studio)* and an Interactive Media Platform (IMP) consisting of network, tracking and display software, middleware and hardware. The development pathway has instigated an ongoing research trajectory that explores the potential of participatory processes and responsive data visualisation to create accelerated communication pathways for building shared vision around complex problems in urban environments.

The *augmented_studio* IMP can be used to document, facilitate and display design process and outcomes, creating: (1) a studio space that draws on a database of images, sound and videos to display content as an immersive environment and (2) an interactive exhibition platform. Stakeholders using the *augmented_studio* framework are able to create, tag and upload content to a Flickr database. The content is then available for use in a curatorial process that can be deployed at multiple scales, forming a dynamic responsive data visualisation. As part of the framework the *augmented_studio* researchers have initiated middleware we call FlickrTool, which allows for broader sets of search queries targeted toward visual data with Creative Commons License attributes [22]. Therefore, *augmented_studio* is the process component - as the facilitator of a conversation about a problem space - and the IMP Toolkit is the exhibition component that creates a responsive spectacle.

Our testing and deployment of the *augmented_studio* framework, together with the IMP Toolkit, reveals that it augments the development of usable common understandings despite language and culture differences through intensive sharing of media. This implies media 'objects' establish synergistic collaborative tools for co-languaging 'joined-up' design processes [23] in participatory, intercultural and co-creation contexts. The responsive and immersive nature of the IMP forms an informational layer [24], producing a multi-agent visualisation system. This is critical to mapping and evaluating the technics of collaborative interaction (which is already heavily mediated at all levels by media technologies) and allows for the formulation of a range of novel participatory co-design and Metadesign [25] strategies and future-shaping innovation initiatives. Substantiated through the theoretical discourse of the image as boundary object [26], images and machine vision can be seen in combination to form a dynamic, networked environment for data-sharing and ideation. This

becomes a site where disclosure and individual and collective narratives remake "the world - not as data, but as modulation" of relations between people" [27]. Re-modulation becomes the basis for creative discourse with dynamic screens (or projections), allowing for ongoing iterative transformation and recursive engagement.

Images allow us to tell stories and in turn to see and hear the world in new ways. Eppler [28] argues there are "crucial and multiple roles of images for collaboration, whether they are conceived as visual boundary objects, conscription devices, visual non-human agents, trading zones, epistemic objects, or simply collaborative graphics." The power of the image includes a diverse and persuasive facility to focus the attention of a group, identify conflict or congruence, reveal implied knowledge and past experiences, and highlight new or unfamiliar ways of seeing and being in the world. *augmented_studio* provides a prototype for a sophisticated scalable open networked technology that supports crowdsourcing, networked interdisciplinary and collaborative co-design, dialogue and immersive mapping of collective thinking about the city. Murphie proposes that, "*augmented_studio* has potential to … re-modulate participant engagement with complex problems, facilitating relational transformation, collaborative attention, and the building of trust via a sharing of experience/memory in order to, quite literally, lead to different, cooperative futures" [29].

augmented_studio as a model for expanded urban media

In the context of *augmented_studio* research, 'participatory' refers to open and social co-creation processes including crowdsourcing and distributed socially derived content development. As defined at the Central St Martins Media Architecture Conference 2007, media architecture (the intersection of media and architecture) describes developments in display technologies, building materials and approaches to architectural façades that are creating opportunities for dynamic "new forms of hybrid architecture, that break away from existing conceptions of surface, structure, lighting and moving imagery" [30].

Situated at the intersection of these conceptual drivers lies the potential for a networked and participatory urban media (curated or real time) and a more participatory and interactive notion of public space. As noted by McGuire [31], despite being deployed historically primarily as a means of advertising, more recent conceptions of media architecture suggest the potential for developing "innovative tools for exploring new modes of social interaction and cultural exchange."

By working in more 'joined-up' ways [32] there is greater capacity to develop more common ideas on what sustainable ways of living, trading and innovating productively might be like. However, as Eppler describes, our still rudimentary understanding of how images might facilitate shared understandings or form the basis for decision-making amongst different sociocultural groups and stakeholders is a challenging limitation. Even when framed as boundary objects, we "are still far from rigorous advice on how to make sound use of images (and by inference visual data) as knowledge-intensive communication catalysts" [33].

The rapidly developing Chinese context presents research challenges that will stimulate the application of *augmented_studio* tools and processes for conceptualising how to encourage 'idea ecologies' in complex Smart City contexts. Perhaps the most urgent of these is its potential for being misunderstood by those not experienced in interpreting the way the culture describes and understands itself. Appropriately supported, *augmented studio* will continue to research and fast prototype new participatory urban media ideas by leveraging the *mediated_moments* and *plasma_flow* platform. CMoDA are devoted to participating in the *augmented studio* and to making an urban media 'engine' to push the confluence of these ideas further to create more participatory immersive, responsive public space. By optimising synergistic local, regional and international collaboration and co-creation, a curated, synchronised mode of participatory urban media can potentially channel and motivate the fragmented interests of social intelligence into strands of positive energies with a driving force and influence.

References and Notes

1. Stephany Wilkes, "Some impacts of "big data" on usability practice," *Communication Design Quarterly Review* **13,** Issue 2 (June 2012) pp 25-32.

2. Haidee Bell and Hanna Niemi-Hugaerts, "Open Cities" in Kaitlyn Braybrooke, JUssi Nissilä and Timo Vuorikivi ed., *#Reacto 3 The Open Book* (The Finnish Institute in London, 2013)

3. Bell and Niemi-Hugaerts [2]

4. E. Manzini, Small, Local, Open, Connected: Design for Social Innovation and Sustainability, *The Journal of Design Strategies, Change Design*, **4,** No. 1, (Spring 2010), Parsons The New School for Design.

5. Scott McGuire, "Networked urban Screens and Participatory Public Spaces", *Telecommunications Journal of Australia*, **61**, No 4 (2011) pp

6. McDonald, McCarthy et. al (2008) in Luke Hespanol and Martin Tomitsch, "Designing for Collective Participation with Media Installations in Public Spaces", *Media Architecture Biennale*, (November 15 - 17 2012, Aarhus, Denmark)

7. Abraham Bernstein, Mark Klein and Thomas W. Malone, "Programming the Global Brain", *MIT Center for Collective Intelligence Working Paper* No. 2011-04.

8. Bernstein, Klein & Malone [7].

9. Bernstein, Klein & Malone [7].

10. Andrew Murphie, Australian Research Council Linkage Grant application, unpublished 2012.

11. According to Sina's 2011 Q4 financial report < http://corp.sina.com.cn/eng/sina_index_eng.htm>, Sina Weibo's registered users exceeded 100 million, while Mark Zucerberg's posting on his Facebook blog on August 26, 2008, Facebook received 100 million users since it's launch. <https://blog.facebook.com/blog.php?post=28111272130> Facebook was launched on Feb. 4, 2004 according to Wikipedia: <http://en.wikipedia.org/wiki/Facebook>

12. Richi Jennings, "Apple iPhone 5 China Sales 'Incredible,' But Stock Falls Felow $497", *Forbes*, <http://www.forbes.com/sites/netapp/2012/12/17/iphone-5-china/> accessed 23 May 2013.

13. Our Mobile Planet (2013) < http://www.thinkwithgoogle.com/mobileplanet> accessed 21 May 2013.

14. Peking University's Visualisation and Visual Analytics Group, The Weibo Event Visualisation Analysis System <http://vis.pku.edu.cn/wiki/project/weibova> accessed 21 May 2013.

15. Our Mobile Planet [13].

16. The Place, Beijing, <http://www.360cities.net/image/the-place#330.00,-13.90,110.0> accessed 23 May 2013.

17. Brad Miller, "*augment_me*: An algorithmic memory, absence and presence in the cloud" *ISEA2011 Conference* (2011) Istanbul.

18. Information about the Memo Akten MSAFluid Software Library can be accessed at: <http://memo.tv/archive/msafluid_for_processing_v1_3>

19. The first iteration of *plasma_flow* was a commissioned installation by Miller, McArthur and Hinshaw, Cleland Store, VIVID Lights ON! Sydney (2012) <https://vimeo.com/42812520>

20. Audio compositions by Ian McArthur including "*plasma_flow*" may be streamed from: <https://soundcloud.com/aiffhead/>

21. The PureData patch originally created by Derek Holzer < http://macumbista.net/> was subsequently further developed by artist Ian Andrews.

22. Creative Commons is a non-profit that offers an alternative to full copyright creativecommons.org

23. John Wood, Metadesigning Paradigm Change. in *Metadesigners Open Network*, <http://metadesigners.org/tiki/Metadesigning-Paradigm-Change> accessed 21 December 2012.

24. Dan Frodsham, "Spaces for Play - Architectures of Wisdom: Towards a Utopic Spacial Play," *FibreCulture*, **20,** Issue 18 (2012) pp 88-108.

25. John Wood [23].

26. Susan Leigh Star and James .R. Griesemer, "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals," in *Berkeley's Museum of Vertebrate Zoology, Social Studies of Science*. **19,** (1989) pp.387-420.

27. Bernstein, Klein & Malone [7].

28. Martin .J. Eppler, "Toward a visual turn in collaboration analysis?" in *Building Research & Information*, **35,** vol. 5 (2007) pp.584-587.

29. Bernstein, Klein & Malone [7].

30. Central St Martins Media Architecture Conference 2007, http://www.mediaarchitecture.com accessed 2 May 2013.

31. Scott McGuire [5].

32. John Wood [23].

33. Central St Martins Media Architecture Conference 2007 [30].

23. Central St Martins Media Architecture Conference 2007 <http://www.mediaarchitecture.com> accessed 2 May 2013.

NARRATIVES OF LOCATIVE TECHNOLOGIES AS MEMORY ASSEMBLAGES

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Abstract
This article considers the virtual (re)construction of the Vila Belga neighborhood in Santa Maria, Brazil in terms of memory and the role of place as integrative of experience. Our paper poses the question "What constitutes the memory of community as a collective process of (re)collection?" and seeks answers in the locative technologies used by the participants to (re)activate and (re)purpose the spacetime of experience through an artwork entitled airCity:arte#ocupaSM. Using a research/creation methodology the researchers sought to produce mappings of relation which constitute the "groundwork" of memory, by integrating information derived from sensing and geolocation devices and traditional audiovisual technologies.

Keywords: memory, locative technologies, narrative, experience, territorialization.

Our paper poses the question “What constitutes the memory of community as a collective process of (re)collection?” and provides answers derived from the results of an artistic research/creation project based on collaborative participation and locative technologies. The focus of our project is airCity:arte#ocupaSM, an artwork project which brought together a team of artists, academics and students to better understand the process of memorial disintegration within urban decay. The object of our collaborative research/creation artwork project was to produce mappings of relation which constitute the "groundwork" of memory, by integrating data derived from sensing and geolocation devices. This cartography pegged the continuity of experience to an ecology of being as occupation. To this end, the participants used a variety of techniques to (re)activate and (re)purpose the space and duration of experience towards a novel (re)alignment of actualization as event.

In this paper we are concerned with two aspects of the art project: on the one hand, the insights garnered from our research/creation methodology and on the other, theoretical considerations pertinent to memory evoked by the activation of invisible spaces through locative media. Using a conceptual landscape indebted largely to Deleuze and Guattari and to Gilbert Simondon, we discuss the significance of foregrounding nodes of intensification as indicative of the processual transformation of territory to reveal political, social and technological implications resulting from changes to urban texture. The use of locative technologies to render visible the invisible is of paramount importance: They allow one to visually consider deterritorialization/territorialization in terms of mappings of processual expanses of intensification. This in turn allows us to imagine these diagrammatic mappings of urban, artistic, cultural and social territories not in terms of pictorial images, but in terms of relational entities which constitute expanses of extensive consistency as bodies [1]. And it is the integration of these zones of operational coherence as assemblages from which memory arises.

Vila Belga: the collective process of (re)collection

Vila Belga is a neighbourhood of the city of Santa Maria, in the southernmost province of Brazil, Rio Grande do Sul. The city currently has 270,000 inhabitants and its economy is based on services, light industry, government, education and agriculture. The Vila Belga neighbourhood was built between 1901 and 1903 along European architectural lines as a railroad community to accommodate Belgian immigrants destined to work in the offices and workshops of the Belgian *Compagnie Auxiliaire de Chemins de Fer au Brésil.* The railway placed the city of Santa Maria on the map, so to speak, by connecting it with the rest of the Brazilian Empire through the Sao Paolo—Uruguiana rail line. In creating Vila Belga, the concern of all parties involved was not one of simply producing housing for the workers but of genuinely causing the emergence of a community.

After the dissolution of the railroad in 1997, Santa Maria was sidelined, the station and workshops lost their raison d'être and were progressively abandoned. Since then, with the demise of rail in Brazil and its replacement by bus and truck transport, the latest generation of the Belgian immigrant residents have dispersed and the neighborhood has lost all sense of meaning except for its historical significance. Its collective memory is expressed as a nostalgia for the halcyon days when the railway and the yards were active. Thus, in May 2012, various buildings of the now defunct Vila Belga railroad station were occupied by artists, academics and multi-disciplinary researchers taking part in the arte#ocupaSM [2] research/creation event for 5 days of intense artistic coexistence. As part of the occupation, an interactive immersive installation AirCity: # ocupaSM was created which occupied the now abandoned main administration building of the Vila Belga Railway. The objective of the project was to activate the “invisible space” as intangible herit-

Fig. 1. Row Houses: Vila Belga, Santa Maria, Rio Grande do Sul, BR (photo © Andrea Oliveira).

age. That is, it aimed to awaken the virtual aspect of physical location as a memorial reconstruction by combining social, political and artistic research/creation methods with digital devices. Among the artists and researchers who participated in arte#ocupaSM were Renato Hermes Hildebrand, Andreia Machado Oliveira, and Daniel Paz from Brazil and Efraín Foglia and Jordi Sala from Spain. These practitioners worked together to propose new ways of deriving meaning from the analysis of relationships that arose between/exist between narratives, spatiality, temporality, and urban territorialities. Specifically, they were interested in exploring the kinds of narratives that would emerge from technological interventions in virtual and physical space. [3]

The planning and pre-production of the project was entirely web-based as the various participants hailed from two continents, and those from South America were separated by its vastness. Two groups emerged: a Brazilian on-location team and an off-site AirCity group. From the invitation to hold an "occupation" in Vila Belga, the Brazilian on-location team began pre-production by collecting and assembling bits of data that were expressive of the disposition of traces of being in the urban landscape. Researchers carried out on-site video and audio sampling, recording ambient sounds and collecting images to compose and composite with video interviews of former railway employees and residents of the neighbourhood, inviting them to reflect on the changes brought on by changes to the urban texture.

The second phase of the artwork project consisted in the gathering and pulling together of data on site which could be made to work with software, technologies and techniques developed in other AirCity projects in Sao Paolo and Barcelona. This involved the use of mobile devices, wireless networking, mapping and sound—all articulated through PureData. In the Santa Maria AirCity project, mobile phones were used to activate audio files to recount a location's intangible reality as the affective disposition of the character of location [4].

Once the audio-visual materials had been collected, we proceeded with the interactive installation in the Railway Administration Building and the programming of AirCity and its mobile devices. The inner core of the project consisted of a WiFi environment with fixed and mobile computing devices. In the main hall, we set up three computers

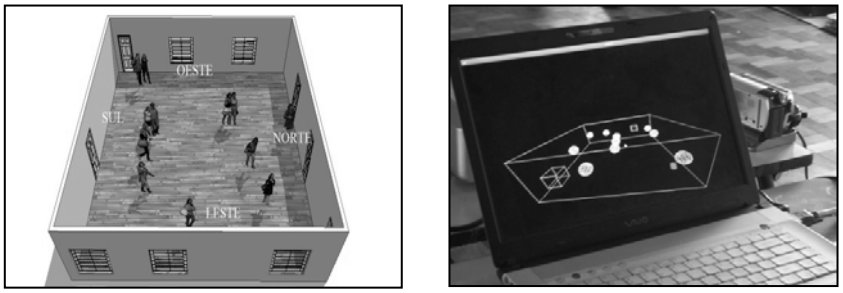

Fig. 2. AirCity virtual environment developed for the airCity:arte#ocupaSM installation. (photos © Andrea Oliveira).

loaded with verbal and audio narratives made with the help of the Vila Belga community which conveyed the goings-on of the Railway Station: one computer received processed audio files in real time from Spain from the capture performed by Jordi Sordi; another drove the sound files and activated the locative media; and two cel phones allowed the public to interact with the emitted audio and the physical space.

The project had been set up as a research/creation project where the artwork itself was not the object of the endeavour. The project was more of a collaborative happening-as-discovery than an onsite re-assemblage of the technical devices and their functional demonstration—if all the creative details had been fully thought out and predetermined, the creative aspects of the get-together would have been stifled. As such, the participative working-together as research inherent in our open-ended process allowed for the emergence of creation as occupational happening. This emergence of participative creativity would not have happened with a pre-established protocollary assemblage. In this respect, the event exceeded expectations: a creative ecology of sundry participants worked together to generate on-site an improvised multidisciplinary research/creation methodology as a foundation for future collaboration.

Memory: the integration of experience

As mentioned earlier, the goal of the project was to better understand the process of memorial disintegration as urban decay—while the AirCity group worked with the technical problem of activating the space and programming the software, the Santa Maria group was working on coming to terms with the past. The on-location video recordings of the interviews were parsed to expose fragments of modalities of being as performative gestures constitutive of bodies within that urban territory. These bodies are not to be seen as subjugated human bodies simply responding to prescribed rules of conduct or as simple predetermined actualizations of virtualities but rather as assemblages or expanses of operational coherence and extensive consistency. The operational consistency produces and extends the horizons of regulation, as expressions of a technicity of association [5] which allow us to conceive of Vila Belga as an associated milieu [6] encompassing the railway, the location, the human and the technological. These expanses of operational consistency as bodies, of a participative relational enmeshment [7] with the railworks expressive of territorializations, are made up of gestures which constitute an on-going performative meta-stability as the mode of being of the community as a machinic assemblage [8]. The values implied in the technical realities of the assemblage constitute an ethics, not in terms of a normative prescription for being, but as an account of the mode of relation between human participants and the associated milieu of the railway and its community as an assemblage.

The objective of both groups was to find ways of revitalizing the community by understanding how the actual results from processual advance by considering memory as integrative. As it turned out, despite the fact that the two groups were working on the identification and foregrounding of ecologies of being, the two were on divergent paths. The researchers carrying out the field-work in Santa Maria were figuring out how Vila Belga as a territorializing machinic assemblage worked as an associated milieu and the second group was working out ways to activate the space with locative media to call attention experientially to the presence of process and its operational unfolding as memory. Thus, on the one hand, we have the expression of memory as a reconstitutive impulse of the past through performative, gestural narratives

and, on the other hand, the (re)collection of that which is being associated, concretized in actuality and being integrated as experience.

We emphasize the point that what is at stake in both approaches is the consideration of the integration of experience into the general unfolding of actuality as memorial process. To think of memory in terms of integration is an odd premise in that nowadays memory is almost exclusively thought of in terms of the stockpiling of information as images and not in terms of how experience as information is concretized into a coherent whole. Memory as an integrative process, as expressive of the consolidation of experience, (re)contextualizes the discourse on memory and (re)members it to the historical tradition from which speculative thought emerges. Memory guides the (re)constitution of the relational as the eventual coming together, which (re)constitutes the event through its (re)petitioned becoming by not only (re)calling itself into being, but by (re)collecting the elements and (re)membering them as the unfolding of the actuality as event.

With the on-site video and audio sampling and interviews, the researchers were (re)calling into being and identifying the habituated conditioned movements and gestures created by occupation and (re)member these relational conditionings to the experiencing of the location as territorializations, as event taking form. Through the (re)calling and (re)collection of all the constituent relations conditioned by the human and environmental participants as an ecology, we end up with an operational solidarity as a navigational familiarity constitutive of a cartography of memory as a recurrent, reciprocal causal dynamic. In the words of Brian Massumi, that which we eventually end up with is “not the result of a simple step-by-step accumulation, or of a piecemeal adding together of elements. It is non-decomposable. It is holistic. It’s not a structure... It does not add elements together to form a structural unity. Rather, it is a holism effect that adds a whole new dimension of existence to the elements’ diversity” [9]. As such, occupation—the taking up of space through relational, participative activity [10]—has become the event as the consummation of the relational possibilities proffered by the *agencement* of the conditionings in place as memorial integration—here *agencement* is understood simultaneously as agency and information immanently arising from the relational conditioning as causal determinant resulting from the disposition of the participants as an assemblage. The research group was moving collectively towards understanding their memorial reconstitution of occupation not as a spatial, volumetric construction but as the location that houses the repeatable expression of the conditionings of relation in terms of gestural performance as process, i.e. occupation as the activation of the location of memory. The locus of occupation as activity taking place where it is taking up space is easy to conceive as the body of the event as activity. Similarly, its shape can be conceived as the manifestation of the event itself at the location where it takes place in its unfolding.

Thus, the body of the event as occupation integrates space and time as the expression of memory. Composed of an infinite recursivity of extremely complex junctions of inter-penetrated territorialities, which Simondon would call concretizations [11], these enfoldings of relations and potentials are integrated into vast expanses of relational operational coherence, which in turn are capable of enmeshing associatively as part and parcel of other subjectivizing individuations. Within the dynamic at play, and with the use of locative media—in their convergence and their hybridization—concepts which characterize relation take on a different hue: interactivity, ubiquity, the liquidity of spaces of representation and the processual advance of serial deterritorialization/territorialization of real and virtual urban spaces are aligned within a different ontological discourse. As used in AirCity: # ocupaSM, locative media draws attention to the presence of process and its operational unfolding—if we see information as the “very operation of taking on form” [12], the artwork informs participants as territorializing experience, able to activate an abstract cartography of intensities while rendering them more aware of their information as participants in becoming as they perambulate through the location. The airCity technology sought to imagistically identify, foreground and demonstrate the affectual elusiveness of relational process while revealing the indiscernible 'hidden' to the stratified plateaus, understanding experience by heightening our awareness of occupation as integrated spatial goings-on.

References and Notes

1. Oliveira, A. Corpos Associados: interatividade e tecnicidade nas paisagens da arte. Porto Alegre: PPGIE/UFRGS, 2010. Tese (Doutorado em Informática na Educação).

2. http://arteocupasm.wordpress.com

3. Hildebrand, H.R.; Olveira, A.; Foglia, E. "Mídias Locativas e Cartografia Urbana no Projeto Mediacity". In: *11 Encontro internacional de arte e tecnologia (#11.ART): homo aestheticus na era digital*, Brasília, 2012.

4. More information on the AirCity projects can be found at http://www.mobilitylab.net/aircity/.

5. Combes, M. *Gilbert Simondon and the Philosophy of the Transindividual*. Translated by Thomas LaMarre. Cambridge, MA: The MIT Press, 2012. p. 92

6. The concept of the associated milieu was originally proposed by French philosopher Gilbert Simondon in *Du mode d'existence des objets techniques*. (Paris: Aubier, 1958). See Oliveira, A. and Rebolledo, F. "The Associated Milieu: A Machinic Assemblage between Artwork and Viewer". In: *The International Journal of the Arts in Society*, Volume 5, Number 5, 2011, http://www.arts-journal.com, ISSN 1833-1866

7. Rebolledo, F. "Putting the Event in its Place: Territories, Bodies, Thresholds. In*: Informática na Educação: teoria & prática*, Porto Alegre, v. 15, n. 1, p. 31-43, jan./jun. 2012.

8. Simondon, G. *L'individuation psychique et collective: à la lumière des notions de forme, information, potentiel et métastabilité*. Paris: Aubier, 1989.

9. Massumi, B. ""Technical Mentality" Revisited: Brian Massumi on Gilbert Simondon. With Arne De Boever, Alex Murray and Jon Roffe". In: *Parrhesia* Number 7, 2009. p. 36–45. Accessed on 2013.02.10 from: http://parrhesiajournal.org/parrhesia07/parrhesia07_massumi.pdf

10. Rebolledo (2012)

11. Simondon, Gilbert. *Du mode d'existence des objets techniques*. (Paris: Aubier, 1958).

12. Combes (2012) p. 9

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EAR IN THE CLOUD ACOUSTICAL ACCIDENTS AND CLOUDED TEXTS IN STELARC'S *INTERNET EAR*

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Abstract

November 10, 2010, Utzon Centre, Aalborg, Denmark: Stelarc's Internet Ear, suddenly and unwittingly, is able to 'hear' and 'broadcast' what was said at a meeting held by the Danish Ethical Council in another part of the building. The transmission is fed back to the ear as 'speech-noise' – and broadcasted once again, creating a feedback loop of fragmented announcements from a debate on ethics.
In this paper, I will take a closer look at how this acoustical accident created a situation where two different and, in some cases, opposing cultural patterns were reloaded / remixed into each other. By analysing this situation using the notions of 'ontological theatre' and 'agency realism' (Andrew Pickering), I am claiming that a collision of realities occurred which, in turn, addresses the issue of dislocated cultural identity in post-digital 'cloud culture'.

Keywords: art, technology, collaborative, practice, action, situations, communication, theory

Acoustical accidents…

When the Danish Ethical Council held its annual meeting at the Utzon Center in Aalborg at November 10, 2010, none of the participants at the meeting realized that a biotech ear was listening in. This was the result of coincidences and an acoustical accident: someone turned on the speaker system by mistake in the exhibition spaces below the beautiful conference hall overlooking the fiord in Aalborg. Located in the exhibition space was an artwork by the Australian artist Stelarc, Internet Ear, which was part of the exhibition Biotopia - Art in the Wet Zone.

Thus Stelarc's Internet Ear, suddenly and unwittingly, was able to 'hear' and 'broadcast' what was said at the Ethical Council meeting. The transmission was fed back to the ear as 'speech-noise' – and broadcasted once again as a transmission inside a transmission, creating a feedback loop of fragmented announcements from a debate on ethics.

In this paper, I will take a closer look at how the aesthetics of Internet Ear is being reloaded / remixed and argue that this event of 'eavesdropping' was the result of colliding cultural patterns made possible by an emergent distributed public in a 'cloud' of accessible data. Internet Ear, then, addresses the issue of cultural identity in a cloud culture, and reveals how it emerges from negotiations between different positions involving acoustical accidents and 'clouded' texts.

In both cases, aesthetics leave the 'reservation of art' – the autonomous territory that art has inhabited for more than a century - far behind, but equally so, both are addressing different aspects of human agency that we live by: applied scientific knowledge regulating human behavior, and artistic exploration transgressing our ideas about being human in a technologized world.

By applying Andrew Pickering's notions of 'agency realism' and the 'ontological theatre' I will show that this acoustical accident could in fact be expected, and lies well within the driving forces of digital modernity. The rationality of regulating the distributed society based on ethical ideas and values; and the experimentation across platforms and with the limits of a distributed humanity, are in many ways each other's mirror.

In this paper I claim that the acoustical accident at the Utzon Centre reveals that Stelarc's Internet Ear is an 'ontological theatre' with post-digital cultural significance. From the acoustical accident emerge two otherwise dislocated cultural patterns simply by staging their collision: An ethical-rational pattern setting up boundaries for post-digital 'practices'; and an experimental/border-crossing pattern seeking out new technological sensibilities.

The Ear on Arm…

Let me begin by explaining Stelarc's work, Internet Ear. Its pretext is another closely related project by Stelarc, Ear on Arm. In this project, and by means of a lengthy surgical process, Stelarc had an artificial human ear implanted in his forearm. A subsequent operation then installed microscopic electronic equipment in this third ear, with a view to both transmitting and receiving sound. Because of the danger of possible infection it was impossible to give the ear a technological "sense of hearing" and the equipment was removed. But the ear is still attached to Stelarc's arm, however unconnected.

Internet Ear, which was commissioned for the Biotopa exhibition, launches the Ear on Arm project onto the Internet. Software and the Internet transform Internet Ear into a listening arm. You can listen along with it from (and to) Moscow or Paris, or whatever corner of the globe you happen to be in. Stelarc's Internet Ear has its own blog (www.earonarm.net), where anyone can contribute to the ear's dialogue with itself.

By speaking into the ear on the arm, your voice will be heard and seen as text projected in the other locations and also accessed on the Ear On Arm website. Webcams will monitor each location and image the interactions on the website. The result will be a looping cacophony of modulated voices and projected text, ebbing and flowing in density and intensity over different time zones: "The global installation will not be about explicit exchanges, but rather about acoustical affect and ephemeral text." [1]

Internet Ear is an exploration of technological sensuality and the technology of the senses. It is conceptualized as an open channel for listening to the world, a fusion of human being and machine, biology and bytes. What this paper shows, however, is that this intention is not fully realised until the Internet Ear becomes a medium for the Danish Ethical Council meeting on November 10, 2010. This is also the case when it comes to the other intended and salient factor at work in Ear on Arm, as Stelarc himself explains: "The exploration of technological sensuality becomes a distributed and expanded sensuality; a sensual technology disconnected from its original 'host' and, in principal, beyond its control" [2].

Furthermore, we are able to hear global interaction with Stelarc's ear in the 'cloud': "Internet Ear is an installation that … will be simultaneously an intimate and extended interaction that explores the dynamics of sound as a globally circulating and connecting experience". [1] Stelarc seems to be pointing towards a phenomenology based upon the body as a distributed entity. It becomes, is, a feedback system of experienced sounds.

This relation of body and sound is 'acted out' through the computer as a real-time telematic medium reminiscent of Peter Weibel's analysis of our artificial eye as the receptor of 'intelligent images' beyond the reach of our bodily-based senses. As he writes, "With our receptors, we are able to go beyond our border; we see something beyond our own body, and we have invented hundreds of telematic machines that go much further than our natural sensory organs can go, and have a much larger horizon of visibility than the horizon of things that we can see and process" [3].

Stelarc's practice points towards some interesting ways in which the relation of remote bodies and sound can be 'instru-

mentalized'– not only in the attempt to move aesthetic production beyond the 'reservation of art'; but also because it really becomes a feed-back system of ethical issues concerning the body, with regard to questions around how far we should go to keep it healthy or, rather, up to speed with technology. The Internet Ear is, in fact, an embodiment of scientific knowledge, as Stjernfelt and May has argued:

"Technology becomes in general a corporeal rooting and embodiment of scientific knowledge and the instrument becomes an interface in which this actor meets his theoretical constituted objects in the form of observations on a kind of 'externalized retina.' In a fundamental sense the technical interface thus constitutes the body's own experienced boundary with the world, but projected towards us like a screen" [4].

In the case of Internet Ear, of course, we encounter the externalized eardrum rather than the externalized retina. I find that the final passage of this quote fits very well into a description of the Internet Ear. The cast of the Ear on Arm is clearly an aesthetic expression of an experienced boundary with the world; moreover, this boundary is projected to us – perhaps not like a screen – but as texts on a screen. Ephemeral texts, clouded texts, texts generated by the voice-to-text generator, and as feed back of generated voices and texts.

The Ontological Theatre

In his recent work, Andrew Pickering introduces the notion of an 'ontological theatre', which is closely connected to his idea about the 'performative brain' [5]. According to Pickering there is a layer of interpretation that creates a connection beyond the work of art. This layer has something to do with ontology.

The western tradition is an ontological theatre for Cartesian dualisms, an asymmetric ontological picture dominated by sight and cognition – we know the world through our senses. This leads to an ontological poetics.

But, according to Pickering, the world is not dualist. The Cartesian dualisms conceal what takes place in the laboratory, which is material in action, on the level of performance. The scientist and material perform a dance of agency. The laboratory creates an 'intimate, performative engagement'. Or: a 'decentered dance of agency', as Pickering formulates it [6]. Thus, the world, according to Pickering, is a place of 'decentered, ontological becoming' with a 'dualist unconsciousness' at play [7].

It is possible, therefore, to speak about a kind of 'agency-realism', which is the true status of the 'ontological theatre' where the dualist unconsciousness is being acted out. Thus, behind the notion of the ontological theatre lies 'the general idea of the material world as lively and unpredictable' [8].

At this point it should be clarified that my argument, which is building on the insights and concepts of Pickering, grows further based on the assumption that the acoustical accident, quite literally, moves the 'dance of agency' of the 'laboratory condition' of the Internet Ear (and the Ear on Arm as well) outside the laboratory. Or, rather, it causes the laboratory condition to collide with real-life issues from outside the art gallery. It becomes an ear in the cloud when that happens – and to say more about this, new, condition I have found Pickering's notion about the 'ontological theatre' helpful.

According to Pickering, the ontological theatre stages the uncontrolled becoming of things that are otherwise being held down by the dualist ontology [9]. Art can be extracted from lively systems, according to Pickering. From this notion, there is a very short step to stating that Stelarc is in fact staging and performing human agency in his laboratory. Humans are performers rather than thinkers. The focus, therefore, is on agency rather than on cognition.

Internet Ear ventures into a controversial area, not only because it stages an attempt to fuse the human body with technology, but because the piece reloads aesthetics conventionally belonging to art into an area conventionally belonging to science.

Thus, the Internet Ear becomes the stage of an important scene in the ontological theatre of human knowledge and cognition – the instance when the body itself becomes a fragmented and distributed entity, data on a medical health card for a physician to interpret.

The Cloud

The Danish Ethical Council Meeting – November 10, Utzon Centre, Aalborg, Denmark

According to the summary found on the Ethical Council's webpage, the meeting in the Danish Ethical Council was debating the issue of a shared health-card, and whether the sharing of information across platforms and in a distributed environment should be limited or contained. The context of the issue debated is a society where computing and computers are everywhere and affects everybody. Among computer-and web developers, the Internet is increasingly seen as a 'semantic web' - popularly referred to as 'cloud computing' [10].

'Cloud computing' is a concept that attempts to describe the configuration of next-generation Internet technology [11]. This introduces a range of new opportunities for 'common-coding' (or what is also called tagging) and collaboration across the platform and protocols. The innovative idea of cloud computing is that anything, in Weinberger's words, "is 'miscellaneous', yet Traceable tagged in Context". This means that although there is so much data, nothing in principle makes itself particularly noticed in itself and can be found in one simple search, so it can be found (and becomes visible) in specially tagged contexts. [12] New technologies such as Echonest gives us an unprecedented opportunity to 'track' sequences and identify 'hidden' content in large data volumes, also called 'emergent' methodologies. These emergent methodologies are not only technologically driven, but based on more people working together, and they point towards collaborative and transdisciplinary semantics for content production among a distributed audience [13].

With the emergent methodologies of digital technologies available today, you never know when you may accidently access or eavesdrop on other people's conversations. The event of 'eavesdropping' is therefore not an unforeseeable accident, but more likely the result of a collision of cultural patterns created by an emergent distributed public in a 'cloud' of accessible data.

The Internet Ear addresses the conditions of a 'cloud culture' where data and communications in a distributed public are 'tagged' in a context where no 'real' cultural conversation is taking place outside that distributed public space. The acoustical accident stages the Internet Ear between two opposing positions in the world's ontological theatre: The speculative/dualist and the experimental / laboratoria.

Collding Realities

Internet Ear stages (as an ontological theatre) a 'process of exteriorization', but a process in which an outer part of a physical organ of the body is operated into another part of the same body. I claim that this creates, in the first instance, a sense of dislocation. The very

idea that the physical organ is changing its location on the body, the ear has metaphorically moved to the arm, creates the situation where the ear as an exteriorized sense organ becomes the center of scrutiny and observation.

In the second instance, it points towards another process wherein the abstraction of sensing an external world achieves physical existence due to the intervention of technology: Text.

2010-11-10 12:43:02, Aalborg: counties by a commission
2010-11-10 12:43:10, Aalborg: Moscow come a long
2010-11-10 12:51:52, Aalborg: tough time in the
2010-11-10 12:51:56, Aalborg: valley have to leave the healing like it or
2010-11-10 12:52:02, Aalborg: where they saw a list of
2010-11-10 12:52:10, Aalborg: minutes of fame
2010-11-10 12:52:19, Aalborg: feeling here is really
2010-11-10 12:52:23, Aalborg: knows what will
2010-11-10 12:52:29, Aalborg: win the respect of ways
[14]

Both visible and audible, the text materializing from the dislocated ear has many implications. Note, for instance, the relics of what may well be a discussion about the notion of the 'uncanny valley' (the notion formulated by robot scientists which explains why the semblance of a robot to humans becomes uncanny when that semblance becomes too realistic) [15]. Resembling something in between absurd theatre à la Beckett and coded data, the textualizations of the acoustic accident can be seen as yet another element in the process of exteriorization.

This could be compared to concrete poetry as well; however, except in cases where people write directly into the prompt on the site, there is no human control involved at all. Even then, the text generated by the human, even though it may be more legible in a literal sense, becomes easily disturbed and dislocated from any contextual meaning in the flow of generated text coming from the Internet Ears located all over the world.

This 'dislocated' text is addressing the human-computer relation, which, even though it is distributed through the cloud, is using the cloud of semantic and tagged data to reach a different world. The clouded texts appearing from the acoustic accident reveal an algorithm of dislocated patterns of cultural identities reloaded through the actions of a sentient body-fragment.

Ear in the Cloud

My claim in this paper is that (drawing on the concepts from Pickering) the acoustical accident at the Utzon Centre is a case of 'agency realism' being acted out. Moreover, I claim that the accident reveals that Stelarc's Internet Ear is an 'ontological theatre' – and because of the accident, it is being acted out in real life and in real time in Utzon Centre, November 10, 2010.

From the acoustical accident, then, emerge the 'ontological theatre' and some critical new levels of technological sensibility that would otherwise have remained dormant in Stelarc's Internet Ear. As a result of the accident, therefore, the Internet Ear emerges as the ear in the cloud it was intended to be.

References

1. Stelarc (2010), "Internet Ear - Artist Statement.", http://stelarc.org/?catID=20339, accessed 2 june 2013

2. Stelarc [1]

3. Weibel, Peter, 1996. "The Intelligent Image" in: Shaw, Jeffrey, Peter Weibel, and Zentrum für Kunst und Medientechnologie Karlsruhe. 2003. *Future cinema : the cinematic imaginary after film, Electronic culture--history, theory, practice.* Cambridge, Mass.; London: MIT Press.

4. Michelsen, Anders, Frederik Stjernfelt, and Færgen Kronborg. 1996. *Billeder fra det fjerne = Images from afar : videnskabelig visualisering : en antologi.* Kbh.: Kulturby 96 : i kommission hos Akademisk Forlag.

5. Pickering, Andrew. 2011. T*he Cybernetic Brain: Sketches of Another Future.* Chicago; London: University of Chicago Press.

6. Pickering, Andrew, "Ontological theatre: Gordon Pask, cybernetics and the arts," *Cybernetics & Human Knowing* **14**, No. 4 (2007)

7. Pickering [6].

8. Pickering [6].

9. Stelarc [1].

10. Leadbeater, Charles. 2010. *Cloud Culture: the future of global cultural relations.* London: British Council.

11. Leadbeater [10].

12. Weinberger, David. 2008. *Everything is miscellaneous: the power of the new digital disorder.* 1. Holt paperbacks ed. New York, NY: Times books / Henry Holt.

13. McAfee, Andrew. 2009. *Enterprise 2.0 new collaborative tools for your organization's toughest challenges.* Boston, Mass.: Harvard Business Press.

14. Stelarc (2010), www.earonarm.net, accessed 11 October 2010.

15. Satz, A., & Wood, J. 2009. *Articulate objects : voice, sculpture and performance.* Oxford ; New York: Peter Lang.

THE DIGITAL DREAMHACKER: CROWDSOURCING THE DREAM IMAGINARY

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Abstract

The digital Dreamhacker is an application that collects dream themes reported by individual dreamers and turns them into crowdsourced imagery. These dream visualisations are then uploaded onto the Social Web, allowing for further commentary and collective interpretation. We thereby focus on the social context of dreams, creating visualisations that are neither depictions of individual imaginings or a means of enhancing artistic skill, but involve the reframing of dreams within the technical and *social imaginary*, which forms our collective understandings and expectations of social life. We outline a research strategy in which social media, supported by methods that emanate from both critical design and network analysis, are innovative contexts in which to explore the connection between technology, culture and our individual 'imaginings', including our dreams.

Keywords: design, interaction, networks, dreams, crowdsourcing, hacking, visualisation.

The belief that, in the early days of television, people dreamed in black and white but began to dream in colour with the advent of a colour TV service, has been verified by a number of research studies, for example Okada, Hitoshi; Matsuoka, Kazuo; Hatakeyama and Takao (2011) [2]. This phenomena evidences the significant connection between technology, culture and our individual 'imaginings', including our dreams. The Dreamhacker project investigates this relationship between technology, culture and imagination. The project is premised on the idea that dreams are never isolated from the wider social imaginary, the meaning of which will be clarified shortly. The Dreamhacker application exaggerates and throws light on this cultural, social and technological mediation of our dreams.

The Digital Dreamhacker project started in November 2012. At that point we developed a digital dream visualisation application and asked participants to use it. The dream visualisations produced were then uploaded onto the web, allowing for discussions and further interpretations. This paper will introduce the Dreamhacker application, explain our reasons for developing it and position it within existing theories, while it will also outline what we have learnt from developing the software.

How does the Dreamhacker work and reasons for developing it

Fig. 1. The Digital Dreamhacker application. (©Antonopoulou, Dare).

The Dreamhacker is a digital application with an interface that allows participants to enter keywords to describe their dreams. The system then creates a visualisation, which is based on crowdsourced online images that are tagged with matching metadata (fig.1). Since the elusive meaning of the dreamers' keywords is the only parameter that defines the selection of the online images used, the generated dream visualisation does not have many visual similarities with the image that the dreamer recollects.

It is important to state that the project is not about the literal illustration of dreams, but more about the repurposing of dreams. It is a form of crowdsourced 'hack', in which we take images from an online community and subvert them into dream visualisations and diverse social networks. The terms 'hack' and 'hacking' are used by this project in the sense that Fuller has defined, whereby technology is "interrogable or hackable, it allows and encourages those networked or enmeshed within it to gain traction"[3]. 'Traction', in the context of the Dreamhacker projects, represents an energetic meeting and exposure of forces – the imaginative, subconscious forces of dreams on the one hand, and the conventional stagings of human computer interaction and communication via social media (including their underlying protocols), on the other.

The project is not about an individualist form of hacking, nor is it about individual identities and personalised imagery. The project is about hacking into the *social imaginary*, which, in this context, refers to the collective representation of our inter-subjective experiences and their associated symbolism. Such a *social imaginary* (or social fantasy system) was identified by R.D Laing as a state of complicity in the enforcing of a normative, rational, and non-creative subjectivity [4]. Our identification with Laing's framing of the *social imaginary* further refutes the idea that this is a self visualisation project or an endeavour to enhance individual 'creative skills'. The project is about the social aspect of dreams. The crowdsourced images act as a visual manifestation of the connection between dreams, technology and culture; they raise questions about the significance of using social media to stage an alternative logical framework for mediating dreams. This techno-social aspect of dreams is further explored in the final step in the Dreamhacking operation, where dream visualisations are uploaded onto the Social Web (fig.2). In this way they are gestated and hatched through dialogue, collaborative interpretation and further re-shaping.

Fig. 2. Uploaded dream visualisations, which allow for commentary and further interpretation. (© Antonopoulou, Dare).

The Dreamhacker can also deploy user defined image files instead of crowdsourced ones (fig.3). However, this option does not and cannot enable them to 'opt out' of the Social Imaginary. The dream visualisations that the system generates are never about individual

imaginings alone. Dreamhacker visualisations are still mediated by a technology which carries its own aesthetics and assumptions [5], including the formalism of its communication protocols. The Dreamhacker redistributes and disrupts user material with these protocols, creating an artefact that is oblivious to the emotional significance of the dream material to the dreamer.

Fig. 3. Interface where the participants can upload their own images. (©Antonopoulou, Dare).

The Deamhacker technology (meaning the network protocols, coded logical structures and online contexts it works with) are not neutral presences, but co-agents, as ideologically loaded as any other cultural system. In this regard, the project is informed by the arguments of Mateas, who uses the term 'Expressive AI' to emphasise the cultural and emotive significance of coding structures, which we also explore in the context of our work with digitally mediated dreams. Mateas writes of 'the sense that there is an entity living within the computer that has its own life independently of the player and cares about how the player's actions impact this life' [6]. This is the entity, imaginary or otherwise, that we refer to as a ' co-agent'.

The agency of the application in connection to the agency of Language

The agency (or controlling influence) of the application has been taken into account throughout the project and is expressed through the ambivalence and agency of language. The use of fragmented words, such as keywords, as the only way to crowd source images, not only further disrupts the elusive meaning of the dream descriptions, but (as noted above) it also limits the possibility of creating visualisations that correspond to the dreamers' individual imaginings. The ambivalence of keywords widens the spectrum of the *social imaginary* by inviting a greater number of collective images that correspond to the dreamers' input.

We have also subverted the common existing protocols of web services into speculative protocols that operate as actors within the narrative of the Dreamhacker. For example, UDDI (Universal Description, Discovery and Integration) has been reframed as *'Universal Dream Description and Integration'* and WSDL (Web Services Description Language) has been repurposed as *'Service Dream Language'*. These semantic re-framings are not merely a play on words, but an attempt to create an arena for exploring reified technological configurations. As actors, the custom made protocol called *UDDI* (Universal Dream Description and Integration) provides a communication standard for interaction. The WSDL protocol is a messaging service that transports and stores the user-defined ontology.

The UDDI protocol provides an opportunity for users to request a visualisation based on either dream content or dream form. Similarly to their original role, these subverted protocols act just as servants, transporting information that makes no sense to them. So naturalised have web protocols become that they are almost invisible to us. The fact that we have subverted them is not only intended to point out their presence in the system, but also to highlight the fact that they are oblivious to the meaning that they transport.

Furthermore, the ambivalence and cultural weight of language played a significant part in naming the project. Originally we wanted to call it the 'Dreamcatcher' because the system collects dreams, however we had to confront the reality that the ancient indigenous American idea of a Dreamcatcher is not something we can have a solid cultural understanding of, and we did not, in the end, feel comfortable appropriating this term. We might also have called the system a "Dream-hatcher" as it allows dreams to grow through social interaction and discussion. But we eventually settled for the term "Dreamhacker" as this is what we believe the system enacts: a form of machinic traction against the social imaginary of dreams.

Theoretical background and our Philosophical position

We frame the Dreamhacker's crowdsourced dream images as works of post-production culture [6] in which individual authorship is remixed, hacked and re-appropriated, resulting, we argue, in a form of collective social and technological dream grammar.

We also frame the Dreamhacker as a variant form of 'design fiction' which materializes ideas, the way that science fiction materializes ideas[7]. In a similar manner to science fiction, it is enmeshed with speculative–fictional design mechanisms, features and protocols. This is the case, for example, with the subversion or 'post-production' of existing Web protocol languages. However, unlike many design fiction projects, our motivation is not to create a non-functional prototype that speculates a future product. Instead, we have created a functional networked application that, in keeping with the semantic framework of dreams, is generative of ambiguity. Moreover, as with critical design philosophies [8], we do not view design as a process by which we could create instrumental, commercial products, but rather as a channel for dialogue and cultural commentary, as well as a conceptual challenge to established practices. This way, online discussions about the uploaded dream visualisations offer spaces for conversation and social interaction.

If there is an overarching term which best describes the Dreamhacker project it is the artist Jeremy Deller 's neologism 'social surrealism'. This term involves 'inverting reality and changing reality if only for a day or a week and changing how you look at the world' [9]. Deller has used the Carnival Procession as an example of Social Surrealism, in which social roles and power relations are inverted. Like Deller's idea of the carnival, dreaming creates a similar form of ontological revolution, disrupting everyday reality in keeping with the disruptive surrealist agenda.

The mechanisms deployed by the Digital Dreamhacker are updated surrealist strategies, such as randomness and chance operations. These are serving as both metaphors and functional agents for the arbitrary collective grammars that shape both our dream imaginings and waking languages. Despite their often arbitrary form, we do not assume a value-free dream imaginary, anymore than we would propose a neutral waking imaginary.

The similarities between dreams and the Dreamhacker

The chance operations of the Dreamhacker system preserve and transmit the illogical processing of language, space and time that happens in dreams. While dreaming, space and identity do not obey their waking constraints, and symbols are often swapped for homonyms. Similar to dreams, the Dreamhacker system cannot know what is cognitively anomalous and cannot fully translate contextual meaning of the keywords. For example, if someone enters the phrase 'had a row' in the Dreamhacker interface, the computer cannot understand if it means that the dreamer was rowing a boat, had an argument or had a series of objects placed next to each other. As a result, the crowdsourced images chosen by the system could refer to any of these meanings. We thus propose a parallel between the way computer systems and dreams operate, as they are both oblivious to cultural normalities and everyday logic.

How can computers process dreams?

Although the chance operations the computer uses resemble the illogical dream process, the computer cannot understand the context of the dreamer's interpretation. This absence of conventional, logical reasoning, cultural and contextual awareness and non progressive thought processes, of the computer software makes it impossible to analyse dreams in the way that Freudian analysis proposes [10], in which meaning is hyper-associative, with myriad branches of symbolic meaning. Thus, we define the application as one that, both methodologically and procedurally, cannot project general meanings onto the dreams of its dreamers. In contrast, the Dreamhacker application can deal with quantities and categorisations and this is in keeping with contemporary dream theorisation, such as the more recent neurobiological theory proposed by Hobson [11]. This theory is not concerned with meaning, rather it describes 'five cardinal characteristics' of dreams, defined as:

- intense emotions
- illogical content
- apparent sensory impressions,
- uncritical acceptance of dream events
- difficulty in being remembered

Similar to the Dreamhacker, these five characteristics do not make any attempt to interpret content but rather categorise and quantify it. Like Hobson's theoretical model, the Dreamhacker system eschews and, indeed, *reverse engineers* the once normative logic of Dream content interpretation, allowing for a loose epistemic relationship with the mental landscapes of its users.

Reflections on the project

We started the project with the goal to create a visualisation application that would create a network of crowdsourced dream imagery. As we originally intended, the Dreamhacker project does investigate the relationship between technology, culture and imagination, however, we had not expected to reach the conclusion that computers are themselves operating in a kind of dream state. By this we mean that the waking physical and cognitive norms humans take for granted cannot be detected or distinguished by any symbolic logical system, such as a computer. In a paradoxical way, the computer resembles a human dreamer, as defined by Hobson: someone who uncritically accepts illogical events.

Conclusion

To conclude, although dreaming is a widespread human experience the surreality and apparent illogic of our dreams makes it hard to position dreaming within digital structures and computational projects. We have attempted to do so by repurposing Web service protocols and drawing from several theories such as critical design, design fictions, social surrealism and contemporary dream theory. The project exaggerates the idea of the impossibility of accurate visual interpretation of dreams by hacking into the social web of our 'imaginings'. The digital Dreamhacker is a system which, like dreams, is generative of ambiguity; but its ambiguity and randomness is never framed as value-free. Instead, it allows the system to stay open to interpretation [12]. We propose that the Digital Dreamhacker contributes to the tradition of artists and designers working with unconscious imaginative material, encouraging multiple meanings and re-mixing the 'individual' into a social and technological dream grammar.

Find the application link and our latest developments**:**
http://digitaldreamhacker.blogspot.co.uk/

References and Notes

1. Descartes, R. , Meditations on First Philosophy. Edited Stanley Tweyman (Routledge. 34-40. London and New York. 1993).

2. Okada, Hitoshi; Matsuoka, Kazuo; Hatakeyama, Takao

Dreaming, Vol 21(3), Sep 2011, 213-220.

3. Fuller, M, Software Studies, a Lexicon, Cambridge:MA, MIT Press, 2006.

4. R. D. Laing, Self and Others (London:Penguin 1969) p. 38-40.

5. Diamond, S., Data Visualisation:Materiality and Mediation (Istanbul: ISEA 2011) Retrieved 28 March 2013

6. Mateas, M., Expressive AI: Games and Artificial Intelligence, available at http://lmc.gatech.edu/~mateas/publications/Mateas DIGRA2003.pdf accessed 19/08/132003,

7 Bourriaud, N., Postproduction: Culture as Screenplay: How Art Reprograms the World(Lukas & Sternberg, New York. 2002)

8. Bleecker. J., Design fiction: A Short Essay on Design Science Fact and Fiction. (Near Future Laboratory. 2009)

9. Dunne, A. Raby, F., Design noir: The secret life of electronic Objects.(Birkhauser- Publishers for Architecture, Basel, Switcherland. 2001)

10. Hall, S., Rugoff, R., Young, R. and Deller,

J. Joy In People (London: Hayward Gallery

Publishing. 2012).

11. Baruss, Imants Alterations of Consciousness. (Washington, DC: American Psychological Association, 2003). p. 80.

12. Sengers, P., Gaver, B.,Staying Open to Interpretation: Engaging Multiple Meanings in Design and Evaluation, Proc. DIS 2006

DANCE AND VIRTUAL PHYSICS: THE MASS OF THE OBJECT DOES NOT NECESSARILY EQUAL THE OBJECT OF THE MASS

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Abstract

Motion capture and 3D animation enable the creation of dance in which relationships between mass, weight and morphology are not restricted to the parameters of real-world physics. This paper will draw on a range of motion capture projects to develop an understanding of the virtualizing potential of motion capture as an encoder of not simply spatiality or temporality, but of the physics of movement, and therefore as a potential means of encoding the gravitational poetics at the core of contemporary dance.

Keywords: motion capture, dance, new media performance

Introduction

Motion capture has been used for over 20 years in commercial film and game development. The technological challenge of using early optical and magnetic motion capture systems meant that motion capture was a relatively large undertaking requiring significant investment in equipment and pipeline development. Consequently, motion capture tended to be associated primarily with big budget film and AAA game projects. However, rapid development of hardware and software by motion capture manufacturers such as Motion Analysis Corporation, Vicon, Giant Studios, Animazoo, Optitrak and Organic Motion, among others, have provided the CG animation industry with a suite of motion capture solutions that range from high-end optical systems used to make major studio films such as *Happy Feet*, *Planet of the Apes* and *Avatar*, to more modestly priced systems used in smaller game development and new media art projects. The recent development of 'prosumer' motion capture systems such as Microsoft's Kinect and the X-Box Motion Controller has added another layer of possibility to motion capture use by making basic figure-based capture affordable for independent artists and home users alike [1].

However, motion capture has something of a checkered history when it comes to creating kinaesthetically engaging and empathetic animation. Famous commercial film examples such as *Polar Express* have demonstrated how the process of extracting optical motion capture data from a performance and re-mapping it onto a CG character can result in wooden, affect-less characters that are difficult to empathize with [2]. At the other extreme are the many highly successful feature films in which high-end motion capture combined with sympathetic and highly skilled 3D animation has created empathetic, even iconic characters [3].

These examples demonstrate that it is not simply recording and transcribing movement pathways that determines the efficacy of motion capture in mapping embodied performance to CG characters. It is the manner in which movement trajectories are translated onto the morphology of a CG character that results in believable (or alienating) animation.

Dance poetics and motion capture

Dance poetics provide a way of understanding the translation between lines of action and embodied movement that underpins the motion capture process. Dance poetics were famously described as 'virtual force' by Suzanne Langer in the 1940s [4]. In the 1980s and 1990s, dance theorists such as Hubert Godard and Laurence Louppe argued that muscular force, enacted via deeply inscribed patterns of muscular tonus, was a means of enacting movement intention and with it a moving, embodied subjectivity [5, 6].

Motion capture systems record movement as marker trajectories in x, y, z space. Trajectory data are mapped onto a CG character skeleton via a solving process in which the relative effects of specific data nodes on the movement of each CG joint are defined. This process is spatial (offsets between data and CG skeleton are constructed to deal with issues of scale and proportion) and morphological (the overall movement fit between data and CG skeleton is optimized across all the virtual joints involved).

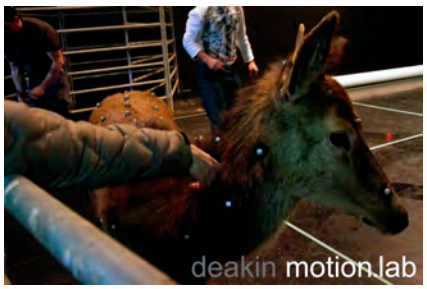

Fig. 1. Deer ready for motion capture for *Nocturnal Migration*. (© Deakin Motion.Lab / Altv.fx. Photo © Megan Beckwith.)

Because motion capture data are visualized via a 'body' of sorts, that is to say, a morphological structure created via 3D modeling software, the resultant animation has an apparent force. Drawing on dance poetics, it is possible to think of force as the virtual and virtualizing agent in the translation between marker trajectory/joint rotation data and the movement of a CG character.

Virtual or implied force indicates not simply a positional journey, but the implied muscular power needed to effect the dynamic movement of the CG character, and is generated precisely in relation to, and by means of, the structural and morphological properties of the CG skeletal model. The torque of a CG joint movement is implied by the length of a CG 'limb,' its apparent mass based on its volume and size, and the speed at which the relevant joint moves through its arc of rotation. For example, a virtual *King Kong* arm, supplied with the same motion capture data as a virtual *Gollum* arm, will appear to function within completely different registers of force and hence intention. The bulk of the *Kong* arm will possess a virtual power that is replaced in the finer *Gollum* arm by a more fluid, grasping, mobility [7].

This is the core of the motion edit process. Motion capture data is not simply transcribed onto a CG skeleton, but creatively deployed to create a character that appears to move with a spatial and dynamic intention that blends the performer's movement intentions with an alternative physical presence. Motion capture is, therefore, aligned with the processes of defining a virtualized force, rather than simply recreating a human performer's mobility.

Erin Manning defines virtual force via her concept of pre-acceleration, which values movement not in terms of actual displacement from one set of coordinates to another, but as the "…virtual force of movement's taking form" [8]. Manning's virtual force arises from incipiency – the sense that the movement is in the process of taking form before it actually occurs. Directionality is not predefined but provisional and emergent. This is precisely the case within motion capture data, since the dynamics of pre-acceleration are present at every point in time. Motion capture data streams as a time series, and at any given moment within that stream, future trajectory can be suggested but has yet to be actualized.

Manning argues that "By the time movement displaces, few options for surprise remain: gravity's pull over the movement's directionality has taken over" [9]. Because the relationship between morphology and action can be rethought and re-formulated within the motion edit process, motion captured movement is not subject to "gravity's pull" in a real-world sense, but can be reimagined and re-formulated to manipulate body and gravity to co-exist in ways that are not possible in 'real' space. Motion capture renders gravity itself virtual, both in the sense of being computer generated *and* in the sense of being an emergent process of possibility, by instantiating a disjuncture between intentional movement generated by a live performer and the effects of that intention when 'enacted' by a CG character.

Motion capture has sometimes been considered an alienating technique in relation to dance because it seems to 'extract' the body from movement. If motion capture is conceptualized as a series of static poses, then its affective function is reduced to positionality. If, however, motion capture is considered in terms of its ability to embed virtual weight and intentionality within CG bodies, then motion capture is fundamentally concerned with encoding movement weight, force and intention, rather than simply movement '*écriture*' [10]. Commerical motion capture exists precisely because it aims to articulate the weight, force and intention of movement performance in a CG context.

Examination of commercial motion capture projects demonstrates this functionality of motion capture. The following examples, drawn from work undertaken at the Deakin Motion.Lab in Melbourne, Australia, are intended to begin to articulate a continuity of practice between commercial and experimental motion capture. Through this analysis, I aim to open up new ways of considering the potential of motion capture for re-defining the role of dance in new media practice.

Commercial motion capture

Motion capture is often used to generate realistic moving CG characters where it is not possible to film 'live' actors. *Noctural Migration*, a television commercial created by Brisbane visual effects company Alt.vfx for Toohey's Beer, provides an example of this approach. The spot replaces young partygoers with deer, who 'migrate' from their homes to the city to participate in a 'night out'. Alt.vfx filmed deer on location in New Zealand, and combined this footage with CG deer animation created using motion capture of a deer at the Deakin Motion.Lab (Fig. 1).

The process required the development of a marker set that would capture the movement of each 'joint' within the virtual deer created by Nigel Haslam of Motion Circus [11, 12]. Working backwards from the degrees of freedom of each joint in the virtual character model, a system of marker placement was developed to ensure that the motion of the live deer could be mapped, joint-by-joint, to the CG skeleton to drive the character's movement. The resulting movement of the CG skeleton is used to drive the movement of the surface (mesh) of the character.

The process of mapping of movement data to CG model involves approximations because the CG skeleton differs, if subtly, from an actual deer in size, proportion and the number and configuration of joints. Compensations for the spatial offsets and changes in dynamics caused by this mismatch are made through the motion edit process.

In this example, the process was designed to match, as nearly as possible, the sense of weight in the movement of the CG deer with the actual deer's movement. While the CG deer was not identical in size and hence apparent mass compared with the real deer, the sense of weight in the finished animation approximated that of a real-world deer. In this case, the process was successful in creating an animation in which the differences in the movement of filmed and animated deer were not readily noticeable [13].

A second example demonstrates the potential of motion capture to amplify the apparent muscular force of a character's movement. For Rugby League Live 2, created by Melbourne animation company Big Ant Studios [14], the goal was to create in-game animation that would provide a compelling experience of rugby league play. Since rugby league foregrounds impact between players, between player and ball and between players and the ground, it was necessary to emphasize the muscular force of the players' movements. For this project, Big Ant Studios and Deakin Motion.Lab used contemporary dancers to create the behind the scenes play to enable a nuanced sense of touch and presence in actions such as hugging, celebrating, expressing discouragement and injury. Professional rugby players were used to generate the tackles of the game play. In both cases, the enactment of muscular impact was critical to the feel of the game movement. Impact and force were deliberately emphasized by both the dancers and the rugby players in their performances. The apparent force of the movement was further amplified via its re-situation within overly muscular CG player characters [15].

These two examples demonstrate the conventional use of motion capture as a means of representing approximations of realistic character movement. However, the disjuncture between live performance and CG character action created through the motion capture process can also be used to overturn real-world physics. In a project by Alt.vfx, in which loaves of bread were animated as if they were animals roaming a pastoral farmyard scene, a deliberate mismatch was created between the 'normal' mass of a character (a loaf of bread) and the way it moved.

The context was a television commercial for Abbott's bread, which aimed to convey the idea of bread as 'slow food,' made from locally grown ingredients [16]. To animate the loaves of bread, a small sausage dog was motion captured walking, running and playing (e.g. rolling over, having its tummy scratched). The dog's playful movements were translated to the bread, which seemed to 'roam' the pastoral landscape. In this case, the disjuncture between the physical mass and movement ability of performer (dog) and character (bread) was extreme. The 'bread' assumed a muscularity and playful mobility that would be impossible given the structure of bread, yet which assumed a degree of believability because the proportions of the 'bread' and the sausage dog matched reasonably well. The finished animation communicated the idea of animal behavior along with a clear sense of the 'artificial' nature of the construction, even in the presence of overtly cinematic/realist landscape design elements.

Interactive Performance

In an artistic context, it is possible to use the ability of motion capture to re-map the movement of a physical performer onto a CG object with different physical characteristics to manipulate the apparent 'weight/flow' of performed movement.

Weight and flow are aspects of what Laban, in his systematized description of human movement, called effort qualities [17]. Effort qualities are further defined by Bartenieff as 'inner intention' [18] in

the sense that they convey not simply the metrics or positionality of movement (i.e. how far, how fast, at what angle), but the mover's intention in relation to the physical world. Weight, as defined in Laban Movement Analysis, is a primarily gravitational concept. It proceeds from the amount of muscular effort with which a movement is executed, and can only be generated through contact with the ground or other gravitational support. Flow relates to the degree of muscular resistance with which a movement is performed, and is therefore primarily a concept of force.

When using motion capture to transfer dance movement to a CG model, it is possible to alter the apparent weight and flow of the movement by mapping it to CG characters of different designs. For example, a CG character with finer, longer limbs than a real performer appears to move faster, and with more flow (lack of resistance) because the motion of the performer is extrapolated through a longer line of action. Yet the sense of weight in the character remains realistic since the timing and dynamic of the weight shifts (e.g. footsteps, leaning of the body) are preserved (Figure 2).

This process, which formed part of an investigation into the possibilities of stereoscopically projected CG 'performers' in contemporary dance [19], allowed the creation of a character that seemed both 'real', by virtue of the clear articulation of weight/flow, but also mythical in its ability to move more smoothly through a greater range of displacement than could be achieved by a human performer. This CG dancer could be thought of as a study in what Lepecki calls 'motility' [20]. This is not to say that, abstracted in this way, the CG 'dancer' was necessarily aligned with Lepecki's understanding of motility as an exclusively modernist exercise in dance. To the contrary, this character to some extent challenges the connection between modernist dance and motility through its extraction of dance motility from an exclusively 'human' context. The effect is of an intentionality (in Manning's terms) that is both human and inhuman, possible, since the movement pathways come from motion capture of a real performance, yet rendered impossible by their 'performance' by a virtual (CG) morphology.

Fig 2. Real time motion capture of CG avatar, performer Ben Stuart-Carberry, development for *Crack Up* (© Kim Vincs, Peter Divers, Deakin Motion.Lab. Photo © Kim Vincs.)

A more extreme disjuncture between the morphology of human and CG performers is made possible by developing a CG character that has an implied volume that varies continuously because its surface is created using a cloth simulation algorithm. The CG 'cloth' moves, in real time, in response to the motion captured performer's movement, and continues to move of its own accord even after the motion capture data driving it has stopped. This character mapping was created for Melbourne director Gorkem Acaroglu's investigation of the use of digitized bodies in dramatic theatre, and was designed to play the role of a 'ghost' [21]. The translucent nature of the 'character's' surface, combined with its undulation even in the absence of movement input, gives an appearance of weightlessness (Figure 3). The character was modeled as a torso that trailed into a dress-like structure. As a result, the concept of a normative gravitational movement was radically displaced since the character literally had no ground supports with which to enact an impact and a push away from a ground surface.

In the case of CG scenography, imagery is further distanced from the physicality of human performers. In a work in development by Australian Dance Theatre Artistic Director Garry Stewart in collaboration with the Deakin Motion.Lab [20], the concept is to place dancers in juxtaposition with 3D stereographic imagery that is not driven by motion capture, but which instantiates an overtly inorganic set of movement characteristics. In this piece, 3D scenography is created and positioned, using stereoscopic projection, as if it exists in space besides and around the dancers (Fig. 4). While the dancers themselves are not technologically modified, they are positioned adjacent to CG images that appear massive in bulk, yet move as if light and

Fig 3. Performer Steph Hutchison with 3D cloth simulation avatar in rehearsal for Gorkem Acaroglu's *Avatars, Ghosts & Robots* (© Gorkem Acaroglu/ Deakin Motion.Lab. Photo © Alison Bennett.)

mobile. This disjuncture between form and movement places the dancers in an 'unworldly' landscape in which their very gravitational normality appears odd and out of place. This effect serves Stewart's aim of creating a work that explores the 'Multiverse' possibilities predicted by string theory by creating a scenographic landscape that seems, like the bizarre geometrical predictions of string theory, literally impossible to spatially comprehend.

Conclusion

This discussion poses a continuity between commercial and dance/art uses of motion capture by considering both applications as processes that map the real-world physics of a performer's movement onto CG characters to generate a 'virtual' physics' of movement generated by combining real-world movement data with the 'apparent mass' of a CG object. While dance and commercial motion capture processes may seem, on the surface, very disparate practices, through motion capture they share the ability to minimize or amplify disjunctures between the real-world physics of a performer's movement and the apparent physics of the CG world.

In the field of dance technology, this ability opens up the possibility of effecting radical deconstructions of movement style and therefore, as Louppe [23] would argue, embodied formulations of subjectivity, through the ability of motion capture and CG animation to destabilize normative physicality. In the field of commercial motion capture, dancers' profound understanding of and ability to creatively manipulate physicality, weight and flow represents a potentially valuable resource for creating both realistic and unrealistic character animation. Perhaps further to both these opportunities is the idea that combining dance and

motion capture practices offers a means of considering movement as not simply positional, directional or even temporal/dynamic, but as fundamentally concerned with the mobilization of force as a means of enacting intention. In this context, Manning's idea of movement as intention is 'given weight,' so to speak, by the real and virtual physics of performance.

Fig 4. Daniel Jaber in rehearsal for Garry Stewart's *Multiverse* (© Garry Stewart / Australian Dance Theatre / Deakin Motion.Lab. Photo © Bradley Axiak.)

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References and Notes

1. Systems such as Kinect offer skeleton-based recognition of human form and movement, but provide a lower level of resolution of individual joint action compared with high-end optical systems. Kinect systems do not, at present, offer precise mapping in the 'z' axis (towards and away from the camera). However, while the resolution gap between Kinect and optical motion capture systems is currently significant, this can be expected to narrow rapidly over the next few years with new generation devices due for release in 2013 and beyond.

2. For examples of reviews of motion capture use in *Polar Express* see High-Def Digest, *Are we done with motion capture yet?* http://www.highdefdigest.com/blog/motion-capture-animation/ (accessed 19 July 2013), and CNN Entertainment, *Review: 'Polar Express' a creepy ride,* http://www.cnn.com/2004/SHOWBIZ/Movies/11/10/review.polar.express/ (accessed 19 July 2013).

3. Examples include *Avatar* and *Lord of the Rings*, which were popular successes. For an example of positive reviews of these films' use of technology in the popular press, see IGN 'How the Lord of the Rings Trilogy changed movies forever', http://au.ign.com/articles/2012/11/22/how-the-lord-of-the-rings-trilogy-changed-movies-forever (acces. ssed July 19 2013.

4. Langer, *Feeling and Form: A theory of art developed from philosophy in a new key* (London: Routledge & Kegan Paul: 1953).

5. H. Goddard in Daniel Dobbels and Claude Rabant, "The Missing Gesture: an interview with Hubert Godard." *Writings on Dance* **15** (Winter 1996) pp. 38–47.

6. L. Louppe, *Poetics of Contemporary Dance*, Translated by Sally Gardner (Alton Hampshire, England: Dance Books 2010).

7. I refer here to well-known CG film characters *King Kong* (2005), film and and Gollum in *Lord of the Rings, Fellowship of the Ring*, film (2001).

8. E. Manning, *Relationscapes: movement, art, philosophy*, kindle edition (Cambridge, Mass: MIT Press 2009) location 105.

9. Manning [8], location 72.

10. I refer here to Laurence Louppe's [8] term.

11. Alt.vfx are a Brisbane Visual Effects company, http://altvfx.com.

12. Motion Circus is a Queensland based animation company, http://motioncircus.com.

13 Behind the scenes videos of the making of Nocturnal Migration can be viewed at http://www.cgsociety.org/index.php/CGSFeatures/CGSFeatureSpecial/altvfx_nocturnal (accessed July 19 2013).

14. Big Ant Studios is a Melbourne game development company, http://www.bigant.com (accessed July 19 2013).

15. Footage from Rugby League Live 2 can be viewed at http://www.bigant.com (accessed July 19 2013).

16. Behind the scenes videos of the making of Abotts' Bread TVC can be viewed at http://altvfx.com/videos/abbottsb4a.php (accessed July 19 2013).

17. R. Laban, Laban's Principles of Dance and Movement Notation (London: Macdonald and Evans, 1975).

18. I. Bartenieff, *Body Movement: coping with the environment* (London, New York: Gordon and Breach, 1980).

19. This character was created as part of Vincs' transmedia dance development *Crack Up*, ARC Discovery Project DP120101695.

20. A. Lepecki, *Exhausting Dance: the performance and politics of movement* (New York and London: Routledge 2006).

21. This character was created as part of Australia Council Artlab project *Mixed Reality Performance* by Gorkem Acaroglu, and supported via DP120101695, The Deakin Motion.Lab and Deakin University's Centre for Intelligent Systems Research.

22. This work was created as part of Garry Stewart's Thinker in Residence program at Deakin University in 2012. The work is, at time of writing, under development for premiere in 2014. It is also supported via DP120101695 and Australian Dance Theatre.

23. L. Louppe, 2010.

SITEWORKS: ECOLOGIES AND TECHNOLOGIES

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Abstract

SITEWORKS is an interdisciplinary research and practice project that invites artists, scientists and scholars to respond to the Bundanon property through the lens of their specific discipline. Over four years this has led to a series of interactive projects, many utilising electronic technologies. The inaugural investigations focussed on the geomorphology of the site and palaeo-environmental research, specifically in the area of sea level rise and climate change [1]. In subsequent years the focus has been on water and the river; land management; Indigenous cultural heritage, and food security.

Keywords: geomorphology, indigenous, food security, Bundanon, climate change.

KILLING THE HOST
Linda Dement

Killing the Host is an augmented reality work that can be viewed on smartphone *in situ*.

Giant scabies mites stand threateningly over wombat burrows on the Bundanon property and at sites of long-wall mines in the southern coalfields of NSW. On approach, sounds of frenzied eating and pained screams erupt. Phrases, gleaned from mining company documents, explain and justify the actions of a parasite so consumed by short-term gain, it fails to realise it is torturing and destroying the very thing that sustains it.

By engaging with the Bundanon property in a site-specific work, *Killing the Host* functions between the material landscape and the invisible environment of satellite signals, GPS co-ordinates and fluctuating wifi. Bundanon has its flows and paths of wifi signals, wombat burrows, scabies infestations, chemical traces, walking tracks, hovering satellites, fox dens, odd wisps of phone signal and of course far more. This work pinpoints and scales up the cruel presence of microscopic scabies and counters the disturbing silence of mange infested wombats, drawing them into the invisible but connected field of signals for a shifted emphatic presence in the landscape.

Long-wall mining and coal seam gas fracking in the nearby southern coal fields are of ongoing concern to locals, farmers and environment groups as the land and water systems are increasingly damaged. Augmented reality allows an insertion directly into otherwise inaccessible mine locations, giving form to critical dissent as an immediate overlay on the source of the problem.

Landscapes are not only composed of farm and bush, river and mine, but also data, signals and connections. Energies and dynamics emerge from, interleave, intersect with and accrete around the real objects and formations of visible tangible ecology. Wifi accumulates around artists. Scabies mites accumulate in cool dark burrows. Satellites throng above the naval base. Longwall mining machinery proliferates where activists do not. Phone signals avoid the valley. These environments entail a shifting conglomeration of invisible entities, convergences and exchanges that arise from and hook back into the solid and real.

Killing the Host aims to conflate, layer and echo between parallel damaging situations –mange and mining – highlighting these two instances of a pattern of tunnelling, toxicity, proliferation and destruction. It gives voice to the experience of a dying host, and makes visible a parasitic infestation that destroys the very thing it relies on for survival.

Fig 1. Killing the Host: an augmented reality work viewed on smartphone. (© artwork and photo Linda Dement)

THE LANTANA PROJECT
Gary Warner

Lantana camara is a scrambling, thicket-forming plant with pretty flower clusters. Native to Central and South America, it was brought to Europe in the seventeenth century as a garden ornamental and diffused across the world in the wake of European colonialism.

In Australia, lantana is deemed a "weed of national significance" due to its ability to aggressively colonise and seriously disrupt natural ecosystems. It is estimated that 5% of the continent is infested with lantana.

A visit to Bundanon in 2007 exposed me to the exhilarating native bushland surrounding the farm, and the shock of decades of significant habitat degradation by lantana.

In response, I determined to spend three weeks of a 2009 artist residency removing lantana by hand from a dramatic bushland amphitheatre. Each day I packed lunch, tea, tools and cameras, and walked up the forest trail to practice 'weeding meditation'.

This involved the methodical removal of dense lantana thickets that were smothering and killing native species and obscuring a panoramic assemblage of sandstone boulders.

The procedure involved a series of stages. Firstly, reaching into the brambly thicket to cut back the leading branches with secateurs. Then using the pruning saw to cut back the branching structure. Then cutting the trunk close to ground level and painting it with glyphosate herbicide to kill the plant. The mass of cuttings were mounded up and left in the amphitheatre to naturally decay.

Why is this meditation? My interest in Zen Buddhism directed my thinking about this project, particularly tenets around work as practice, the value of daily discipline and mindfulness during activity. While working alone through the day, I was open to the sounds of the forest, encounters with birdlife and the changing atmospheric conditions under the canopy of spotted gum and stringybark trees - light, air, rain, scents. Each day I broke for a lunch of rice, vegetables and tea, sitting for a while in a state of empty mind before starting the afternoon session.

Finally, a sweeping arc of the amphitheatre perimeter had been cleared, to reveal and revive a variety of small trees, rock orchids, heath shrubs and large sandstone boulders.

Please reference as: [Author(s)-of-paper] (2013) [Title-of-paper] in Cleland, K., Fisher, L. & Harley, R. (Eds.) ***Proceedings of the 19th International Symposium on Electronic Art*****, ISEA2013, Sydney. Page numbering begins at 1 at the start of the paper.**

Four years on, the native species are thriving, the boulders are moss-covered and the heap of decayed cuttings is occupied by bracken fern and grasses. Each year, during the Siteworks weekend, I make a pilgrimage up to the amphitheatre to wrench out any new lantana seedlings.

MILK AND HONEY
Nigel Helyer

Bundanon is a canvas worked and reworked, an image floating over underpainting after underpainting, never quite obscuring the historical layers that resonate from a deep past. The hand of Boyd pushing a brush, a crawling Nebuchadnezzar, a farmhand chopping timber, a tribal owner cutting sugarbag (honey) from a blue gum, the river slowly eroding the mountain.

"A land flowing with Milk and Honey" is the phrase from Exodus describing the agricultural plenty of the chosen land. Early colonial settlers to the Shoalhaven region forged their own path towards this metaphor of plenty in a life that melded European practices and stereotypes with a landscape *chosen* but unknown and perhaps unknowable.

His eyes shall be red with wine, and his teeth white with milk. Is it a small thing that thou hast brought us up out of a land that floweth with milk and honey, to kill us in the wilderness, except thou make thyself altogether a prince over us?

For when I shall have brought them into the land which I swear unto their fathers, that floweth with milk and honey; and they shall have eaten and filled themselves, and waxen fat; then will they turn unto other gods, and serve them, and provoke me, and break my covenant.

As if stranded by some ancient flood, two sonic river punts *float* in the Bundanon Homestead, carrying cargoes of Milk and Honey, sounding out their riverine environment with fragmentary voices in a strange new world.

The soundscape is driven by a series of eight audio actuators that resonate the surface of the sculptural elements, turning the punts, beehives, milk churns, oars and a stray Steinway piano into resonant sound-boards.

The eight streams of audio intermingle Old Testament verses with ambient nature recordings and cryptic nineteenth century farm diary entries. Waterscapes envelop the sounds of hand milking in an old fashioned dairy whilst a quill pen scratches out the daily farm routines, weather patterns and the small detail of agricultural life:

"Drummed down a swarm of bees…Went into bush after a bees nest but got no honey… Mother cut up peaches…. Jimmy would not bring down his punt as river too high… Went over to peddlers boat… Wrote to Bob, got no prizes… Shipped 22 bags of corn on punt… Picked preserving dish full of grapes to make jam… Got a small swarm of bees, mother practiced her hymns…"

An incessant flow of small details that gradually accumulate into the great slow-moving river of life.

Fig 2. The Verdant Shed projection. (© artwork and photo Josephine Starrs & Leon Cmielewski)

THE VERDANT SHED & CLOUD MAPPING
Josephine Starrs & Leon Cmielewski

We created two artworks for Siteworks 2012, using video projection and animation to respond to the unique Bundanon environment and architecture.

The Archive & Study Centre is a large old shed the Trust architects sensitively converted, cladding the shed in a way that leaves its perimeter of massive posts exposed. We brought these massive tree trunks back to life by projecting an animated drawing of trees over the building. *The Verdant Shed* refers to the ancient practice of building sacred structures and meeting places from living trees and also the current organic architecture trend to incorporate living trees into modern building designs.

Bundanon is somewhat isolated, so that transient, ephemeral site-specific work such as night-time projections would not normally have an audience. The Siteworks event offered the opportunity to create a projection piece for an audience to view as they left the property in the evening.

The second project we made for the Future Food event was a stop motion animated drawing that depicts a hand drawn map of the Shoalhaven River morphing into an Australian Bass fish leaping out of the river. These Bass have been in decline due to weirs and dams blocking fish migration on many rivers. There is the Tallowa Dam upstream from Bundanon built in the 1970s that blocked the Bass from more than 80% of their habitat before a fish lift was added several years ago. This animated drawing was projected onto several locations around Bundanon, from old fence posts to the stone-walls of the Bundanon homestead. It was then re-shot, edited and installed in the Bundanon Homestead Library for the exhibition.

Our project in progress at Bundanon is to document the clouds above the Shoalhaven River that winds through the Bundanon properties. We made several row-boat journeys documenting the clouds above the river. Using GPS we have placed the cloud images in the correct orientation above the spot they were photographed within Google maps. Mapping is usually about fidelity and accuracy of scale and dimension, as it is related to land title and land ownership. We find it interesting that a river is the only boundary in the rigid cartesian space of cadastral mapping that moves. All other points are fixed in space, but a river as a legal boundary line is mobile, it changes shape over time, like the clouds floating above it.

LAST WORD 2012
Robyn Backen

Last Word 2012 was a collaborative performance on the Shoalhaven River, Bundanon at dusk. It was the third and final commissioned performance in the series for Siteworks.

This work developed research into acoustic and light transmission systems in remote environments. While much research into the future advancement of twenty-first century technology is poignant, the examination of past and present forms of communication enabled a rich and deeper insight into the human condition.

This collaboration focused upon a growing understanding of the land from cultural and scientific perspectives, encompassing both indigenous and non-indigenous histories of place and inevitably, considerations of land usage and discussions around the future of food and water [2].

This work embodied a river fugue of voices, and channelled memory in the form of a farmer's diary from the region [3]. Thomas Bilholf wrote the following entry [4] on Saturday 29 September 1890:

"Cold Westerly Wind - Kate Hughes came over and washed. Bob rolled front paddock. Ted and Reggie went on planting corn inside paddock, Bob helped them in afternoon. I husked and picked corn. Mrs Trotman all right again. Mother wrote to Tottie. Cassie Hughes came over in the evening. Boys threshed."

This diary entry was expressed throughout the performance, as well as within the fugue-element, which include a list of the mundane weather reports from 1890. These reports display a farmer's consistency, sense of time and the necessary need to understand the climate. The transmission of the reports was via echoes across the water, walkie-talkies in tin cans, PA system and portable mp3 players. The voices of the four performers where transmitted and then received beside, around and across the Shoalhaven tidal zone.

Last Word 2012 referenced the Boyd landscape legacy, specifically through the light transmission that illuminated and echoed upon the ghostly hillside, as a procession ascended and eventually disappeared into darkness. This darkness offered the audience a moment to listen to the river.

PRESENT IN THE LANDSCAPE
Garth Paine

All landscapes are contested spaces. They are constructions of enculturation, be that perceptions of the energy and spirits within the land, and reflected by the land and the animals inhabiting it, or a Western consumer view of the potential of wealth production, the litres of oil, tons of ore, gold etc. *Present in the Landscape* is an exploration of the Shoalhaven River (S34 53.686 E150 30.157) in southern New South Wales, Australia. This work came about during the Siteworks residency at the Bundanon Trust property. Siteworks marks a shift in my practice - it has led to a series of works that respond to the river, the natural environment (especially the birds) and the Aboriginal culture and practices of the area.

These works contemplate a series of communications – conversations with the landscape – a series of experiments that seek to give voice to the experience of being truly present in the landscape.

I am investigating the sense of presence as a profound oneness with the land – inclusive of the wombats and kangaroos, the birds, the fish jumping in the river, the cold, the heat, the long grass, the trees, the undergrowth – etc.

I undertake this exploration by going out at 4-am and setting up to make ambisonic sound recordings through until 7 or 8-am. The Ambisonic format is a full three-dimensional sphere – a sound field – giving a sense of immersion in the soundfield upon replay. I lie on the ground with my headphones on, enveloped in a super-real sonic environment absolutely stationary in a kind of meditation for three or four hours. They become a durational act – one of resisting the aching body, the insects crawling around and the hot or cold – an endurance of being still, present and absorbed by the earth. Recordings have also been undertaken from late afternoon into evening - listening to the unseen.

On each occasion I learn something about the transition of the night to the day – the slow quiet voice of the owls through to the raucous awakening of the parrots – the very last to wake and of course the noisiest. The fish leaping from the river to catch insects at night - the splash of their bodies re-entering the river - swallowed by the mass of water - disappeared again from sight.

Critical to this practice is the sense of lying on the ground, feeling the coldness, firmness, and vibrational energy of the space – a perception of the landscape shared with me through the generosity of the local Aboriginal people, (especially local song men Cecil McLeod and Richard Scott Moore). The welcome into their dreaming with a ceremony on the sand at the edge of the river - discussions about the landscape as vibrational energy - the appearance of a crow around the corner of the river just at the time it was named, and zephyrs of wind on the river surface apparently on command. This, all be it an introductory insight into another way of seeing the world around us, has been very influential as I laid on the ground in the dark, listening to the sounds of the ecosystem.

Fig 3. Last Word 2012 night time performance. (© artwork and photo Robyn Backen)

SITEWORKS REFLECTION
Jodie Newcombe

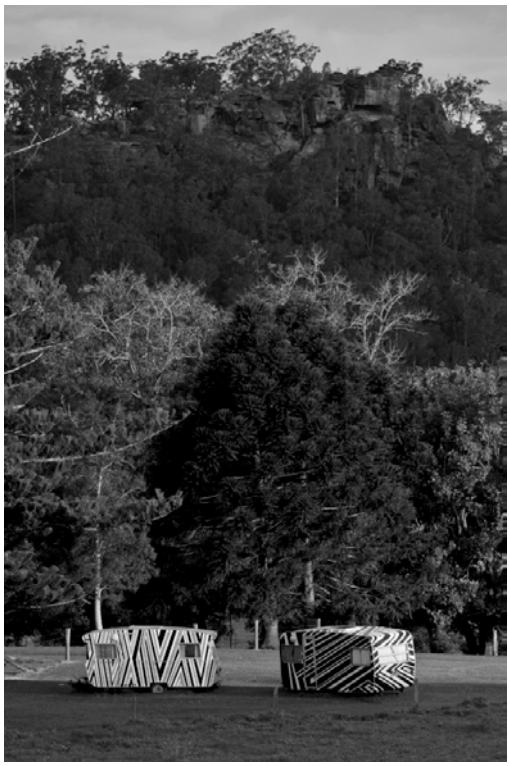
Since 2009, I have had the privilege of attending two Siteworks events at Bundanon and each has offered unique connections, insights and moments that have been fundamental to the development of my own practice, Carbon Arts. In 2009, *Ten Trenches*, the first Siteworks project, came at a time when I had just started planning Carbon Arts as a creative agency tasked with generating multi-disciplinary, artist-led projects to address climate change.

At the centre of *Ten Trenches* were the two Cohen brothers, a scientist and a theatre director who collaborated over a number of weeks to explore the impact of rising sea levels on the Bundanon property. The physical interventions on site, through the digging of trenches to reveal the historical reach of the river, as well as markers that reached above ground to show historical flood levels, seamlessly wove cultural and scientific investigation. The public event was a day and evening of stunning performances that opened my eyes to the power of art and science collaboration, and the logic of responding to global issues through a very deep exploration of site and place.

Three years on, with a number of major projects behind me under the banner of my now full-time occupation as founding director of Carbon Arts, I was invited back to participate in the *Future Food Feast*, the culmination of the Siteworks 2012 project. This time, Carbon Arts participated directly, showcasing a documentary film of one of our projects in a Brook Andrew caravan for the public to enjoy. The film tracks our long-running engagement with artist Natalie Jeremijenko and her *Cross (x) Species Adventure Club*, which "enlists humans to explore a biodiverse and delicious future; to engage in culinary experiments; invest in food innovation; and participate in re-designing our collective relationship to natural systems" [5].

A particularly magic moment occurred during the Siteworks 2012 open weekend, which for me epitomised the nature and value of the whole initiative. During the Friday evening in the kitchen shared by all the visitors, an artist specialising in weeds – Diego Bonetto - brought to the kitchen bench a thick bunch of Scottish Thistle, a reviled weed, and invited us to taste its sweet celery-like core. Standing by was celebrated chef, Jared Ingersol, who was inspired to turn this weed into a delicious salad to be incorporated into the morrow's public lunch; while Chris Andrews from Greening Australia watched on with amazement and exclaimed that he couldn't wait to tell all his staff that they could eat this stuff that they usually tossed away! For me, having just launched *The Australian Future Foods Lab* to reignite the public imagination around sustainable and emergent food systems, this was a defining moment that reaffirmed my belief in the value of bringing different disciplines together to examine complex problems as an art practice.

Fig 4. Travelling Colony in situ at Bundanon. (© artist Brook Andrew) Indigenous and Pop inspired caravans commissioned by Carriageworks and Sydney Festival 2012. © photo Rob Little)



References and Notes

1. Reported in T.J. Cohen. and S.J.K Kermode. and M. Leggett. "Ten Trenches: A Science-Art Collaboration." Leonardo 46.1 (2013): 74-75. Project MUSE. Web. 3 Jul. 2013. <http://muse.jhu.edu/>.

2. The core collaborative team (The PLANK) included: Ian Hobbs, Michelle Xen, Annemaree Dalziel, Neil Mackenzie, Kiera Mackenzie, Bert Tenbungu Groves–Yamma and Chris Zinn.

3. The work referenced *So You Want To Write a Fugue* written by the Canadian composer Glen Gould in Gould. http://www.youtube.com/watch?v=QZM4yxbE0ZE

4. The performance was held on the corresponding date in 2012.

5. http://nataliejeremijenko.com/projects/

STEREOSCOPIC THEATRE: THE IMPACT OF GESTALT PERCEPTUAL ORGANIZATION IN THE STEREOSCOPIC THEATRE ENVIRONMENT

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Abstract

This paper argues that it is essential for live theatre that incorporates stereoscopic imagery to reconceptualise the performance space to facilitate a successful audience experience. While 3D technology greatly increases artistic possibilities, the risks of perceptual confusion exist in live theatre just as in stereoscopic cinema, indeed more so given the co-existence of live performers. This paper argues that Gestalt perceptual organization theory can be valuable in informing how best to employ stereoscopic imagery within a live theater environment, with reference to the artistic works of one of the authors.

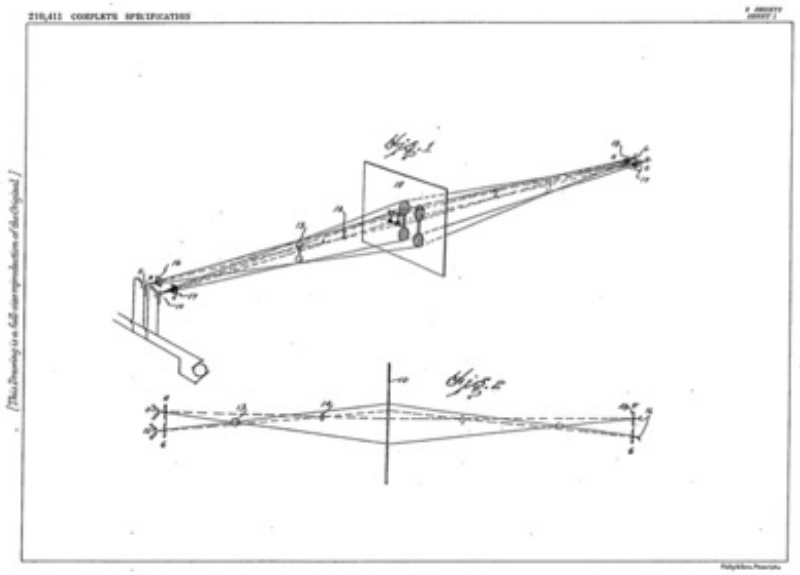
Keywords

3D, stereography, dance technology, digital scenography, choreography, multi-media dance.

Introduction

It is the impressive amount of detail within the stereoscopic image that gives the three dimensional (3D) phenomenon its impact. The stereoscopic picture is perceived as real because the image has volume, depth and texture, and is placed within three-dimensional space. Although originally developed for still pictures, this visual effect has been used within the film industry since its inception. Early examples include the peep-shows of the late1800s and early 1900s. In the twenty-first century, stereoscopic imagery has come to the forefront with popular Hollywood films such as *Avatar*[1] and the *Great Gatsby*[2] and theatre based 3D film productions such as the English National Opera 3D live 3D broadcast of Donizetti's *Lucrezia Borgia* [3] and Wim Wenders' *Pina* [4]. Interestingly, 3D films are also presented with a traditional two-dimensional (2D) viewing option. At least at the present time, the stereoscopic image does not appeal to everyone. This may be a result of the 'visual stress and disorientation' experienced by some viewers [5]. Overcoming these discomforts is central to providing a broadly enjoyable experience for audiences of artistic works.

Fig.1 Hammond's system of stereoscopic shadowgraphs. Described is; no. 16 anaglyph lights, no. 13 & 14 performers, no. 10 screen, no. 18 the audience [6].



While cinema has been the primary focus of 3D attention, the use of the stereoscopic image within live theatre is a development that promises more than just visual effects or skillful lighting. Both authors have created live performances that integrate the stereoscopic illusion and live contemporary dance. This process has made us aware of the problems and possibilities of this unusual combination. This paper addresses these issues from the creative perspective of theatre-makers. We suggest that many of the issues that arise when creating and viewing stereoscopic theatre revolve around the audience's ability to comfortably perceive a theatrical scene that includes both the live body and stereoscopic image. Gestalt theories of visual perception are a practical way to understand the processes of stereoscopic theatre this is because they emphasise wholeness and perceptual cohesion.

In this paper we focus on creating a method to develop a comfortable and unified experience of stereoscopic imagery in live theatre for the audience. This is by no means the only approach that could be adopted. The reverse approach of emphasizing the disjuncture and perceptual alienation stereoscopic imagery can induce is also an artistically valid choice, and one adopted by many visual artists working with stereoscopic imagery. However, we feel that given the perceptual complexity of combining live performance with stereoscopic imagery, it is perhaps prudent to explore less deliberately disruptive territory first. In the case of combining stereoscopic imagery and live dance performance, our experience is that even work designed to be as perceptually cohesive as possible still generates significant challenges for audiences. In the use of stereoscopic imagery, even in the absence of live performance there is also the risk of visual fatigue which can induce asthenopic symptoms such as headaches, tiredness and visual discomfort, [7] and this also influences our choice to consider the potential benefits of creating a more cohesive perceptual experience.

Background

Fig. 2. Through proximity the animated figure and performer almost appear as one (© Megan Beckwith.)

Stereoscopic theatre is live performance that incorporates stereoscopic images as an integral part of the scenography. The theatre and stereographic combination creates a multi-layered performance experience that optically redefines theatre space. The stereographic technical system controls the horizontal separation of two video projection streams, each of which is visible only to the audience's right and left eye. The resulting effect "exists only to the observer" looking directly at the image or projection surface [8]. The stereographic process relies on the audience's ability to fuse the right and left eye images to form a 3D depth image.

The stereoscopic image is not a new phenomenon. It was developed in the 1830s by Charles Wheatstone and became an entertainment marvel of the time [9]. The stereoscopic images of the 1830s provided a novel approach to image creation for entertainment events, and were extremely popular. Initially, the imagery of the stereoscope was so innovative that the mechanism of the stereograph was often misunderstood. Oliver Wendell Holmes Senior wrote: "Many persons suppose that they are looking on miniatures of the objects represented, when they see them in the stereoscope. They will be surprised to be told that they see most objects as large as they appear in Nature"[10].

Stereoscopic images were described further by Holmes as "frightful" because they contained so much information. The images looked as if "they would scratch ones eyes out"[11]. Holmes was describing not only the detail contained within the imagery but also the emotional and visceral reaction to the 3D image that seemed hyper-real.

Stereoscopic theatre was pioneered in the 1920s. Laurens Hammond, who is commonly known for the Hammond organ, invented the Stereoscopic Shadow Scope for use in theatre in the 1920s [12]. The Shadow Scope was a lighting affect using the anaglyph stereoscopic method. Two colored lights in red and cyan were used to back light a scrim and the performers, placed between the lights and the scrim. The audience viewed the shadows of the performers with corresponding red and cyan glasses (See Fig. 1). This effect was picked up by Florenz Ziegfeld and was used extensively in the 1920s, particular within his 1927 review called Padlocks, where it was used in both dance numbers and comedy acts [13].

Fig. 3. The petals appear on different planes behind, in front and directly to either side of the performer, giving the illusion of the animation and performer within the same space. (© Megan Beckwith.)

Tricking the brain tricks the person

The stereo image provides the visual system with artificial, deliberately manipulated, depth information. While we are usually aware, from the context of attending a 3D event and from understanding that the image contains manipulated depth information, that the apparent and real location of a stereoscopic image do not match, this conscious knowledge is often not sufficient to override the physical sensations initiated by mismatching visual and kinaesthetic positional information. This is why an audience often physically responds to the stereoscopic imagery with reactions such as reaching and grasping, jumping and flinching, or with not so pleasant responses such as motion sickness and tiredness. Stereographic film-maker Clyde Dsouza understands these perceptual effects as potential means of enhancing the affective power of a story. "A stereoscopic (3SD) movie is such a realistic optical illusion that it even activates our reflexes, this is why we flinch or duck when we see something "flying" out of the screen in a 3D movie. We don't usually have the same reaction in a 2D movie. So the main question I have to ask is… If S3D is an illusion that fools our brains into believing that what we see on a screen is real, can we use Stereoscopic 3D movies to heighten our psyche…heighten our subconscious? If this is possible…we have then discovered a new purpose for delving into this new art of visual story-telling"[14].

In contemporary dance the stereoscopic illusion provides a potential means of

Fig. 4. The animated lines and the performer move in common fate (© Megan Beckwith.)

Fig. 5. The animated bubbles confuse the common fate. (© Megan Beckwith.)

Fig. 6. The colour of the costume and animation draw the two elements together. (© Megan Beckwith.)

creating or manipulating emotional elements of a work through its ability to create strong perceptual reactions. The stereo image is not simply a passive stage dressing or a virtual prop, but can be a potent means of enhancing emotional effects within the performance. The stereo image has the ability to add a new dimension to the performance experience which, in their potential to provoke strong visual/embodied sensations, are not unlike Holms' "Frightful images" from the 1830s where the images were perceived as almost assaulting the audience [15].

Cognitive loading and Perceptual Organization

The stereoscopic images viewed alone can cause visual fatigue due to the disjuncture created between the visual functions of accommodation and convergence [16]. Including the stereoscopic illusion within the live theatre experience adds to the visual cognitive processes required of a viewer. The brain is required to synthesize left and right eye images and coordinate this information with object depth information derived from the accommodation system. This creates a mismatch, since the objects are in focus at the screen plane but appear to be located either in front or behind the screen plane. This information must then be integrated with visual information regarding the positioning of real bodies. In the stereographic theatrical scene, actual and virtual objects must be blended into a single percept, even though depth cues arising from the different kinds of visual information do not match. Combining these elements into one theatrical scene creates an unusual perceptual load.

Given the inherent disjuctures between the spatial locations of real and projected objects in stereoscopic theatre, there is potential for scenes to appear complex and confusing. Finding ways to assist the perception of a single, unified scene rather than a visually incoherent one is therefore important in this kind of work. In our experience, the potential for visual chaos is never far away in stereoscopic theatre, and it is therefore important to provide cues that can enhance visual coherence. Gestalt theory, since it deals specifically with creating perceptual wholeness, seems a good method for understanding how to create a more cohesive experience for the audience. The following discussion concerns the ways in which we have been able to map Gestalt perceptual principles to the process of making different elements of stereoscopic theatre appear congruent rather than dissonant, despite the inherent tension involved in presenting two different kinds of depth information within the same theatrical scene.

Gestalt

Famously, the Gestalt theorist Kert Koffka wrote in 1935 "the whole differs from the sum of its parts"[17]. Koffka was expressing the difference between what we look at in a scene and what we focus on when viewing an object within that scene. The Gestalt theorists developed a series of laws to describe this phenomena and based these laws on the nature of the mind to perceive patterns. These laws revolve around the notions of proximity, similarity, continuity and closure. The Gestalt grouping rules reflect visual regularities in the world and these rules have currency in the 3D stereoscopic theatrical environment. These ideas can help to facilitate a more cohesive viewing experience for the audience within a stereoscopic dance environment.

The examples below are from the development of stereoscopic theatre in particular contemporary dance.

Proximity

Often, within a stereoscopic performance, the audience doesn't know what to look at. The stereo image and the performer appear as different entities and not a cohesive work. The audience will look from one to the other rather then viewing the two elements as a scene. The Gestalt law of proximity can assist in the drawing together of the elements of the real figure and the virtual image. This law looks to the proximity of objects or elements. If objects or elements are near to each other they tend to be seen as a unit or one thing [18]. Making the stereoscopic image appear close to the performer will invariably draw the two different parts together. The dance work Bug [19] explores the idea of the post human through xeno – technology where the dancer becomes a Kafkaesque, part human, part insect monster, (see Fig. 2). It is through the use of proximity that the 3D animated image and the performer almost appear as one, chimera like.

Fig. 7. The dancer is placed within the animated scene to finish the line of good continuation. (© Artist Copyright Holder. Photo © Photographer.)

Common Region

Common region is a principle of perceptual grouping described by Stephen Palmer in 1992. Palmer's ideas on groupings take into consideration depth perception, the planes the objects appear to be on, and occlusion of objects. This principle takes into consideration 3D environments [20]. Getting the performer to appear to be on the same plane as the stereo object is difficult, because the dancer's real body becomes a depth cue within the space and the stereoscopic illusion can be lost. When the stereoscopic image occludes the performer the stereoscopic illusion is destroyed as the image rolls across the un-polarized body. This is not unlike a window violation but is referred to as a choreographic violation.

This problem of the depth cue and occlusion can be minimized when using animated particles. For example, in Fig. 3 the petals appear on different planes behind, in front and directly to either side of the performer. This gives the illusion of the performer existing within the same space as the petals [21]. The confusion created by the many petal particles also appears to cover the choreographic violation through a conflation of movement and texture within the space.

Common Fate

Common fate is 'when elements move in the same direction, we tend to see them as a unit' [22]. The most effective way of developing the effect of common fate in stereoscopic theatre is through the use of motion capture. Real time motion capture can create this appearance as the dancer and virtual object are essentially tied together. When objects and performers are choreographed on the same movement pathway the animated theatrical scene appears composed. However, when there are many animate objects connected to a performer it becomes confusing and the common fate becomes lost (see Fig. 4 & 5). In the first example, the animation and performer move in a line of common fate as a dance duo. In the second example the common fate is lost due to confusion arising from having too many objects within the space.

Similarity

Within the stereoscopic theatre environment the use of costume colour and animation texture is an effective way of creating similarity. The Gestalt similarity law 'describes why certain elements seem to go together', in particular how objects that are alike appear to be grouped together and therefore appear as a collective of things [23]. For example, objects of the same color and shape will appear grouped even if randomly placed.

Within this example (see Fig. 6) the costume of the dancer matching the animation makes the two elements of the real dancer and the virtual object and performer appear similar, and they then appear to operate within the same space or world. The color of lighting also draws the image and the performer together. In the 3D dance environment lighting can become a mediator between the real and virtual. In this performance the animated cups consistently fall around the dancer, ending with an avalanche of cups [24].

Good Continuation

Good continuation describes the phenomena when elements or objects which are set in a straight line or a smooth curve are likely to be viewed as a unit or one thing [25]. In choreography this principle is often used within a composition technique called cannon, where one element moves after another, giving the appearance of a continuing line. In this example (see Fig. 7) the dancer completes the smooth curve of the animation, creating cohesion and assimilation within the stereoscopic scene. In this scene from the work *Parallax* [26], the dancer explores inner emotional and outer physical viewpoints of the notion of perspective and placement. The dancer is placed within the animated scene to finish or complete a line or in contrast as juxtaposition.

Conclusion

With the use of projection technology becoming increasingly normalized within theatre, the stereoscopic illusion has the potential to become one of many techniques available to the theatre choreographer or director. We have found that using these principles in creating stereographic theatre can be an effective way to unite the perceptual world of the work despite the sensory dissonance in depth information. Our experience is that, though difficult to achieve and by no means fool-proof, using the perceptual organization ideas described by the Gestalt theorists provides an approach to creating cohesive stereographic theatre scenes.

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References and Notes

1. James Cameron, *Avatar* (2009), film.

2. Baz Luhrmann, *The Great Gatsby*, (2013) film.

3. 3D Broadcast of Donizetti's Lucrezia Borgias 2011, television broadcast, Sky Arts and the English National Opera, London, Feb.13, 2011.

4. Wim Wenders**,** *Pina* (2011), film.

5. Monika Pölönen, Marja Salminaa, Viljakaisa Aaltonen, Jukka Hakkinen, Jari Takatalo, "Subjective measures of presence and discomfort in viewers of color separation based stereoscopic cinema." Journal of the Society for Information Display 17.5 (2009) pp. 459-466.

6. Laurens Hammond, "*Process of and Apparatus for Exhibiting Stereoscopic Shadowgraphs or Silhouettes*." Patent No. 210,411, United States, (January 1923)

7.Kazuhiko Uka, PeterA. Howarth, "Visual fatigue caused by viewing stereoscopic motion images: Background, theories, and observations."Sicence Direct Displays 29 (2008) pp. 106-116

8. J. Rule, *Letter to Mr. J A. Norling, in Stereoscopic Cinema and the origins of 3-D Film 1838 – 1952*, M. J. A. Norling, eds. (New York: The University Press of Kentucky, 1952) pp. 186 - 187.

9. C. Wheatstone, "Contributions to the Physiology of Vision. - Part the First. On some remarkable, and hitherto unobserved, Phenomena of Binocular Vision," *Philosophical Transactions of the Royal Society of London*, (1838) pp. 371 -394

10. Oliver Wendell Holmes, "*The Stereoscope and the Stereograph*," *Atlantic* **3** (June 1859) pp. 738 – 748.

11. Holmes [6] pp. 738 -748.

12. Ray Zone, *Stereoscopic Cinema and the origins of 3-D Film 1838-1952* (University Press of Kentucky, 2007).

13. The Cornell Daily Sun, Volume XLIX, Number 180, 28 May 1929, "Padlocks of 1929, "Pretentious Revue Coming to the State, Largest Vaudeville Act on Tour (Article)

14. Clyde Dsouza, *Think in 3D: Food for Thoughts for Directors, Cinematographers and Stereographers*. (Clyde Dsouza, 2012*)*

15. Holmes, [6] pp. 738 -748.

16. Kazuhiko Ukai, Peter A. Howarth. "Visual fatigue caused by viewing stereoscopic motion images: Background, theories, and observations." *Displays* 29. 2 (2008) pp.106-116.

17. Kurt Koffka, Principles of Gestalt Psychology, (1935). http://www.gestalttheory.net/cms/uploads/pdf/archive/1934_1960/Principles_Gestalt_Psychology_koffka.pdf

18. H. J. Foley, M.W. Matlin, Sensation and Perception. (Bosten, Allyn & Bacon, 2010.) pp 121

19. Megan Beckwith, *Bug*, Allan's Walk Artist Run Space, artistic residency, 2007

20. Stephen Palmer, Common Region: A New Principle Grouping, *Cognitive Psychology* **24** (July 1992) pp. 436 – 447

21. Megan Beckwith, *Parallax*, The Substation, Melbourne Fringe Festival, 2013

22. Foley & Matlin, [15] pp. 121

23. Foley & Matlin, [15] pp. 121

24. Megan Beckwith, Time for Tea, The No Vacancy Gallery Space, The Melbourne Fringe Festival, 2011

25. Foley & Matlin, [15] pp. 121

26. Beckwith [18]

BABY X:
DIGITAL ARTIFICIAL INTELLIGENCE, COMPUTATIONAL NEUROSCIENCE AND EMPATHETIC INTERACTION

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Abstract

As a new media curator, I work with artistic practices that engage multi-sensory media environments. *Baby X* is a digital artificial intelligence mixed reality installation created by Dr Mark Sagar. It is concurrently a neuro-behavioural computational model with emergent behaviours actively being used for neuro-scientific research and, at times, a media art installation on public display. This paper will explore some of the diverse issues at play in this project from the perspectives of embodied cognition, emotional engagement and perception within a mixed reality environment and trans-disciplinary research context.

Key Words: media art installation, mixed reality, embodied cognition

Fig 1. Sagar, M with Laboratory for Animate Technologies, Auckland Bioengineering Institute, *Baby X* (snapshot), autonomous animation, 2013 (© Mark Sagar).

Introduction

In the Laboratory for Animate Technologies at the Auckland Bioengineering Institute at University of Auckland, Dr Mark Sagar and his team are building a computational model of the brain and face. The model is constructed using current neuro-scientific research sourced through collaboration with the university's Centre for Brain Research.

Sagar has developed a unique aspect of this research project: *Baby X*, a mixed reality installation for display in public settings including museums and galleries. When installed the work, *Baby X*, is essentially an interactive media art installation, containing both scientific and artistic content. *Baby X* invokes a number of challenges to the new media curator in terms of contextualization, presentation and audience engagement. The work traverses a diverse disciplinary territory, it has a complex technical nature, it raises specific debates concerning embodied cognition and neuro-behaviours, it is displayed in both scientific and artistic venues and has a wide and deep collective and specialised research culture supporting its ongoing evolution.

Having come from the animation film and entertainment industries, Sagar's research interests include developing a universal system for mapping faces including morphology, anatomy and biomechanical modeling. Accordingly he analyzed the muscular facial control system and began investigating the emotions and neuro-behaviours driving character expression. This led, in turn, to the current project to create a neuro-behavioural computational model with emergent behaviours.

Baby X as interactive media art installation

In a typical 'media art' installation *Baby X* exists within a standard black box gallery environment. Upon entering the exhibition, the audience sees a large screen on which the face of an animated child is projected, disembodied, larger than life and floating against a black background. This autonomous animation is capable of responsive behaviours through a variety of camera-based sensor tracking systems aimed at monitoring eye and individual body movement of the viewer. The child follows their actions and movements, often engaging through direct gaze, and displaying realistic behaviours such as smiling, crying, confusion and abandonment. The child's character is based on Sagar's own six-month-old baby and is therefore pre-verbal.

Linked to the autonomous child animation, separately screened, is a real-time neural simulation. In a live neural network, representations of muscular anatomy through to the neuronal activity and neuromodulator levels can be viewed. It is possible to follow live stimuli through the responsive neural pathways and through this simulation gain understanding of neural networks. Thus, *Baby X* brings into play an oscillation between character, neurobiological representation and digital artificial intelligence. Digital artificial intelligence in this sense is a simulated virtual biology based on life-like behaviours. Digital artificial intelligence in the case of *Baby X* can be encapsulated, as Shanken has described, as "synthetic biology". [2]

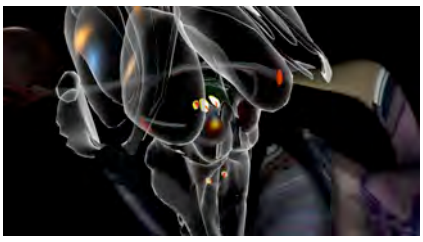

Fig 2. Sagar, M with Laboratory for Animate Technologies, Auckland Bioengineering Institute, *Baby X* (animation still), autonomous animation, 2013. (© Mark Sagar).

Baby X, trans-disciplinary research and collaborative modular construction

In this sense, *Baby X* digitally simulates a synthetic biology through representing neurobiology generated from algorithmic functions. This project is made possible by its trans-disciplinary research basis. *Baby X*, as a work, crosses across disciplinary boundaries, being of interest to the arts, sciences and bioengineering. Mark Sagar as a practitioner is variously artist/animator, designer and bio-engineer.

This trans-disciplinarity is reflected in its design framework. *Baby X* is constructed of 'neural building blocks'. It is built to be both modular and to accommodate the needs and interests of diverse research communities. As Sagar states: "We are building a collaborative modular model of the face and brain, a brain and face Lego with swappable and reshapable parts" [3].

The methodology of neural modular architecture is supported by Grand who proposes that: "Nature, then, seems to work with three fundamental neural architectures to solve the problems of behaviour and control. The first and

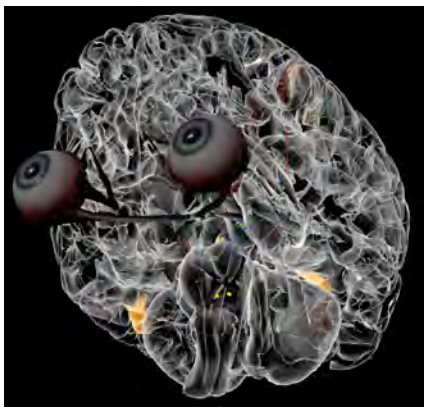

Fig 3. Sagar, M with Laboratory for Animate Technologies, Auckland Bioengineering Institute, *Baby X* (animation still), autonomous animation, 2013 (© Mark Sagar).

simplest is to use the neuron itself as a basic building block in relatively simple networks … The second is to use repeated circuits of neurons, .. as the basic building blocks.' The third neural architecture is a higher-level building block that 'has the capacity to reconfigure itself during the creature's lifetime.' He postulates a fourth, volitional level of brain structure that may control the 'flow of signals around groups of pre-existing self-configured maps in a highly flexible and general-purpose way.'" [4] It is this modulated and fundamentally flexible design and construction premise that is at the base of *Baby X's* computational model.

Fig 4. Sagar, M with Laboratory for Animate Technologies, Auckland Bioengineering Institute, Baby X (animation still), autonomous animation, 2013 (© Mark Sagar).

Recently, Sagar collaborated with Angus Kerr and Rita Soromenho to create an architectural pod to display *Baby X*, and with Murray Fisher to compose sound. The architectural housing expands the emotional and physiological states of the brain through an embedded network of fibre optic cables and LED strips creating a virtual nervous system. Sound, generated live through a synthesizer MIDI system, composed by Fisher and developed by Ricky Huntington, reflects, through major and minor chord changes and tempo, the shifts in state. As Sagar explains, "The idea is to create 'emotional amplification' through simultaneous and correlated expressive modalities (facial behaviour, expression, music and light)." [5]

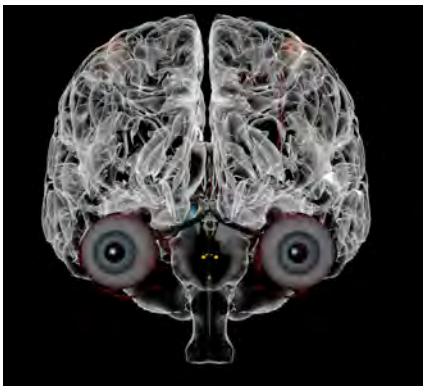

Fig 5. Sagar, M with Laboratory for Animate Technologies, Auckland Bioengineering Institute, Baby X (animation still), autonomous animation, 2013 (© Mark Sagar).

Baby X, empathetic engagement and emergent behaviours

In a recent public exhibition, when *Baby X* was displayed for the first time in the specially designed pod, many of the viewers experienced an empathetic connection to the character. The intensified conditions of exhibition magnifying the brain states caused an emotional and responsive rapport between viewer and character.

With repeated use, the character develops richer and more complex responsive behaviours. At this early stage of development the model already displays emergent behaviours. This aligns with Seaman's definition of neosentience – "The N_S.E.N.T.I.E.N.T. Paradigm' comprising the various characteristics of being Neosentient; Self-organising; Environmentally embedded; Nascent; Temporal; Intra-active; Emergent; Navigational; Transdisciplinary.'

The model could be described as having the capacity to focus 'on the theoretical relations between cognition (top-down processing) and perception (bottom-up processing)". [6]

Fig 6. Sagar, M with Laboratory for Animate Technologies, Auckland Bioengineering Institute, Baby X (animation still), autonomous animation, 2013 (© Mark Sagar).

In the act of viewing this mixed reality installation, conditions of cognition and perception from the audience perspective, arise. Like many media art installations, *Baby X* contains both virtual and real elements. Existing within a mapped space monitored by sensors, *Baby X* requires the viewer to engage with the character in order to enact the process of viewing. As Kathy Cleland states: "We are now living in a mixed reality paradigm where the real and the virtual, the natural and the artificial blend and intermingle in complex ways" [7]. The combination of real-time interaction, immersive conditions of viewing and the character's frequent direct gaze result in an installation that is emotionally engaging.

Additionally, this replicates recent neuro-scientific research regarding mirror neurons. "Experiments show that areas of the brain collectively known as the mirror neuron system respond not only when individuals perform and action themselves but also when they watch someone else perform that action … Similarly watching someone cry, being hit or expressing emotion can trigger empathetic mirror neuron responses so that those actions and responses are experienced by the person watching." [8]

In the real-time of media installations, the audience, in the act of experiencing and discovering the installation through sensing, movement and feeling, develops understanding through assimilating the space of the installation, the body and the mind. Mixed reality installations require embodied cognition. [9] As Chris Salter observes: " … perception is not representation but action – a direct projection of the body into the environment and an ongoing 'probing' of that environment with the sensor and motor capabilities of the active body." [10] *Baby X* is a curious work as it activates an exchange between viewer and virtual, 'probing', surface and varying degrees of micro layers, reciprocal emotion and gesture. Through the virtual and actual interrogation of interaction and perception in the process of experiencing the work, an interesting dialogue between cognitive neuroscience, computational neuroscience and embodied cognition emerges for the viewer.

Baby X as scientific research tool

As mentioned earlier, *Baby X* is also a scientific research tool. The Laboratory

for Animate Technologies is part of the larger Centre for Brain Research at the University of Auckland. Current research within this centre involves over 40 research teams and more than 200 researchers deployed across the university. Each research team specializes in one of four areas – clinical neuroscience, cognitive and computational neuroscience, molecular and cellular neuroscience and sensory and motor neuroscience. The Laboratory for Animate Technologies is located within the cognitive and computational neuroscience research strand.

In terms of disciplines, this collaborative computational modelling research initiative involves staff and students from computer science, architecture, neuroscience, engineering, psychology and the arts. It is in essence a trans-disciplinary research project integrating various disciplines, processes, perspectives and frameworks and is actively creating new understandings as a result.

This can be seen in the overall computational neuroscience research project that is currently exploring both theories of brain function and brain disorder. For example the effects of synthetic lesions or damage to key circuits due to conditions such as Huntington's or Parkinson's disease can be visualized both schematically and also in the way they affect the animation of the computational modelling that is an aspect of *Baby X*.

Applications for the computational model range far beyond medical research parameters and extend to commercial applications including gaming and film markets. In the entertainment industries, there is an increase in demand for realism and a desire to automate elements of the animation process and to create fully autonomous characters. These applications require a particular focus on facial features in terms of developing a dynamic character that includes capabilities of communication, identity, emotion and intent. Consequently the Auckland Face Simulator project, led by Mark Sagar with an investigative research team comprising of Associate Professor Paul Corballis, Dr Benjamin Thompson and Dr Jason Turuwhenua, was established. Research has been initiated where experiments involving animation, psychology and visual neuroscience are underway.

Baby X is a complex work intertwining and challenging disciplinary boundaries within rich scientific and artistic contexts. As a computational model with emergent behaviours it raises interesting content for analysing our relationships between the virtual and the real. As a computational neuro-scientific project it facilitates an ongoing analysis of emotional, sensing and perceptual functions of a simulated brain. As a project that has an ongoing development and research programme, it has particularly curious applications and possibilities for future experimentation. In its immersive media installation context, it enables a potent dialogue between embodied cognition and simulated computational neuroscience. In addition, the amplification of the emotional intensity of the work, through design, causes an empathetic audience interaction with the autonomous animated character and vice versa. This expanded context generates a complex territory for facilitation, research and curatorial practice.

References and Notes

1. Observations, contained in this paper *Baby X*, form the basis of a Doctorate within the College of Fine Arts, University of New South Wales and the National Institute of Creative Industries, University of Auckland. The creative practice component includes formation of a trans-disciplinary research group and staging exhibitions and symposia from 2014-2016. I acknowledge the support of the University of New South Wales and the College of Fine Arts.

2. E. Bartlem. "Immersive artificial life (A-life) art", *Journal of Australian Studies*. (2005). 28:84, p. 98.

3. "Making computer animation more human". University of Auckland press release (8 March 2012). http://www.abi.auckland.ac.nz/uoa/home/about/our-research/projects/animate-technologies

4. Grand quoted in J. Johnston. *The Allure of Machinic Life. Cybernetics, Artificial Life, and the New AI*. (USA: MIT Press, 2008). pp. 405-406.

5. M. Sagar. Personal communication. (September 2013)

6. B. Seaman & O. E. Rossler, *Neosentience: The Benevolence Engine*, 5th Ed. (Chicago, USA: University of Chicago Press, 2011). Kindle p. 17-19.

7. K. Cleland. "Mixed reality interaction: audience responses to robots and virtual characters", *Digital Creativity*. (2010). 21:1. p. 30.

8. K. Cleland. [8] p. 35

9. D. Lawler-Dormer. "Sensing Sites: Contemporary media art installation by Turner, Lyons and Sagar as cross-modal sensory experimentation and multimodal interaction." *Re-New 2013 Conference proceedings.* (October 29 – 31 2013). In press.

10. C. Salter. "The Question of Thresholds: Immersion, Absorption and Dissolution in the Environments of Audio-Vision". In Daniels, D., Naumann, S.; with Thoben, J (eds): *See this sound: Audiovisuology essays 2: histories and theories of audiovisual media and ar*t. Koln, Germany: Verlag der Buchhandlung Walter Konig. (2011). pp. 200-235

COMMUNITY MAPPING:
FROM REPRESENTATION TO ACTION

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Abstract

Community mapping is an approach to spatial representation that promotes a sense of agency and active engagement by encouraging "bottom-up" participation by users and community groups. Reviewing the place-based work of an earlier generation of geographers, environmental writers, and artists, the paper provides a context for understanding contemporary mapping utilizing geo-technologies such as "locative media." The author concludes that technologically empowered artists, partnered with specialists engaged in place-based research, can translate objective representations of place into socially engaged action.

Keywords: community mapping, sense of place, psychogeography, site-specific art, relational aesthetics, locative media, GPS, socially-engaged art.

Community Mapping

Community mapping, can be defined as a place-based approach that supports participatory action at the community level. It inverts the traditional "top-down" approach to mapping by:

1. incorporating local knowledge
2. integrating and contextualizing spatial information
3. allowing participants to dynamically interact with input and analyze alternatives.

As distinct from more traditional mapping processes that attempt to objectify and quantify a given locale or condition, community mapping can be seen as promoting a sense of agency and active engagement by encouraging "bottom-up" participation by users and community groups. Constructing an effective community map can lend visual clarity and authority to socially engaged art practices.

Deconstructing the Map

The recent history of cartography and geography has seen a full scale revolt against mapping methodologies that claim to be accurate representations of the world.

Maps are seen as active agents that help to preserve the status quo or catalyze change. While cartography as a discipline can represent place by literally reflecting "the lay of the land," maps also play a crucial role in representing socially constructed views of place—what Harley characterized as "expressions of power and knowledge" [1]. A map has the capacity to represent diverse cultural, political, ideological, class, and gender views [2]. Theorists such as Denis Wood [3], John Pickles [4], and Rob Kitchin and Martin Dodge [5] have demonstrated the ideology inherent in maps (or their *second text*) and how maps *lie* (or at least provide selective stories) due to the choices and decisions that have to be made during their creation, and how they are read by users. In increasingly pluralist societies, maps and geographic information help communities coalesce by delivering usable products and by building both spatial and human relations [6]. Maps can also add form to individual and collective reality and stimulate curiosity about the unknown [7]. Whatever else they are, maps are rarely to scale and they are never value neutral. They are constructed texts that can be read historically, socially, culturally, and psychologically.

John Brian Harley, for example, builds on the post-structuralist ideas of Michel Foucault and Jacques Derrida to argue that the process of mapping is not a neutral, objective pursuit but rather one laden with power. He contends that the process of mapping consists of creating, rather than simply revealing, knowledge. In the process of creation many subjective decisions are made about what to include, how the map will look, and what the map is seeking to communicate. As such, Harley notes, maps are imbued with the values and judgments of the individuals who construct them and they are reflections of the culture from which they emerge [8].

Historically, maps have been constructed by those in power. Communities—neighborhoods, local populations, cities and regions—are seldom engaged in representing their own circumstances. Communities that are empowered to make their own maps are communities that have a voice at the table and are engaged in a powerful form of self-representation.

To understand the relationship of traditional "maps" to those representations that truly engage "places" at the service of communities, it is helpful to make a fundamental distinction between "space"—as in a mathematically informed spatial description—versus the "lived experience" that characterizes "place."

Place vs. Space: A Brief History

Blending philosophy and geography, Edward Casey, the eminent phenomenologist at State University of New York at Stony Brook, identified a tension—dating at least back to Plato and Aristotle—between Platonic notions of place that reduce certain *primal regions* to simple geometric portraits, and Aristotelian notions of place that are rooted in *pre-metric phenomenon.* Where Plato, in his *Timaeus,* closely identified *place* with the abstract concept of *space,* Aristotle, in his *Physics,* shifted attention away from place as geometry (only) and argued for a fuller account that captures the inner essence and body-felt power of place [9].

Today, a useful description that moves beyond the contested distinctions between space and place can be summed up in the simple equation: "space + meaning = place" [10]. *Space* is the abstract perception of the world around us and *place* is space as lived and experienced. Where the concept of *space* encourages a purely mathematical description (Cartesian or otherwise), *place* requires a more phenomenological, body-centered orientation. Casey (and Aristotle) would argue that space refers to objective geometrical extension and location, and that place describes our subjective experience of being in the world and investing a physical location or setting with meaning, memories, and feeling [11]. This essentially Aristotelian idea echoes the conclusions of many field-based studies and locational media projects that have taken a second (and third) look at specific landscapes. In the book *Third Views, Second Sights*, which details the ongoing Rephotographic Survey project of the American West by teams of photographers, project leader Mark Klett writes that "the intimate knowledge of a region by its residents has changed the once common view that the West is empty geography" [12]. The purely instrumental goals of spatial description —the *objective* basis of much of western science—give way to a deeper *place-based* understanding informed by generations of human experience.

Yi-Fu Tuan, another pivotal geographer/philosopher, focuses on human experiences and connections to places. His work provides a solid grounding for understanding the concept of place as a humanistic construct. Tuan's experiential perspective describes place as created by the process of human experience in a physical space. This process is explained through four layers of human experience: physical, social, personal, and cultural [13].

More recent articulations of *place* have laid emphasis on *situated communities* and their relationship to the natural environment. Here our "subjective experience of being in the world" is expanded to include our embeddedness in communities.

> Sense of place includes how well the community is situated within the natural environment in which it is located; how well it relates to and exhibits its historical and cultural development and uniqueness; and how the people within the community live lives that reflect a sense of community cohesion and purpose [14].

While Lew's definition of *sense of place* may impose impossible demands on communities—which are often conflicted, and manifest contradictory missions—it does offer a kind of rubric for balancing a given community's drive towards growth and change with sustainable models more in harmony with its cultural legacy and the natural environment.

This layered web of interactions is echoed by a number of well-known environmental writers such as Wendell Berry, Wallace Stegner, Barry Lopez, Annie Dillard, and Aldo Leopold.

Less acknowledged is the engagement by visual and performance artists, poets, and technologists in exploring the intersection of the body, geography, and community.

The Mapping Impulse in Art

Starting in the 50s, and reaching full flower in the 60s and 70s, artists engaged in performative practices that explored territories outside the confines of the traditional (commercial) gallery. Their own bodies provided the referent to engage real spaces—from untouched wilderness to the urban jungle.

In the 50s, the Situationist International (SI), a political and artistic movement organized by Guy Debord and his colleagues and represented by a journal of the same name, invented a series of techniques for engaging in class struggle by reclaiming individual autonomy from "the spectacle**"** (contemporary consumer culture and commodity fetish) [Fig. 1].

Debord and his cohorts gave the methodology of *psychogeography* a quasi-scientific status in order to oppose, in part, the rationalized, Corbusian-style town planning of post-war Europe [15].

Psychogeography is an approach to geography that emphasizes playfulness and "drifting" around urban environments (the *dérive*). It was defined in 1955-56 by Guy Debord as "the study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals" [16].

The Situationist's work in psychogeography laid the conceptual foundation for a generation of experimental artists who embraced "walking" as a central part of their practice—artists such as Peter d'Agostino, Richard Long, and Vito Acconci.

In his early, performance-based work from 1973-74, Peter d'Agostino experimented with perceptions of landscape, time, and point of view. *The Walk Series* documents three different "walks" (on a roof, a fence and a beach) that the artist took in the San Francisco area, while recording with a hand-held camera. These excursions — recorded in real-time and unedited — map the parameters of the artist's environment, as d'Agostino uses video to redefine the landscape in his own image [17].

Where d'Agostino's work is mediated by the camera, and is generally experienced as a video recording, the famous walks of Richard Long are minimalist traces that require a leap of the imagination for the viewer to participate [18]. His insistent lines and circles, hand drawn on maps and often reconstructed in galleries, anticipate, record, and serve as documentation of his walking meditations and gestures.

The private nature of these works point to an intensely personal and meditative experience. Broader social and pressing environmental concerns soon became the focus of many artists, however.

While echoing the social movements of the 60s, the 80s and 90s saw a turn toward the social and political in the work of many artists. Projects such as *7000 Oaks* by Joseph Beuys (1982) and *No Blood, No Foul* by Suzanne Lacy (1995-96) set the stage for what theorist Nicolas Bourriaud called, in 1996, *relational aesthetics* —"a set of artistic practices which take as their theoretical and practical point of departure the whole of human relations and their social context, rather than an independent and private space" [19].

In 1982 Beuys was invited to create a work for *Documenta 7*. He delivered a large pile of basalt stones and announced that the stones would mark the planting of 7000 oak trees around the city of Kassel, Germany. The goal of the project — a work, in Beuys's words of "social sculpture" — was nothing less than to affect long term environmental and social change.

Many artists in the past decade have found ways to combine intensely personal, embodied experiences with work that is "activist" in nature and seeks, if not "social change," an awareness of intractable social, political, and environmental issues.

In June 2005 Francis Alÿs walked from one end of Jerusalem to the other, a distance of 15 miles, carrying a can filled with green paint. The bottom of the can was perforated with a small hole, allowing the paint to dribble as a continuous trace on the ground as he walked.

His walk followed the line demarcating the armistice after the 1948 Arab-Israeli War. The original "Green Line," negotiated by Moshe Dayan, commander of the Israeli forces in the Jerusalem region, and Abdullah al-Tal, representing the Arab Legion, has since been considerably altered on the ground, the shifting border reflecting the irreconcilable difference of two peoples [20].

While Alÿs resists taking an overt stand, the work is hardly neutral. Combining in a sense the respective legacies of early performance art with the social conscience of a Beuys or Lacy, he creates a metaphor about history with his body, what Holland Cotter called "a separatist symbol, both triumphant and oppressive" [21].

This engagement of urban space, while evoking the early experiments of the Situationists, suggests a more activist position, one that acknowledges and encourages participation by real people in real places. It also finds a kindred spirit in the work of Simon Pope.

One of Pope's recent projects, *Memory Marathon*, reflects on the enduring importance of personal recollection during times of major cultural and political change. On November 7, 2009, Pope walked 26 miles in twelve hours through the five East London boroughs hosting the 2012 Olympic and Paralympic Games. Starting out at dawn from Thamesmead in south-east London, and arriving twelve hours later at the entrance to Olympic Park in Stratford, Pope accompanied over a hundred local residents through Greenwich, Newham, Tower Hamlets, Hackney and Waltham Forest. In an unbroken relay, in which each resident walked a 400-metre section of the 26-mile route alongside Pope, they were asked to speak about a personally significant moment from Olympic histo-

ry, before passing the microphone to the next person [22].

Locative Arts and Media

Over the past decade, developments in geo-technologies along with the availability of low-cost, light weight hand-held devices, have laid the foundation for an entirely new genre of interactive media called *locative media* [23] or, alternatively, *locative arts* [24]. Whatever the appellation, the idea has taken root in participatory culture and socially engaged art, emphasizing the linkage between social networks and the geographical context of media. The technology enables experiential mapping and geo-spatial annotation to produce online applications that support geographically "located" communities.

Combining the idea of the personal walk with these new technologies, Christian Nold's *Emotion Map* presents the individual's subjective state, measured using Galvanic Skin Response as an index of arousal, within a GPS map. Each map is a personal record of an emotional as well as a physical journey [25].

An earlier instance of locative media in 2002 by Dutch artist Esther Polack and the Waag Society created a precedent for this kind of GPS enabled *dérive* to create both individual records of people's peripatetic walks of Amsterdam, and aggregated maps that effectively illustrated the "city drawing itself" [26].

Teri Rueb has constructed a body of work utilizing GPS to activate "sound walks" that draw visitors into intimate relationships with various landscapes.

In a recent work at the Institute for American Indian Art in Santa Fe, Rueb and her team created a GPS-based sound walk and sculpture installation that explored the concept of wilderness and its shifting meanings across cultural contexts. Entitled *No Places With Names*, the sound walk premiered at ISEA 2012 [27].

The work of sound artist Yolande Harris offers a challenge to the assumption that there is a one to one relationship between "location" and "position" via GPS. In her work *Sun Run Sun*, she investigates navigation through the use of sound by charting a path between embodied experience and the drifting calculations of GPS satellites. A continuously changing musical composition is generated from signals of navigation satellites in orbit, together with the participant's coordinates on earth [28].

Adding additional layers of GPS enabled sensory input is the work of Meredith Drum. Her work *Oyster City* is an augmented reality, mobile media walking tour and game which guides participants along branching story paths through lower Manhattan and around Governor's Island. Produced collaboratively by Drum, Rachel Stevens and Phoenix Towes, the piece explores urban history with a focus on oysters.

The work allows participants to explore GPS anchored augmented reality assets as a way of experiencing the urban water's edge and enables not only GPS placement of text, images and sounds, but also touch, orientation, and movement events, allowing the participant to act as a performer as well as a viewer [29].

For all the promise of locative media, some critics have already identified the dark underbelly of the technology. Brian House and his colleagues at the Research and Development Lab at New York Times Company have created *OpenPaths*, a platform and a model that demonstrates the collective value of personal data sovereignty. House writes:

> The collection of personal geographic data from mobile devices is a ubiquitous practice of service providers and application developers. These data are being stored, analyzed, and monetized primarily by corporate interests; there is limited agency for individuals over their own data [30].

For House, a critical question remains:

> How can we seat the individual in a mode of control over personal geographic narratives in a society in which locative media has become banal [31]?

Community Mapping and Socially Engaged Art

Locative media is being used to develop community maps that aid environmental protection and restoration, track human health trends, and serve poverty alleviation projects seeking to comply with international law for human rights. Locative media, in concert with community maps, can serve neighborhood groups in formulating action agendas and making their case to elected officials and policymakers. The strategy can reveal the stories of place that remain invisible to the casual observer. It can provide a matrix for organizing, tracking and growing socially engaged art practices.

Sauti ya wakulima, "The voice of the farmers," is a collaborative knowledge base created by farmers from the Chambezi region of the Bagamoyo District in Tanzania [Fig.2] with assistance of a group of artists and technologists. The farmers use a laptop computer and a 3G Internet connection to view the images and hear the voice recordings that they posted during the week. They also pass the two available smartphones on to other participants, turning the phones into shared tools for communication. The smartphones are equipped with GPS modules and an application that makes it easy to send pictures and sounds to the Internet. The farmers at Chambezi use them to document their daily practices, make reports about their observations regarding changes in climate and related issues, and also to interview other farmers, thus expanding their network of social relationships [32].

Jeanette Hart-Mann and Chrissie Orr have created another project that incorporates community mapping practices. In their words, *Seed Broadcast*

> is a collaborative project exploring grassroots seed action through collective inquiries and hands-on creative practices. Throughout the year, the team gathers to discuss critical issues surrounding seed and food sovereignty, visit local farms and gardens to experience what is happening in the field, and engage in creative projects, to dig deeper into the real how-to's of local agri-culture [33].

A website and online map geo-locates their growing web of partners and seed banks across North America.

In a recent project of my own, I have organized a collaborative undertaking focused on the future of the Colorado River.

The *Colorado River Re-Storied* is a collection of "stories of place" shared by individuals with personal experience, distant love, or professional involvement with the Colorado River and the entire Colorado River watershed. Our goal is to "re-story" the landscape of the Southwest by helping to describe, re-store, and re-discover the hidden or lost cultural practices and pragmatic wisdom of the Colorado River —and provide alternatives scenarios for the future.

My collaborators, Meredith Drum, Helen Rowe, Eric Margolis, Kaard Bombe, Shaun Ylatupa-McWhorter, and I believe that a collection of short, first-person accounts will not only give voice

and expression to the uniqueness and hidden potentials of the River, it will catalyze a conversation focused on sustainable solutions for preserving and protecting this most precious life-line for future generations. We consider this work a "community map" in that it provides a collective portrait of place — in this case, the 1450 mile reach of the Colorado River [34].

Conclusion

Putting mapping tools in the hands of artists helps to capture the complexity of a given place—including nuanced descriptions of physical settings, evidence of lived experience, and creative interactions with communities. Technologically empowered artists, partnered with specialists engaged in place-based research, can translate objective representations of place into socially engaged action.

References and Notes

1. John Brian Harley, "Deconstructing the Map," *Cartographica, 26* (1989) pp. 1-20.

2. Sonia Talwar, *Spatializing Science and Technology Studies: Exploring the Role of GIS and Interactive Social Research.*, PhD Dissertation, (Vancouver: UBC, 2008) <https://circle.ubc.ca/bitstream/2429/755/1/ubc_2008_spring_talwar_sonia.pdf>.

3. Denis Wood, *The Power Of Maps* (New York: The Guilford Press, 1992).

4. John Pickles, *A History of Spaces: Cartographic Reason, Mapping, and the Geo-Coded World* (London: Routledge, 2004)

5. Rob Kitchin and Martin Dodge, "Rethinking Maps," *Progress in Human Geography*. *31*(3) (Beverly Hills, CA: Sage Publications, 2007) pp. 331-344.

6. W.J. Craig, and S. Elwood, "How And Why Community Groups Use Maps And Geographic Information," *Cartography and Geographic Information Systems*, 25(2) (1998) pp. 95-104.

7. Doug Aberley, *Boundaries of Home: Mapping for Local Empowerment* (Gabriola Island, BC: New Society Publishers, 1993).

8. Harley [1] pp. 1-20.

9. Edward. S. Casey, *The Fate Of Place: A Philosophical History* (Berkeley, CA: University of California Press, 1997).

10. S. Harrison and P. Dourish, "Re-Place-ing Spaces: The Roles of Place and Space in Collaborative Systems," *Computer Supported Cooperative Work* (Cambridge, MA: ACM, 2006).

11. Casey [9].

12. Mark Klett et al, *Third View, Second Sights: A Rephotographic Survey Project of the American West* (Santa Fe, NM: Museum of New Mexico Press, 2004).

13. Yi-Fu Tuan, *Space And Place: The Perspective Of Experience* (Minneapolis: University of Minnesota, 1977).

14. Alan Lew, "What is Geography?" *Geography:USA* (Northern Arizona University, 2008) <http://www.geog.nau.edu/courses/alew/gsp220/text/chapters/ch1.html>.

15. Tim Abrahams, "Chronicles of the City," *Blueprint*, (2009) <http://www.timabrahams.net/article.php?uid=61>.

16. Guy Debord, "Theory of the Dérive, *Les Lèvres Nues* #9 (Belgium: November 1956) <http://www.bopsecrets.org/SI/2.derive.htm>.

17. Peter d'Agostino, *The Walk Series* (1973-74) <http://www.temple.edu/newtechlab/esky/Walk.html>.

18. Rebecca Solnit. *Wanderlust: A History of Walking* (New York: Viking, 2000).

19. Nicolas Bourriaud. *Relational Aesthetics* (Dijon: Les Presses du Réel, 2002).

20. Francis Alÿs, *The Green Line* (2005) <http://francisalys.com/greenline/rima.html>.

21. Holland Cotter, "Thoughtful Wanderings of a Man With a Can," *New York Times* (New York: NY Times Company, March 13, 2007) <http://www.nytimes.com/2007/03/13/arts/design/13chan.html?_r=0>.

22. Simon Pope, *Memory Marathon* (2009) <http://www.fvu.co.uk/projects/details/memory-marathon/>.

23. Jillian G. Hamilton, *Ourplace: The Convergence of Locative Media and Online Participatory Culture.* In: The Proceedings of OZCHI 2009, November 23-27 (Melbourne, Victoria: The University of Melbourne, 2009).

24. Drew Hemment, *Locative Arts* (August 2004) <http://socialinterface.files.wordpress.com/2007/12/locativearts.pdf>.

25. Stephen Boyd Davis, "Mapping the Unseen: Making Sense of the Subjective Image," In C. Nold (Ed.), *Emotional Cartography* (http://www.softhook.com: 2009) pp. 39 – 52 <www.emotionalcartography.net.>
.

26. Esther Polack, *Amsterdam RealTime* (2002) <http://www.polakvanbekkum.com/done/major-gps-projects/amsterdamrealtime/>.

27. Teri Rueb and Larry Phan, *No Places With Names* (Institute for American Indian Art: 2012) <http://www.terirueb.net/place_names/>.

28. Yolande Harris, *Sun Run Sun* (2007 – 2009) <http://yolandeharris.net/?nk_project=sun-run-sun>.

29. Meredith Drum, *Oyster City* (2012-2013) <http://meredithdrum.com/work/oyster-city>.

30. Brian House, *OpenPaths* (2011 – 2013) <http://blog.brianhouse.net/post/52831575918>.

31. House [29].

32. Eugenio Tisselli, Juanita Schläpfer, Angelika Hilbeck, *The Voice of the Farmers* (Tanzania, Africa: 2012) < sautiyawakulima.net>.

33. Jeanette Hart-Mann and Chrissie Orr, *Seed Broadcast* (2011 – 2013) <http://www.seedbroadcast.org/SeedBroadcast/Seed_Broadcast.html>.

34. Dan Collins, *The Colorado River Re-Storied* (2013) <http://coloradoriverstories.org>.

Fig. 1. Guy DeBord, *Guide Psychogeographique de Paris* (Denmark: Permild & Rosengreen, 1955?), cover.

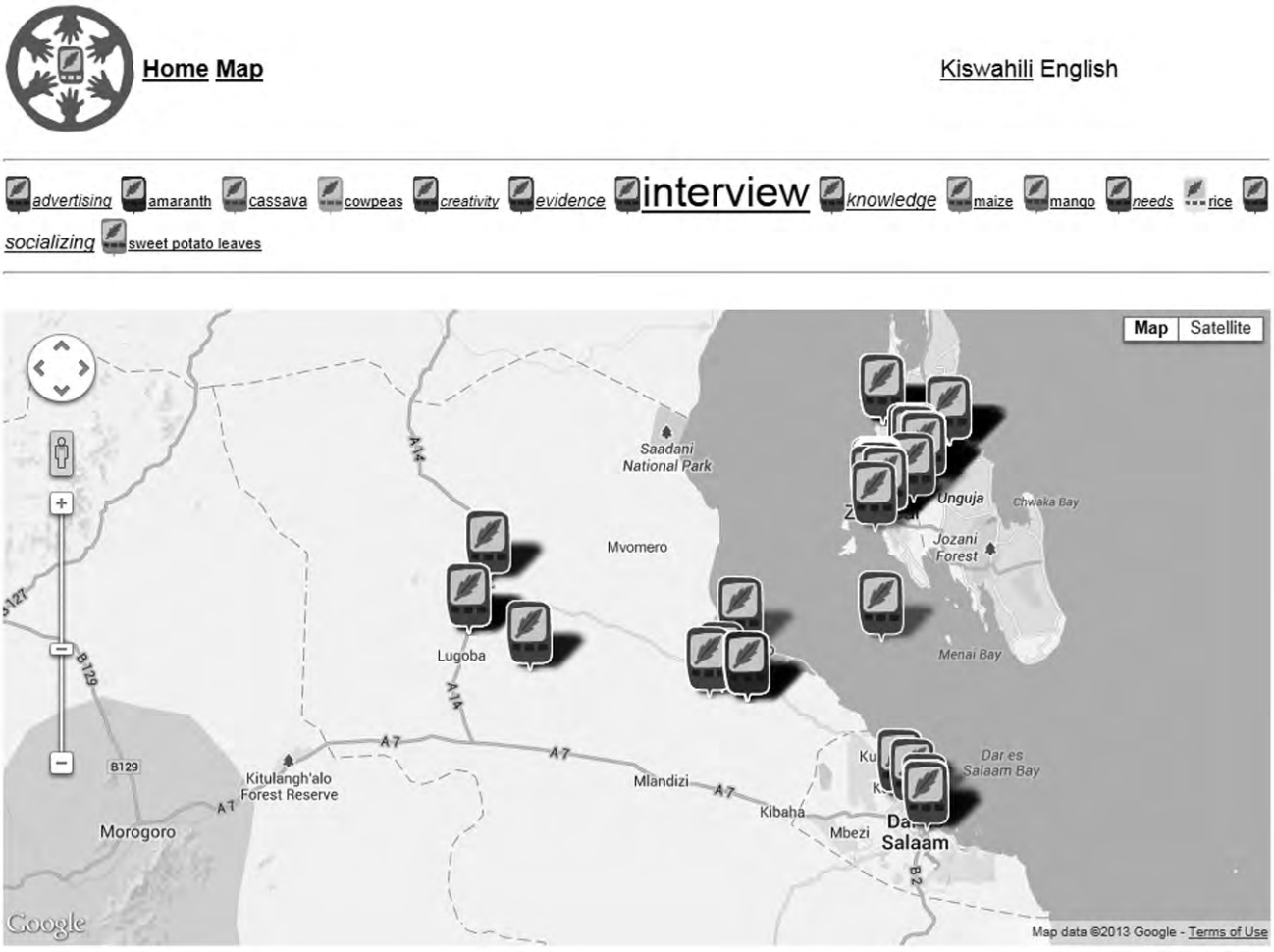

Fig. 2. Eugenio Tisselli, Juanita Schläpfer, Angelika Hilbeck, *The Voice of the Farmers* (Tanzania, Africa: 2012)
<sautiyawakulima.net>

THE PROBABILITY OF THE DIAGRAM

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Abstract

This paper will explore links between art and science by focusing on Richard Feynman's 1979 diagrammatically enhanced lectures. These lectures explore various theoretical understandings of the quantum world, revealing new possibilities that insert different realities into the physical world. These different realities will be compared with Gilles Deleuze's writing on diagrams revealed in the work of artist Francis Bacon. Feynman and Bacon were both drawn towards the diagram as a means to visualise and explore the probability of something occurring.

Keywords: Diagrams, Art, Quantum Mechanics.

The diagram

In this paper I want to demonstrate how Richard Feynman's diagrams produced a basis for visualizing phenomenon in the universe. The meaning of Feynman's diagrams, when visualising the effects of the atomic world, illustrate the summing of the probabilities of becomings. In comparison, the artist Francis Bacon, who built upon the diagrammatic stage, presents actualised becomings.

The diagram is used in the context of this paper as a drawing or graph that presents information or describes something. The diagram is seen as being analogous to a sketch that visualizes thoughts, concepts, directions and duration. In Gilles Deleuze's book *Francis Bacon: The Logic of Sensation*, a chapter is dedicated to the Diagram and is based around an understanding of Francis Bacon's methodology in his preliminary under painting as diagrammatic. Feynman and Bacon were both drawn towards the diagram as a means to explore and expose the probability of something occurring.

The diagram and intuition

In the *Introduction to Metaphysics* Henri Bergson, when discussing duration, states that 'an essential characteristic of the concepts and diagrams to which analysis leads is that, while being considered, they remain stationary. I isolate from the totality of interior life that psychical entity which I call a simple sensation' [1].

In this context the contents of the Richard Feynman diagram can be seen to represent frozen moments in time that are viewed as a single instance. As the diagram is subsequently adjusted and changed it becomes a depiction of 'not a single sensation but several successive sensations' [2] that become serialized moments. Bergson suggests that this is 'what science needs for its own proper development' [3]. Science needs to be able to quantify the sensations that are portrayed through the diagram.

This view is contested in Bacon where there is no single sensation that 'does not change every moment since there is no consciousness without memory' [4]. The ongoing relationship to the world around you is one where the memory is the swelling of the past mixed with the present, 'consciousness means memory' [5].

The wonder of the diagram is that it can do much more than simply plot the sensation or sensations, but allows for the addition of other abstract levels of complexity that allows for all possible paths to be made visual.

Bergson and quantum mechanics

The relationship between Bergson's theory of duration parallels that of the wave particle duality postulated in the beginning of the twentieth century.

What we find with Bergson's theory of duration is a fundamental pre-emption of Werner Heisenberg's uncertainty principle, which gave us the beginnings of quantum theory. If we were to take the findings that led to our current understanding of the wave particle duality, it is that a particle appears when it is measured and at all other times it acts as a wave.

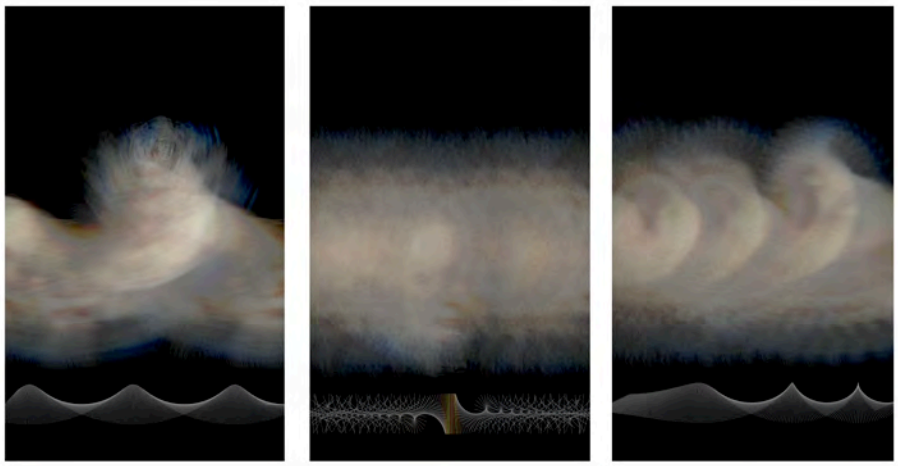
The connection between the theories lies in the inability of duration to be seen as being any more than a state of consciousness. Bergson states that there is on 'one hand a *multiplicity* of successive states of consciousness, and on the other a unity which binds them together' [6]. In this context the multiplicity can be seen as the particles and that 'unity' stands for what would have been known as ether, but today would be referred to as the vacuum energy. The awareness of Bergson's theoretical understandings that have inspired a number of artists over the years are syncretically aligned to some of physics' most successful quantum theories.

The scientific diagram can never be the phenomenon, it can only be a series of expressions of moments or states. The dots, arrows and lines that individualise the probable position and direction of matter presuppose its singularity. The problem comes in describing the wave as a field that is everywhere and taking all possible routes to any given target. Bergson's concepts of duration, perception and the unconscious have pointed out to us that time is not the instrument of measurement but a place where past and present coalesce. The duality of time and space here is borne out by quantum theory and can be enriched by Bergson's theory of duration in showing the unmeasurability of a thing that remains in a fluid state.

Marta De Menzes in her masters thesis *Visual representation in Art and Science: A study of Richard Feynman's and Joseph Beuys' Diagrams*, when writing on Feynman, states that his diagrams 'can be used as a mathematical tool is due to the following characteristics. First, the exchange of a photon represented by a wiggly line should not be taken as a classical particle following a single space-time path, but as the sum of all possible ways in which that photon could have gone from one particle to the other'. [7]

Feynman's diagrams

The Feynman diagram presents the probability amplitude when plotting the path of a single photon acting as a particle reflecting from a mirror's surface. In this diagram the wave-like states as reflected in the terms of the wave-particle duality is not put into focus. The change in state of the wave-particle duality is constant in all atomic structures, when measured they act as particles and when they are not being measured they act as waves. The particles in their wave-like state decide on which routes to take in their travels by summing up all possible options, in the same way that we might do when confronted with a queue at a shopping market. Neil Turok describes in his CBC Massey Lectures, '*The Universe Within: From Quantum to Cosmos*' [8] how we decide when shopping which checkout queue to join, suggesting that we do so by gauging how many people are in the lines, how far the queues are from our location, whether there are families, how many goods are in the basket and so on, and then choose a route. Particles do the same thing, based on William Rowan Hamilton's (1805 –1865) action principle that suggests particles survey all the possible routes to the future and chose the one that demands the least actions. Hamilton suggested that physical systems could even take a multitude of different routes with probability amplitudes for each part based on each action.



Multiverse (2013), Kevin Raxworthy and Paul Thomas, is an aesthetic translation of the scientific diagram, and draws a synchronistic relationship with the diagram in Francis Bacon's triptych portrait paintings.

As the complexity of quantum theories evolve, due to the amount of data that needs to be processed based on the probabilities of something occurring, the limits of what binary computing can do will be reached. In Feynman's case he changed the rules in science by using visualization as a means of more fully understanding the probability that some phenomenon can happen. In quantum computer it will be the atom itself that records and processes it own data, each cubit will allow for hundreds of calculations to happen simultaneously. How will the diagrams of quantum computing develop to complement and visualize this new future? What is the likelihood that artists today are synchronistical working on these visions of the future? In this context I want to draw comparisons between Feynman's diagrams and the diagrams (paintings) of Francis Bacon as theorised by Deleuze in *Francis Bacon: The Logic of Sensation*.

Feynman's diagrams were used to visualize the physics of the atomic world. The diagram was a way for Feynman to understand, innovate and develop schematic research for thinking through the complex problems being encountered at that time. The diagrams researched for this paper come from Feynman's 1979 lecture series were he used the traditional blackboard and chalk as part of his presentations. The research Feynman presented in the performative drawing of the diagrams demonstrated how the chalk marks are used in exploring concepts and articulating thinking to present the fundamental quantum probabilities of photons behaviour.

Feynman's diagrams were developed to articulate things in the atomic world that demanded a great deal of imagination and alternative thinking to explain. The diagrams tried to describe something that was different from anything encountered or experienced before within our field of reference. We want to see the physical world of quantum physics as resembling something we know, a strange familiarity with the world around us. Feynman used visual thinking as a necessity to work through his ideas. Some of his thoughts seem to emerge from the interaction with the blackboard itself, demonstrating in their visibility a schematic becoming.

What could be seen was that with the aid of the diagram, 'entire new calculational vistas opened for physicists' [9]. This enabling of physicists to explore the potential of diagrams that can be used in calculations, extended the scope of their significance. The diagram took on a new status, but in allowing for the visualisation of probabilities they were not extended into the more subjective relationships with that of the diagrammatic qualities to be remediated through art.

The diagram: Deleuze and Bacon

Feynman's diagrams in this context form a symbiosis with Deleuze's understanding of Francis Bacon's work. Deleuze uses the concept of the diagram when he is commenting on Bacon's tendency to 'make random marks (lines-traits); scrub, sweep, or wipe the canvas in order to clear out locales or zones (color-patches); throw the paint, from various angles and at various speeds. Now this act, or these acts, presuppose that there were already figurative givens on the canvas (and in the painter's head), more or less virtual, more or less actual.' The process of painting here is to form the basis for the problems to be made real. Visualized through acts of scrubbing, sweeping and wiping, the diagram forms the basis from which the work evolves. The modes of embodied engagement with the material reveal aspects that distort, contort and expose, enabling the potential for a shift in experience. The marks in the diagram are in direct relationship with the physics and effects of the materials, not to solve a problem but rather to reveal the actuality of something existing within the marks.

Deleuze writes 'It is as if, in the midst of the figurative and probabilistic givens, a *catastrophe* overcame the canvas' [10]. The probabilistic is what is being explored here and what is revealed is an intuitive understanding of the world of quantum mechanics. This foundational work defines a way of visualizing thinking and sensation as though the diagram of the problem was already manifested in Bacon's head and the process of visualizing this creates a fundamental flow 'like the emergence of another world.' ([11]

Bacon's intuition

In Bacon's well documented personal library there is a publication on the 'Phenomena of Materialisation.' In the introduction there is a passage that explores the concept of the 'abandonment of the materialistic conception of the universe which, even thirty years ago, was in sole possession. Modern physics regards matter as a form of motion, and is dominated by the idea of energy. Psychology also is gradually emancipating itself from the purely physiological conception of mental life; and under the leadership of the philosopher Bergson, it tends to acknowledge the superiority of the psychical over the physical. Thus the circumstances are much more favourable to the investigation of great new problems and facts than they were some decades ago' [12].

This particular reading of the diagram creates a difference of intention, from the scientific towards the intuitive. This 'survival of the past' into the present moment means that we are not trapped in 'instantaneity' but can unfold and allow the concept of duration to 'swell' [13]. Within this concept of duration we formulate a 'perceptual becoming' that allows the diagram to oscillate between different states. Out of these different states the diagram creates a potentiality of outcomes that can be visual but not

visualised. In other words, the abstract quality of Feynman's diagram expresses so much to the physicist in that it identifies points in time that act like frozen moments. These frozen moments can be seen not as instances but as part of the swelling; the basis for the creation of an art work where the work of artists like Bacon are challenging the diagrammatic nature of comprehending life. The artwork attempts to create human interaction with the possibility of becoming and being in the world. The artwork responds to the various inputs and stimuli but is indicative of a state of becoming that can only be viewed in its semi abstract state as a conscious stream.

Deleuze suggests that Bacon visualises what Wittgenstein calls the possibilities of facts. It is this very possibility of the painting that ties in with Feynman's diagrams. The possibilities of facts are not in themselves facts. The Feynman diagram that demonstrates how the spin of the photon reflects from a mirror uses the probability amplitude to perform a process of discovery. When creating the diagrams on the blackboard, Feynman wipes away, moves between, etc to lay out the diagrammatic foundation of the problem. What Bacon revealed by producing the visualization of the probabilities in the scrubbing, sweeping and wiping is a presence in the work exposed for all its flaws and possibilities. The faces in Bacon's triptychs with their smears and voids gives us a view of the world never seen, 'more or less virtual, more or less actual' [14].

The readings of the two forms of constructing the diagram presented here are intended to show the symbiotic and complex relationships between science and art. The two men were striving for the probability or possibility that something was happening in the world that was emerging from our continual probing and imagination when it comes to comprehending the aspects of the universe. The exploration of the probability of light by both Feynman and Bacon goes some way to showing synchronicity with art paralleling science.

1.Bergson, H. (1949). An Introduction to Metaphysics. New York, Liberal Arts Press.

2. Bergson [1].

3. Bergson [1].

4. Bergson [1].

5. Bergson [1].

6. Bergson [1].

7. Menezes, M. d. (2001). Visual Representation in Art and Science: A Study of Richard Feynman's and Joseph Beuys' Diagrams. Masters, University of Oxford.

8. Turok, N. (2012). The Universe Within: From Quantum to Cosmos, CBC Massey Lectures.

9. Kaiser, D. I. "Physics and Feynman's diagrams." Am.Sci. 93: 156-165.

10. Deleuze, G. (2005). Francis Bacon: The Logic of Sensation, Minneapolis, University Of Minnesota Press.

11. Deleuze [10].

12. Notzing, B. V. S. (1923). Phenomena of Materialisation. London, Kegan Paul, Trench, Trubner and Co. Ltd.

13. Bergson [1].

14. Deleuze [10].

THE TACET MARK AS BLACKNESS

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Abstract

James Webb's 2012 performance *The World Will Listen* gestures towards a blackness of 'zero of flow,' updating the historical avant garde's 'zero of form,' both in terms of the electronic media used and the history of communities that have been historically figured as unformed and unmediated.

Keywords: 4'33"; James Webb; John Cage; South Africa; African art; sound art; electronic art; Eskom

The July 2012 performance of Webb's *The World Will Listen* was performed at a sound art opening at the Bag Factory gallery in Johannesburg. For four minutes and thirty-three seconds, the power to the gallery was cut off at the main breaker, which rendered the space completely black. The performance was unannounced and unexpected and the visitors' immediate collective assumption was that the gallery was experiencing a rolling blackout, which is common during Johannesburg winters. All of the sound works, the noise and talking in the gallery stopped for a moment—both sound and sight were suspended. In an electronic media exhibition with around twenty-five artworks, some of which were very loud, the sudden cut was a shock. A short few seconds later, order returned as the majority of the gallery goers lit up their mobile phones to help them navigate out of the front doors and onto the sidewalks, still casually chatting and drinking wine. *The World Will Listen* alluded to John Cage's 4'33" first performed in 1952, the so-called "silent work" in which a performer is instructed to sit with a particular musical instrument in front of an audience and remain silent for a given length of time.

It seems to me that the gesture of *The World Will Listen* refers not only to the iconic work of John Cage, but also to a history of metaphors that have circulated around technology in the development of electronic art and the industrialization of Africa. In South Africa, the history of electronic art must be examined in terms of how the nation was electrified in the first place, which was mainly by the mining industry. The purposeful suspension of services by the apartheid government resulted in a silencing–through a lack of connectivity to the flow of commerce, information, and political identity–specific sectors of the population deemed primitive.

However, Webb's work has not trafficked in explicit signs and symbols of politics. He carefully crafts his artworks to hover between conceptual art, sound art, and visual art at the edges of their disclosing meaning or even information. The undercover rogue quality of the breaker cut in *The World Will Listen* is found in many of Webb's works, including *Spectre*, performed in September 2011 at the First National Bank Johannesburg Art Fair. Webb commissioned a volunteer to walk through the fair carrying a powerful mobile phone jammer with a 20m radius that also disrupted credit card transaction signals. Another ongoing work, also unannounced, *Untitled* (2006-) (performed most recently at the Johannesburg Art Gallery) is a programmed light that flashes Morse code message, undisclosed to which the public pay little if any attention. In regards to all of these works, critic Julian Jonker writes that "[Webb's work] is that most South African form, the prank, but made zen, reduced to its littlest intuitive moment" [1]. It is fitting that his work *The World Will Listen* reworked one of the most famous spoofs of art history, John Cage's silent piano performance.

I want to narrow my discussion to two main aspects of John Cage's *4'33"* which have special relevance to Webb's *The World Will Listen*. The first is the qualitatively different method of notating music once it is understood as signal and noise—and electronically reproducible. Cage experimented with many versions of music notation, especially when composing *4'33"*, in order to understand a new electronic territory of sound. Liz Kotz argues that Cagean philosophy is "partly the result of changes in material support and medium," and *4'33"* is "part of a perverse turn to language that occurs in reaction to the electronic inscription of sound…." [2] Kotz argues that Cage only arrived at *4'33"* after his experimentation with magnetic tape recording. Cage saw in sound, as it was mapped onto a tape, a whole new type of inscription that was entirely mediated and really electrified. In other words, the map of sound was no longer the musical notation or rationalist musical staff, but something much more direct and non-visual: the magnetic tape could only register as a field of positive or negative charges. That is, sound is the index of fluctuating electrical flow, a reversal of the figure ground relationship of art that Cage attempted with *4'33"*.

The second and related aspect of Cage's work I want to relate to Webb's *The World Will Listen* is conceptual art's use of instructions and, at times, aggressive commands. Over the years, Cage wrote many different notations and verbal instruction for this and other performances. Kotz sees this as arising from the influence that music and sound art had on the visual arts in the 1960s, with the "deep structural transformations" in sound phenomena. I would make a more general statement, however, as it relates to the nature of electronic media. The set of instructions embedded in electrical language is the basis of the protocological language of data processing and electricity itself, the sets of commands by which electronic machines operate.

In the 1952 typewritten score of Cage's *4'33"*, the work is written as a series of instructions that are simple, that is,deskilled. Before detailing the instructions for the performance of the piece, the score is divided up into three

Fig. 1. James Webb, web documentation of *The World Will Listen*, 2005. (© James Webb)

THE WORLD WILL LISTEN |2005

A 4-minute 33-second power failure instigated at a gallery opening.

Medium: *Electricity*
Dimensions: *Variable*
Duration: *04:33*
Date: *2005*

sections indicated by the roman numerals I, II, II. Underneath each symbol is typed out "TACET," indicating a three-part composition linked together by a total rest by the performer. "Tacet" has a relationship to the "rest" mark on scores, the rest usually noted by a thick black line that indicates a temporary silence on the part of one of many instrumentalists. When that instrument has no remaining parts in the composition, the score is marked "tacet." There is no longer a visual representation of silence or rest, only the linguistic command to rest. While most agree that *4'33"* was an experiment in framing sound, silence, or even experience, Kotz argues that the various scores and textual instructions for the piece indicate a relationship with language and instruction that arose from a "failure of his efforts and precision and control" [3].

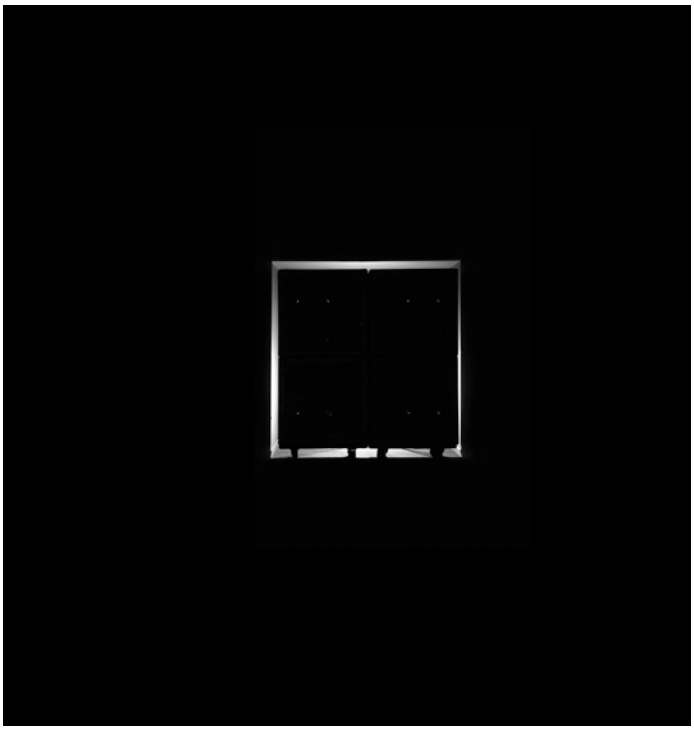
If we take these two innovations of Cage's work and examine them in relation to James Webb's *The World Will Listen*, a few things emerge as to Webb's departure from the iconic *4'33"*. The first is in the title *The World Will Listen*, which can be read as not a set of instructions or a form of "language activated" in Liz Kotz's words, but rather a veiled threat that matches the provocation of the power cut. It matches the command language of conceptual art and information processing and its veiled relationship to politics. That is, much more than just a spoof or a turning back of the performative onus onto the audience, *The World Will Listen* instead worked with the aspect of *4'33"* that forced an experience of duration, this time overlaid with a longer history of modernization in South Africa. This history of industrial modernism has resulted in infrastructural shortcomings that are so routine that the first assumption of a blackout is that they should be ascribed to the power company and/or the government that are seen by the public as having malevolent intent. In fact, that title is only an afterthought of the piece, as the audience would not have any way of knowing that the piece existed unless they came across documentation after the fact. The command of *The World Will Listen* originates from an unknown, menacing agent.

Second, unlike Cage's *4'33"*, *The World Will Listen* lists electricity as its medium, both a material and a phenomenon. Webb raises electricity to the level of signification in the face of its absence, in the moment of blackness in the gallery. Both works attempt the impossible: to code a deterritorialized flow in a way that will both preserve it, while still making it meaningful, or perhaps just perceptible. However in terms of contemporary Johannesburg, this notion of electronic art as failure occurs within a lived reality of infrastructural failure and a chaotic mixture of signification practices of all types. Those moments of failure, silence, and noise are represented as a power relationship that shifts constantly. Sarah Nuttall's and Liz McGregor's collection of literature called *Load Shedding: writing on and over the edge of South Africa* describe "load shedding," another term for rolling blackouts, as both a material and psychological experience [4]. The types of puns and plays on words, where "load shedding" is a sensibility as well as a technical term, are common in art from post-revolution states where political promises have been emptied out by the multiplication of infrastructural disparities and cold calculation of profit.

Thus the third departure from *4'33"* in *The World Will Listen* is in its oblique, secondary linking between the deterritorialized flow of electricity and the history of "black" Africa. As William Pietz argues in his article "The Phonograph in Africa," "New machine technologies … discovered a vast new intentional space, as yet unterritorialized, which capitalism colonized with as much eagerness and anxiety as it colonized the geographical world" [5]. There are many examples of the conflation of Africa with the schizo flows of electronic technology, both labor and communication devices. What can be said overall, again to quote Pietz, is that "there is no message except the all-consuming passion and labor to fill up all possible lines and routes within the new non-territorial space of technological communications." A typical example in South Africa is a story recounted by electricity historian and African National Congress activist Renfrew Christie, one that circulated in the diamond-mining town of Kimberley, that "raw natives flocked from far afield to see the magic of all the street lanterns lighting up simultaneously, with no man near them. Groups gathered in the streets after sunset and acclaimed 'Tagati!" [6]. That is, the native's supposed reaction to the electrical light reassured the mining officials of their superstitious belief in the deterritorialized primitive, and the amorphous nature of natives and electricity both—materials waiting to be harnessed. This statement by white officials characterizes the primitivism of media development that continued into the period of the information economy of colonialism of the late twentieth century.

The Bag Factory gallery, where the *World Will Listen* was performed in 2012, is in the Fordsburg district of Johannesburg, a location that was caught in the crossfire of the processes of electrification and industrialization in the early twentieth century. The introduction of large-scale electrification in South Africa was one of the precipitating factors that led to a major mining strike, as the mechanization of drilling and earth removal would require less white semi-skilled and supervisory jobs. Just a half a block from the Bag Factory, in March of 1922, the government of General Smuts performed an aerial bombardment of Fordsburg Square that resulted in thousands of casualties and arrests. This silencing of protest and

Fig. 2. James Webb, *The Black Passage*, 2006. (© James Webb)



collectivity haunts *The World Will Listen.*

Today, the power industry is often referred to sardonically as an "Africa problem," communicating the weariness of incompetence by those running the country and its operations. But to assume that it is only incompetence is to overlook Eskom Power's careful calculations over the years of power output and profit. In the years following the 1994 elections, Eskom has adapted to the changing conditions of the country—a different production of territory has obtained compared to the physical spatial occupation of the early days of electrification. Eskom is caught between competing goals to extend the grid to underserved communities, as was its mandate after the 1994 elections, and to maintain a stable profit flow to investors. The future of basic services is now one that is flexible and fundamentally insecure. [7]

We can then examine the impossibility of the work's proposition of the neutrality of blackness, silence, and noise and its philosophical precedents in Cage, Warhol, and even anti-pictorial art of the early twentieth century. In the most overtly political of Webb's work, *The Black Passage* (2006), the reference to mining and mechanization is fed back into the media object itself, as well as its localized metaphors such as the black box. *The Black Passage* consists of a dark 20 metre long narrow tunnel, at the end of which is hung a black curtain framed with golden back lighting. A looping eleven-minute audio recording of an elevator descending into and ascending out of the shaft of the famous South Deep mine in South Africa plays loudly in the dark passage, its amplification indicating a power relationship between recorded sound and its output into the environment.

The curtain, according to Webb, references Malevich's 1915 painting the *Black Square* in its blackness, absence, and iconicity [8]. Webb explains that the darkness of the tunnel is mythical, even otherworldly, while it also refers to the black laboring bodies taken down into the mine. But in eschewing visual referents to the miners, which Webb believes is voyeuristic, the audience instead experiences a deafening mediated version of the elevator's noise. Art critic Sean O'Toole writes about *The Black Passage* that it is "[a]n absence meditating on an ephemeral sound presence, this invisible sound sculpture is also a black nothing" [9]. He goes on to cite the early modernist aspiration of many European artists to achieve blackness in their work, declaring blackness the "soul" of the modern age. After revolution, in other words, blackness is anarchy.

The Black Passage is therefore not a reference to, but really an index of labor conditions in South Africa and elsewhere, a stripped down recording of one of the great engineering feats of industrialism. The sound's transference from the ground to the recorded version is amplified through large speakers, connecting to the sensory-engineered spaces of early sound and video art that so puzzled Cage as he thought through the materialism of sound in relation to its textual representation. *The Black Passage* recodes the empty space of capitalism, its holes and dead spaces, with the pure sound of machines: elevator and amplifier. This mine is now an overdetermined symbol, particularly after Steve McQueen's 2002 film *Western Deep*. The same elevator is depicted in jarring juxtapositions of light and dark, sound and silence, to elicit experience in the audience engineered by sound and moving image. Unlike *Black Passage*, *Western Deep* ends with a subtle but unmistakable visual representation of oppression in the figure of the miner's black body. Webb's piece tests that boundary of a pure sound without visual referent. In other words, the Orpheus he evokes might descend and even ascend, but there is no poetic salvation somewhere outside of the sound of the mechanization; he leaves the outside of the work undefined.

In this sense, *The World Will Listen* operates in a contemporary art field entirely overcoded, especially when it appears in "Africa." Webb implicates himself, if not Cage, in the arbitrary power relationship of command language and the inevitability of its turn to signification and allusion. That is, if Cage desired in part to silence the canned four-minute sound products of Muzak that endlessly flowed out the speakers in department store elevators, Webb calls up a different elevator altogether, the elevator that penetrates the underworld before materials arrive at department stores transformed into polished products. In *The World Will Listen* and *Black Passage*, Malevich's zero of form is attempted as "zero of flow," while gesturing towards that proposition's ultimate impossibility.

As with the tacet mark and its use of blackness to indicate pause, still the proposition stands as Liz Kotz suggests for Cage's notation, that he "[moved] toward an indeterminate relationship between score and performance in which the musical notation ceases to be a system of representation and instead becomes a proposal for action" [10]. *The World Will Listen* presses the parameters of this gesture, inverting the conditions of performance from an expectant public to an unexpectant public, which then reverts to a jaded, expectant public that is conditioned by the discontents of politics and the enduring conditions of apartheid-era modernization. In that mode of modern industrialization, artists do not have to do much work to uncover electronic art and its base material electricity as operating by codes and commands. It was rather obviously delivered according to who had been designated "without" electricity, those unformed and unmediated "black" Africans. In that, they must work rather at redirecting that overcoding, to resist the near immediate desire to read pause as failure.

References and Notes:

1. Julian Jonker, "Haunted Weather" *Art South Africa* 4, no. 3 (Autumn 2006).

2. Liz Kotz, *Words to Be Looked At: Language in 1960s Art* (Cambridge, MA: MIT Press, 2010), 14.

3. Kotz [2], 8.

4. Sarah Nuttall and Achille Mbembe, eds. *Load Shedding: Writing on and over the edge of South Africa* (Cape Town: Jonathan Ball Publishing, 2009)

5. William Pietz, "The Phonograph in Africa" in *Post-structuralism and the Question of History* (Cambridge: Cambridge University Press, 1987), 278.

6. Renfrew Christie, *Electricity, Industry, and Class in South Africa* (London: Macmillan Press, 1984), 5.

7. See Leonard Gentle, "Escom to Eskom: From racial Keynesian capitalism to neo-liberalism (1910-1994) in David A. McDonald, ed., *Electric Capitalism: Recolonising Africa on the Power Grid* (London: Earthscan, 2009).

8. www.theotherjameswebb.com/blackpassage.html

9. Sean O'Toole, "Black Landscape: An Argument in Three Parts" *Art South Africa* 9, no. 1 (September 2010).

10. Kotz [2], 17.

Between one and zero: noise, ghosts and plasticity.

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Abstract

This paper addresses two sonic artworks, *Ghost* (2011) and *Plasticity* (2012) that use models of spiking neurons to materialize endogenous and exogenous composition in relation to noise and sonic memory. In the formation of these artworks the exploration of noise is considered in the context of areas of neuroscience, cell switching and cultural theory. Noise appears to be the glue that turns the boundary or limit of the cell into a threshold, no longer indivisible. And that noise, in drawing sound into being, carries with it the root of all information implicit and explicit.

Keywords: Ghost, Plasticity, noise, neuroscience, memory, synapse, sound art.

'I'm interested in cause and effect, but only when something happens between the cause and the effect, so that the effect is not really directly related to the cause.' (Alvin Lucier) [1]

Noise is the undercurrent of matter, of information; mutable and implicit, it draws things into existence. Noise inhabits the space between the signal and its opposite. Noise is the not yet of information, the incipient structure keeping buoyant the code. The signal, stripped of its noise, is fundamentally altered and when detached from its origin cannot hold all that brought it into being. And, whilst it appears important to free the signal from the morass, perhaps the factoring out of noise is an error, particularly in living systems.

The synapse is a gap, the space between neurons. It is the site where neurotransmitters relay information from one neuron, known as presynaptic, across the synaptic cleft to the postsynaptic membrane or cell. The synapse is a place of translation, electric to chemical signals and the release of compound information into the synaptic field. It is both transmitter and receiver. The cleft of the synapse is the site of potentiality, but also of uncertainty. The translation from matter to fluid, carrying sensory information, is fascinating in that it turns away from the model of network topologies' multilinear structure of the brain, into a fluid potentiality.

There are billions of cortical synapses in the human brain. These spaces in between are said to be one of the sites where memory is stored, both long and short term. Synapses are considered unstable as archives for memory due to their continual modification as sensory information is processed. The molecules (or neurotransmitters) in each synapse are renewed usually after five days although some are renewed at around four to five weeks. [2] Memory, however, has the potential to last for days with long-term memory lasting decades and often a lifetime. There appears to be a conflict between these scales in time, and one of the most important research questions in neuroscience is to find out how long-term memories can remain stable in what appears to be unstable circumstances.

One of the many theories of long-term memory retention is that all memories are revisited on a regular basis, perhaps in sleep. However, this theory is unlikely given the vast amounts of information presented with the potential for long-term memory imprints. Another very recent theory presented in the paper 'Long-term memory stabilized by noise-induced rehearsal', by Yi Wei and Alexei A. Koulakov, [3] proposes that memory in the synapse is given its longevity by 'implicit rehearsal'. Wei and Koulakov use the term implicit rehearsal to describe the reactivation of old or long-term memories by noises that are not explicitly reactivated or revisited. This means that an imprint of the memory could be carried by neural noise and synaptic plasticity in and of the system despite the instability of the synapses, and that this memory may be recalled for a long period of time without losing the integrity or memory image of the content or representation.

Signal and noise

Between the signal and absence is a space between something, but not nothing. The signal to noise ratio is a measure of desire and its opposite. The signal, clean, clear and crisp speaks of precision, of information transferred, understood and explicit.

Noise, however, is its abstruse partner, an undercurrent of information, not yet formed, mutable and implicit. Signals are measured, removed of noise, their code, employed and translated as information, as the opposite of nothing, or nothing structured enough to be factored in. The signal must be a singular stream, a positive. And yet it appears that noise is the underlying endogenous stimulation of the brain and many other biological systems. Sensory neurons are extremely noisy.

In the 1995 groundbreaking paper 'Stochastic resonance and the benefits of noise: from ice ages to crayfish and SQUIDs', [4] Kurt Wiesenfeld and Frank Moss discuss the presence of noise in the single neuron. One of the examples given in the paper is an experiment undertaken to discover whether there might be a benefit to the presence of noise in bio-sensory apparatus. One experiment used the mecanoreceptor hair cells of a crayfish thought to detect weak but consistent signals in the motion of water, most likely to perceive predators. In the experiment, the cells' detection of weak and most notably incoherent sig-

Fig 1 'Ghost', external image of the installation at Maksem during the Uncontainable exhibition, ISEA 2011, Istanbul. Microphones placed outside of the octagonal building pick up live sounds from the street and reconfigure them through the neuronal system. © Jane Grant. Image by Jane Grant

nals was greatly enhanced by noise coupled with stochastic resonance [SR]. The authors report that SR may act as a threshold device in cell membranes responding to external influences 'randomly switching between open and closed states in response to thermal fluctuations' [5]. 'SR is a nonlinear cooperative effect in which a weak periodic stimulus entrains large-scale environmental fluctuations, with the result that the periodic component is greatly enhanced" [6].

In his book 'Parables for the Virtual', Brian Massumi [2006] discusses Wiesenfeld and Moss's paper:

> 'Stochastic resonance, which replaces linear causality with near-relational concepts involving "noise" (chaotic indeterminacy of signal), interactive "amplification", "threshold," and global systemic "modulation," has implications far beyond acoustics. It has particular significance for brain science, where it adds a level of non linear causality functioning *on the level of a single neuron*, even prior to the consideration of the collective behaviour of populations of cells' [7].

In the effort to understand the intricacies of the workings of the human brain, large-scale networks are often employed, however we see here that the single neuron can generate its own noise in relation to its external environment. These findings have profound implications with respect to the folding in of the exogenous with the endogenous through noise. 'Scientists often reconcile the stochastic and the deterministic by appealing to the statistics of large numbers, thus diminishing the importance of any one molecule in particular' [8].

The paper 'Nature, Nurture, or Chance: Stochastic gene expression and its consequences,' by Arjun Raj and Alexander van Oudenaarden, [9] presents a study of noise, cell switching, and fluctuation in single and small group studies of cells. In one section of the paper the authors discuss a study in which small groups of cells commit a proportion of their population to stochastically anticipate the arrival of food sources [10]. This is a neater way of detecting food and a viable and probable alternative to a situation in which cells firstly directly sense food in their environment and only then activate their metabolic network. The former strategy shows that 'stochastic switching is a viable alternative to sensing and that it is most effective when the switching rate is closely tuned to the rate at which the environment fluctuates' [11] (or resonates), even when this strategy sacrifices the switching group to 'suboptimal' growth.

It appears that noise or stochasticity is what links the internal workings of cells, groups of cells, and the organism as a whole to its environment. By being sacrificed to fluctuate or resonate in rhythm with external influences, whether food or predators, these groups of cells become peripheral whilst still being embedded in the biological host. They are at once committed to exteriority, to exogenous noise with its own rhythms, patterns and weights. We might see this internal noise as something intangible that flows from the organism, enfolding it implicitly to the external, a random and fluid equivalent to binary determinism.

Noise and networks

'Life is a study in contrasts between randomness and determinism: from the chaos of bio-molecular interactions to the precise coordination of development, living organisms are able to resolve these two seemingly contradictory aspects of their internal workings' [12].

Noise is what Henri Bergson might claim to be a halfway place between 'the thing and its representation' [13]. Noise appears to be the glue that turns the boundaries or limit of the cell and the self into a threshold, no longer indivisible.

In relation to the single neuron, the noisy network offers up the concept of innumerable discrete clusters of stimulated cells, each resonating with its variable external counterparts and its own internal structure, a circuitous route through cause and effect. This noisy network is mutable, intangible, indeterminate. Richard Coyne describes networks as 'discursive devices,' with 'shifting authorities', and suggests that'[a] further mode of resistance to the transcendence of the network is to think of the network as an effect and not a cause' [15].

Ghosts

Between the signal and noise are the ghosts of memories resonating, coming into being, aside and between sensory information. They are implicit, felt, ripples of affect, oscillating at frequencies both endogenous and exogenous. In his book 'Becoming Beside Ourselves: The Alphabet, Ghosts and Distributed Human Being' [16] Brian Rotman proposes that contemporary technology expands what we might think of as the narrated self, an autonomous, monadic, linear body.

> 'The result is a body which, though conditional by and inseparable from its evolutionary lineage, is revealed as increasingly exogenous – made and conceived from its bio-technocultural environs; increasingly transparent – less privately enclosed, more publically in-

Fig 2 'Ghost' internal image of the installation at Maksem during the Uncontainable exhibition, ISEA 2011, Istanbul. Eight speakers play the reconfigured sounds combined with the 'memory embedded' sounds in the neuronal system. © Jane Grant. Image by Jane Grant

spected and surveyable through a multitude of techniques; increasingly porous – engaged in a constant flow of information and affect across its boundaries; increasingly heterotopic – an assemblage of differing processes with their own histories, dynamics and itineraries understood collectively, conceived as "a type of world full of an infinity of creatures"'[17].

The ghost transgresses boundaries, extends the self both physically and temporally, and inhabits our world alongside other less tangible places. The sonic artwork *Ghost* [18] was concerned with memory revisited, implicit and subtle. In this work a model of a small artificial cortex based on the Izhikevich spiking neuronal network model [19] was developed and connected to eight microphones and eight loud speakers. The model was 'memory embedded' in the sense that sounds had been previously implanted into the cortex. The work was premiered at ISEA in Istanbul/ Istanbul Biennial and installed in Maksem, a beautiful old building in Taksim Square. Once installed, live sounds picked up by the microphones outside of the building (the microphones were attached to the windows) stimulated artificial spiking neurons modelled in the computer to 'fire', sending small fragments of sound to the eight speakers inside the building. If the external sounds fail to reach a particular threshold, the 'memory embedded' sounds begin to be heard. Over time, the external sounds start to embed themselves into the model, gathering sensory information and sonifying both the past and the present. As I have written in another context:

> 'When these sounds fail to reach a certain threshold, the cortex will journey around its own architecture, re-visiting older, established pathways, using its 'memory' as buoyancy when external stimulus dies away. This memory is its own internal noise, its earliest and primary stimulation. These sounds will be heard as 'sonic ghosts,' a term I have used to describe internal or endogenous noise embedded in the cortex, which reoccurs when the external stimulation is low or not present in the gallery space' [20].

In this space the microphones picked up the busy sounds of traffic, sirens and the Adhan from an adjacent mosque. These sounds become fragmented, reconfigured, overlapping, a flickering sonification through the speakers of the neurons firing. External and endogenous patterns and rhythms blend the neural past with the neural present, the sonic ghosts: 'the very phenomena of emergence into presence, lingering persistence, and withdrawal' [21].

In one of my earlier papers, 'Neural Ghosts and the Focus of Attention' [22], I discuss the case in Eugene Izhikevich's models of spiking networks of neurons for which external stimulation fails to reach a particular threshold (Izhikevich, 2006). In this situation, discrete networks become a 'focus of attention' so much so that they represent the firing pattern as if the stimulation where present.

> 'Perception is never a mere contact of the mind with the object present; it is impregnated with memory-images which complete it as they interpret it. The memory-image, in its turn, partakes of 'pure memory' which it begins to materialize, and of the perception in which it tends to embody itself: regarded from the latter point of view, it might be defined as a nascent perception' [23].

'When a memory appears in consciousness, it produces on us the effect of a ghost whose mysterious apparition must be explained by special causes' [24].

The ghost is a thing without referent [25], it has no substance, it is an absence of materiality or code. The ghost is perceptually intangible; it is a thing sensed, a signifier between the image and its representation. Like noise, the ghost is both exogenous and endogenous, it is imagined internally but manifests in spaces external to the mind. In the work *Ghost*, the overlaying of the sonic memories are blended in the present. These sonic phrases are 'emergent structures' [26] formed from the older established firing groups in the context of the present.

Plasticity

Plasticity [27] is a discrete participatory sound and light artwork comprising 6 microphones and 16 speakers within one large room. This work was concerned with the sonification of spiking networks of neurons heard through the context of the human voice. The computer model runs a network of 100 artificial neurons and records the input sound made by the 'audience' into the microphones, and retriggers short sections of this sound when one of the neurons 'fires'. The neuronal network is driven by a noisy signal, keeping the system 'buoyant,' and has an additional algorithmic 'plasticity' code, which changes network connection strengths according to causal firing between the neurons, mimicking simple 'learning'. When the neurons 'fire', the corresponding LED coil also illuminates causing cascades of firing events to create a scattering of light and recorded live sound across the

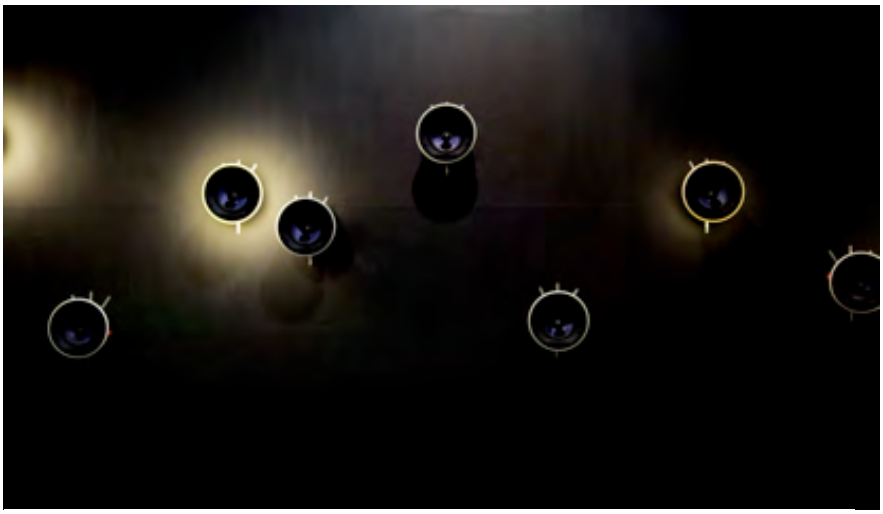

Fig 3. 'Plasticity' at the onedotzero 'Adventures in Motion' Festival visitors make sounds into microphones which are re-triggered by the firings of an artificial neuronal network accompanied by flashing LED lights at firing events in the adjacent gallery space. © Jane Grant, John Matthias, Nick Ryan and Kin. Image by Avril O'Neil

speaker network. A live chorus of voices performed by The Holst Singers was fed into the work as it opened at the British Film Institute as part of onedotzero's 'Adventures in Motion' Festival. This chorus then underpinned the work, forming a sound bed over which public participation took place.

The proximity of the speaker array to the microphones afforded the participants a visual overview of the work as a whole so that they could see and hear their contribution and its effect on the instrument. This work focused specifically on the voice, and therefore microphones were placed strategically and grouped together to encourage audience participation. As the participants perform, they build emerging rhythmic structures with the software using their voices or sound.

In 1908 Bergson wrote 'A remembered sensation becomes more actual the more we dwell upon it, that the memory of the sensation is the sensation itself beginning to be'. [28] And one might make an analogy here with Izhikevich's models of spiking neurons where, deprived of external stimulation and driven by noisy currents, the model re-visits older neural pathways and clusters formed by external stimulation. These pathways correspond exactly as if the external stimulation were present. Izhikevich concludes; 'Such 'thinking' resembles 'experiencing' the stimulus.' [29].

Bi-stability, multi-stability, thresholds and vagueness

Bi- and multi-stability are ideas pertaining to the phenomena in which the human mind can hold opposing or contradictory information simultaneously. 'Perceptual bi-stability may best be understood as a means for optimising interpretations of the sensory environment' [30]. However, as Denham and Winkler state, perceptual information is often inherently ambiguous and therefore the perceptual system explores likely alternatives to 'minimise misinterpretations', [31] and this process is a result of 'the active exploration of the sensory environment'.

When thinking resembles an absent stimulus, such that the noise in the system is no longer resonating with the external stimulus, the boundary between endogenous and exogenous has been transgressed. The permeability of the boundary with its resultant signal and residual noise brings about a discontinuity of localized events. These networks are not just discrete entities but form firings, ripples in the system. Philosopher David Wood puts forward the idea that boundaries are 'time shelters', interchangeable as states, and that 'a boundary is not a thing but a cluster for the procedure of the management of otherness' [32]. 'The boundaries of shelters are essentially permeable in ways that allow interruption – invasion, infection, corruption' [33].

Where Bergson talks of the extensity of sensation, the rootedness of *all* sensations that might be located externally, he claims that space is 'no more without us than within us' [34]. This shifting interchange between internal and external, endogenous and exogenous through sensation points towards the uncertainty and transmutability of how we enfold experience, continually modifying the present in relation to noisy memory whether encrypted in the neuronal network or the body: 'On the biological level, it is the margin of undecidability accompanying every perception, which is one with a perception's transmissibility from one sense to another' [35].

The signal stripped of its noise becomes linear, binary, hermetically sealed from its noisy origin. This has proved very useful in engineering and many sciences, however as technologies and engineering develop, more complex systems need noise to carry information. The re-introduction of noise is interesting; stochastic resonance has recently been developed in tiny computer chips to allow the signal its buoyancy, the noisy counterpart no longer stripped away from the integrity of the system. This 'non-linear causality', [36] that Massumi speaks of when discussing stochastic resonance, signifies the beauty and complexity of systems, the peaks and flow of information, of things above, through and beside, resolving itself in intensities both implicit and explicit.

In his discussion in which he describes what experiencing might be Massumi invokes William James' analogy as "drops" of experience, Massumi says,

> 'At the limit, what appears isn't just a drop or a pool but a whole ocean, with calm stretches and turbulence, ripplings that cancel each other out and others that combine and amplify, with crests and troughs, killer surf-breaks and gentle lappings at the shores of other situations' [37].

References and Notes

1. A. Lucier, Retrieved July 16, 2012, from http://www.kunstradio.at/ZEITGLEICH/CATALOG/ENGLISH/lucier-e.html

2. Yi Wei and Alexei A. Koulakov, *Long-term memory stabilized by noise-induced rehearsal,* Retrieved July 19, 2012, from http://arxiv.org/abs/1205.7085v1

3. Wei and Koulakov [2].

4. Kurt Wiesenfeld and Frank Moss, *Stochastic resonance and the benefits of noise: from ice ages to crayfish and SQUIDs* in *Nature* **373**, 33 - 36 05 January 1995).

5. Wiesenfeld and Moss [4].

6. Wiesenfeld and Moss [4].

7. Brian Massumi, *Parables for the Virtual, Movement, Affect, Sensation.* Durham and London: Duke University Press, (2002), pp.296.

8. A. Raj and A. van Oudenaarden, *Nature, Nurture, or Chance: Stochastic gene expression and its consequences* in *Cell* - 17 October 2008 (Vol. 135, Issue 2, pp. 216-226)

9. Raj and Oudenaarden [8].

10. M. Acar, J.T., Mettetal, and A. van Oudenaarden, *Stochastic switching as a survival strategy in fluctuating environments.* Nat. Genet. 40, 471–475 (2008).

11. Raj and Oudenaarden [8].

12. Raj and Oudenaarden [8].

13. Henri Bergson, *Matter and Memory*, New York: Zone Books (1988) pp. 174.

14. Richard Coyne, *The net effect: Design, the rhizome, and complex philosophy* in *Journal of Futures: the Journal of Policy, Planning and Futures Studies* doi:10.1016/j.futures.2007.11.003, (2008) pp. 16.

15. Coyne [14] pp. 17

16. Brian Rotman, *Becoming Beside Ourselves: The Alphabet, Ghosts and Distributed Human Being.* Durham and London: Duke University Press. (2008)

17. Rotman [16] pp. 133.

18. Grant, *Ghost*, Eight-channel sonic artwork, site based installation, shown at *ISEA* Istanbul, (2011).

19. Eugene Izhikevich, *Polychronization: Computation With Spikes, in Neural Computation*, 2006 18:245282. Retrieved July 20, 2008 from http://www.izhikevich.org/publications/spnet.pdf

20. *Neural Ghosts and the Focus of Attention*, *ISEA*, 2011. Retrieved July 20, 2012, (2011) from http://isea2011.sabanciuniv.edu/paper/neural-ghosts-and-focus-attention

21. David Wood, *Time shelters: an essay in the poetics of time*. In: *Time and the Instant: essays in the physics and philosophy of time*. Durie, R. (Ed.), Manchester: Clinamen Press, (2000) pp. 227.

22. Grant, *Neural Ghosts and the Focus of Attention, ISEA*, 2011. Retrieved July 20, 2012, (2011) from http://isea2011.sabanciuniv.edu/paper/neural-ghosts-and-focus-attention

23. Henri Bergson, *Matter and Memory*, New York: Zone Books (1988) pp. 170.

24. Bergson [23] pp. 187.

25. Mark B. Turner, *The Ghost of Anyone's Father* (January 28, 2004). *SHAKESPEAREAN INTERNATIONAL YEARBOOK*, Vol. 4, pp. 72-97, Graham Bradshaw, Thomas Bishop, Mark Turner, eds. Hants, U.K.: Ashgate, 2004. Available at SSRN: http://ssrn.com/abstract=1334445

26. Turner [25].

27. *Plasticity* is a discrete participatory sound and light artwork comprising 6 microphones and 16 speakers within one large room. Each speaker is coiled in LED ribbon, it was first exhibited at BFI, British Film Institute (BFI Southbank) as part of onedotzero 'Adventures in Motion' Festival, 2011.

28. Henri Bergson, *Matter and Memory*, New York: Zone Books (1988) pp. 174.

29. Eugene Izhikevich, *Polychronization: Computation With Spikes* in *Neural Computation*, 2006 18:245282. Retrieved July 15, 2012, from http://www.izhikevich.org/publications/spnet.pdf

30. Denham, SL., Winkler, I., *The Role of Predictive Models in the Formation of Auditory Streams* in *Journal of Physiology* - Paris 100, 154–170 (2006) pp. 157. 29

31. Denham and Winkler [30].

32. David Wood, *Time shelters: an essay in the poetics of time*. In: *Time and the Instant: essays in the physics and philosophy of time*. Durie, R. (Ed.), Manchester: Clinamen Press, (2000) pp. 227.

33. Wood [32].

34. Henri Bergson, *Matter and Memory*, New York: Zone Books (1988) pp. 288. 33

35. Brian Massumi, *Parables for the Virtual, Movement, Affect, Sensation.* Durham and London: Duke University Press, (2002), pp. 36.

36. Brian Massumi, *Parables for the Virtual, Movement, Affect, Sensation.* Durham and London: Duke University Press, (2002), pp. 296.

37. Brian Massumi, *Semblance and Event: Activist Philosophy and the Occurrent Arts.* Cambridge Massachusetts, London England: The MIT Press, pp. 52.

DANCING IN SUITS: A PERFORMER'S PERSPECTIVE ON THE COLLABORATIVE EXCHANGE BETWEEN SELF, BODY, MOTION CAPTURE, ANIMATION AND AUDIENCE.

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Abstract

The motion capture process places unique demands on performers. The impact of this process on the simultaneously artistic/somatic nature of dance practice is profound. This paper explores, from a performer's perspective, how the process of performing in an optical motion capture system can impact and limit, but also expand and reconfigure a dancer's somatic practice. This paper argues that working within motion capture processes affects not only the immediate contexts of capture and interactive performance, but also sets up a dialogue between dance practices within and beyond the motion capture studio.

Keywords: dance, motion capture, interactive performance, somatic practices.

Motion capture has emerged over the last ten years as a technology that offers new possibilities for dance analysis and for choreographic creation. Motion capture analysis has been used in biomechanical studies of dance technique and style [1, 2, 3, 4] and to develop dance technology performance works [5, 6]. Dance researcher Sarah Whatley has developed a number of projects that seek to embed somatic, dance-based information within digitized environments. Whatley emphasizes the importance of taking into account the somatic nature and requirements of specific dance practices when developing motion capture projects, [7, 8] in discussing digital artist Ruth Gibson's use of motion capture to investigate Skinner Release Technique.

Optical motion capture systems use markers attached to the dancer's body, either by means of a Velcro suit or by attaching markers directly onto skin using sports tape and surgical tabs. Inherent in this process, and in the technology itself, is a mapping of the body's movement to lines of action in space that are defined by the movement of the markers rather than of the body itself. A dual shift in somatic awareness is involved here. Firstly, the dancer's experience of moving is re-constituted within the physical sensation of wearing markers and/or a suit. Secondly, the dancer's movement is re-formulated in terms of a series of lines in space, rather than as a volumetric 'body' moving through an environment.

This paper seeks to examine and articulate the ways in which these shifts in embodied experience can be understood in the somatic, aesthetic and artistic context of dance practice. We argue, based on the experimental work described below, that these shifts can only be understood in terms of a two-way process between a dancer's practice inside and outside motion capture systems. That is to say, the 'effect' of motion capture on dance is not uniform or pre-determined by the nature of the technology so much as it is constituted in and by the somatic/artistic practices of an individual artist.

This discussion arises from a series of experiences, projects and conversations arising from the work of the Deakin Motion.Lab over the last three years. The authors have worked together, and with the creative team at Motion.Lab [9], on numerous projects in dance analysis and transmedia performance, Hutchison as performer/ creator and Vincs as director/researcher. In the first instance, the investigation into the experience of dancing in suits was not an explicit goal, but arose from ongoing conversations that took place in and out of the studio as we worked together across a range of projects and creative and research contexts. The relationship that exists and is articulated in these few pages gives voice to our ongoing discussion about the nature of performing 'in suits' and what that might mean for a dancer's practice both in and outside of a suited environment.

An implicit contract

Hutchison provides a first person description of approaching a motion capture shoot.

> *Seeing yourself as a cloud of markers when you first walk into a motion capture volume is always strangely exhilarating and exciting, but also an experience of vulnerability. It doesn't matter how many times I have donned a suit now, it's still the same feeling. There is a sense that anything is possible and the opportunity to test what that might mean is fuelled by the adrenalized feeling of a performance. Whether the situation is a data capture or simply an exploration of a new process, I feel it is a performance from the moment I put on the suit. I find this the case even in processes that are explicitly provisional and exploratory, and hence more about testing, buffering, adjusting, negotiating, aligning, familiarizing for the system, and not really about how one usually understands performance. 'Performance' is what I feel from the moment I step into the suit. With performance comes a sense of openness and possibility, but also of exposure and vulnerability.*

This vulnerability arises from the process of exchange we know will present itself as part of the task in hand. Whether this task is recording movement data to be later mapped onto a CG figure, or testing and performing interactive motion-driven visualization, an openness to admitting movement modalities, qualities, textures and sensations simultaneously from sources inside and outside the dancer will be integral to the process.

Perhaps the most vivid evocation of this sensation occurs when working with artificial intelligence systems. Working with Motion.Lab interactive artist John McCormick, Hutchison improvises with an avatar generated by a neural network system created by McCormick. The system is trained on Hutchison's movement data and attempts to respond to her movement rather than copy it [10]. In this system the exchange with technology is composed not simply in terms of texture, surface or trajectory, but in terms of movement constituted via a hierarchical skeletal (joint-driven) model. Thus the terms of the exchange are enacted through humanoid morphology, with Hutchison's movement placed in dialogue with the avatar's seemingly humanoid movement.

The way in which Hutchison constructs her part of the exchange can only be fully understood in terms of her practice outside of and prior to her work in motion capture. Hutchison's understanding of hybridity, drawn from her solo performance practice, marks and defines her approach in very specific ways. Hutchison describes her solo practice, again in the first person to capture the embodied nature of the work as closely as possible, as follows.

> *Away from my work in a motion capture suit, I experiment with the collaborative and artistic potential*

between contemporary dance, circus arts and improvisation, and the selves that the specific bodily practices brought about through the practice of these physicalities. I experience myself, through these practices, as multiple, a hybrid body.

When I describe myself and my work as hybrid, I am seeking to articulate a practice, performance and self that is not one, not singular or discrete in its aesthetic, physicality or philosophy. This hybrid is a mesh of intertwining strands of practices, experience, memory, imagination and consciousness, which are constantly weaving and re-weaving tensile, interconnected threads. Rather than viewing hybridity, the hybrid body, as a negative construction brought about through a pastiche of poorly understood practices, I view hybridity as a positive and expansive practice, process and philosophy. Hybridity involves, for me, a fluid dynamic relationship across art forms and the ability to collaborate widely.

Dance theorist Laurence Louppe, who understands dance as a means of constructing an embodied subjectivity which is developed over years of practice and therefore not quickly or easily malleable, states that, "In today's dance, both the demands made by choreography and the structure of dancers' training inscribe hybridization in the destiny of the body. As a result, it is virtually impossible to develop recognizable zones of corporeal experience, or to construct the subject through a given corporeal practice" [11]. Louppe's view is that hybridization works against the development of a distinctive corporeality. Hutchison seeks the opposite. Her project, as a dance artist, has been to find within the hybrid practices in which she has trained strategies for repurposing cultural, artistic and corporeal elements of these practices to create a recognizable and distinctive subjectivity. Unlike the great moderns, such as Martha Graham, Merce Cunningham and Isadora Duncan, who were interested in refining cohesive and distinctive dance practices based in their own bodies, Hutchison seeks to find cohesion through integrating diverse, and even contradictory, practices within her body.

We question whether hybridization, which is, as Louppe argues, inevitable for this generation of dancers on the basis of their immersion in a project-based dance industry, is necessarily problematic. Within a historical context of ubiquitous cross-modality, it is perhaps more useful to seek the possibilities within hybridity than to simply assume hybridity to be the enemy of distinctiveness.

Hutchison works with the specific bodily practices of tumbling, tissu, corde lisse, improvisation, contemporary dance phrase material, ballet and running in her examination of hybrid processes. By separating these practices out she investigates the precise nuances of the body in each form as distinct and exclusive processes. In developing performance, she takes her cue from Deborah Hay and generates an improvised practice that recognizes all potentialities at once by engaging multiple bodies, multiple practices, and the interstitial spaces that open up between them. Hay's practice "constructs body as a site of exploration to which the dancer must remain vigilantly attentive. Body does not succumb to the dancer's agency – striving, failing, mustering its sources to try again. Instead it playfully engages, willing to take on new projects and reveal new configurations of itself with unlimited resourcefulness" [12]. Hay's practice creates space for experimentation with all possibilities for dance at once, and values "the body as a generative source of ideas" [13] – in this instance augmented by the technologized environment rather than by a written or verbal score.

Each practice inscribes my body in precise and specific ways. In performance, the borders are torn, all possibilities are actively in flux and permeable.

Hybridity is fundamentally a process of respect. Working with hybrid practices involves a care for the nuance, context and history of each individual practice, and a diligence about resisting the easy solution of allowing one to dominate or subsume the others. This process is precisely analogous to that of working with another dancer. The enactment of this approach in motion capture work has come, over a period of years, to be encapsulated in a ritual articulated as follows.

While changing into motion capture suit and attaching the markers (which I often do myself as it seems quicker and easier), I make an implicit agreement to respect my 'dance partners'. In a motion capture context, my 'dance partners' are not usually other dancers or even other practices, as is the case in my work outside the motion capture studio. My dance partners in motion capture are markers, animations, motion graphics, avatars and the spatial reality of the motion capture volume.

The ability to work in this environment, to perform with a giant animation on a screen, for example, does not mean making myself larger, more dynamic, or more present as if to compete with the sometimes overwhelming scale of a visualized graphic. On the contrary, to work successfully in this environment, I need to be more vulnerable in the sense of allowing myself to be really seen and to be responsive and open to whatever comes in to the space from all of the potential collaborators (human and technological) present at any given moment. To engage with human and non-human collaborators requires an openness to possibility that is the opposite of 'technique' in the sense of previously mastered movement capacities.

As anybody who has ever danced a contact improvisation duet with a partner knows, reciprocality and sensitivity is needed rather than force and the assertion of a pre-defined intention. The experience of working with motion capture environments is that I cannot be concerned only for my own enjoyment and/or ability as a dancer. I need to foster an implicit, moment-by-moment negotiation with all 'partners'. Remaining open to any and all potentialities at once is what makes the initial testing or experiment phase really powerful and exciting.

The moment when performer and director see the marker-data cloud demands an acknowledgement of a new contract or relationship for the day ahead. The contract is really an unspoken agreement to find ways to test and challenge but also to be highly respectful of one's dance 'partner/s' – the markers attached to the performer's body and the cameras seeking their presence.

A very tangible example of this interconnectedness is the approach to movement motion capture requires. In an optical motion capture system, marker occlusion is a constant problem. Because optical motion capture works on line-of-sight, if markers are occluded by body or floor, the data becomes more difficult to process. Hutchison has developed, in response, a subtle but effective approach to moving in ways that minimize occlusions while maintaining a rich movement exploration process.

Investigation and experimentation

Choreographic investigation implies cultivating constant embodied shifts and changes that produce new nuances in the body. In the suit these are more pronounced because of the heightened state of awareness necessitated by the environment. There is a need to be aware of relationships to the screen and to others in the space, and responsibilities to maintain the markers in sight of the cameras and to not roll around on the floor or over-bend in the hips to maintain the integrity of the data-stream. There is also, and perhaps more critically, the need to generate movement that is readable in relation to the screen. That is to say, the geometry of the image must be activated in ways that are consistent with 'its' spatial and temporal parameters. To do this, it is necessary to test the properties of the graphics or avatar that might be up on the screen, and to explore and challenge how it works and what moves it and in turn how this moves the performance itself and how others perceive it.

> *There are a lot of balls flying around and my attention therefore seems intensely focused, perceptive and responsive. In this environment I am less concerned than I might otherwise be in dancing "for" myself and more concerned with the feedback I am receiving. The feedback is multiple and instantaneous. It is coming from different perspectives – other dancers, directors, the animation, the animators, programmers and myself. What is really important in this environment is listening. It is listening with your body as you do in other forms of dance improvisation but it goes beyond this and takes you into more of the role of facilitator and guide. Responses to particular movement of my body and what this does up on the screen really creates my score and landscape within which to keep working.*

Different graphical and avatar environments require different 'orders' of physical control. An amorphous avatar based on a cloth simulation, for example, which has the implied weight and mass of a woman's torso but no limbs to provide stability, extended movement or even the ability to stand or walk, requires very fine motor control through the dancer's torso. Less is more, with regards to the dancer's physicality, because slight shifts within the dancer's core axis create large ramifications for the avatar/figure's whole mass. Conversely, a series of trails that mark specific marker trajectories have an easy motility that requires constant movement through large arcs created by the dancer's extremities to create effect. The dancer's literal, physical presence is, in both cases, mediatized and re-presented on screen in the form of avatar/figure/motion graphics that form an extended sense of 'presence' within and through the generated imagery. In the first example, the dancer's screen 'presence,' both physical and mediatized since both are visible in the space simultaneously, is linked to the axial skeleton, to posture and its subtle shifts which in turn animate the figure. In the second example, presence is mapped by arcs through space that must be constantly replenished since they fade quickly, erasing all sign of the performance that was.

> *I am working with curiosity as to what this version of myself is. I'm watching quite closely on the screen to see the motion, particularly at my joints. It's a playful exchange of pushing boundaries. Really small fine movement and larger more dynamic movement edging towards the floor and perimeter of capture volume mark out territory in a way but also tune my body to my virtual body and space.*

Tension and intention

Both within and outside of a suit, the practice of weaving together multiple perspectives of movement, physicality, expression and collaboration across art forms and artists involves grappling with tension. Tension arises through holding on to many multiple threads at once and creating from these threads in the moment of performance. The acuity of the tension from moment to moment must be sharp or focused so as to be clearly articulated and interpreted. In this way the intention is always pointed, focused on drawing precise action out of an 'in-between' of multiple artistic, technological and movement information dialogues. Success means achieving a dialogue between all parties. Failure means incoherency and 'noise'.

The tension created through the awareness of what you're working with at any given moment has a focusing effect. It means one must attune to what is urgent at that moment – perhaps to the juggling ball that is in the most danger of being dropped, or perhaps to the ball that offers the most potential, or draws the most audible comments or sharp intakes of breath from the inevitable group of artist/researchers/observers watching the process.

> *Each animation, each marker or group of markers being used to drive the animation provides the opportunity to interrogate my body, to ask how with these particular constraints, these references to draw on, and as formed in response to the collaborators and audience present in the space, might I move.*

Conclusion

Other than performing in the round there is no other performance environment that acutely sharpens one's attention to 360 degrees, to the whole body at once. A heightened state of awareness is induced by wearing a suit covered in markers, and having one's every move recorded, amplified, projected and mediated by a visual representation that can range from the most abstract points and lines to the most realistic of humanoid characters. This process affects a profound influence on embodied practice that simultaneously invites attention to the possibilities of the body and possibilities beyond the body. In this way, we see the motion capture process as inherently generative for dance practice in and of itself, aside from any of its more instrumental uses in dance analysis and creation. It may, in fact, be precisely this ability to call attention to the experience of one's body that underpins its effectiveness in enabling processes of dance analysis and hybrid, trans-media creation, because this attention focuses not only the process at hand, but also the individual dance practices that are brought to it.

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References and Notes

1. A. Imura and M.R.Yeadon, 'Mechanics of the fouetté turn'. *Human Movement Science* 29 No. 6 (December 2010) pp. 947–55.

2. J. Shippen and B. May, 'A kinematic approach to calculating ground reaction forces in dance' *Journal of Dance Medicine and Science* **16** No. 1 (March 2012) pp. 49–43.

3. S. Bronner and S. Ojofeitimi, 'Pelvis and Hip Three-dimensional kinematics in grand battement movements,' *Journal of Dance Medicine and Science* 15 No. 1 (March, 2011) pp. 23–30.

4. M. Yoshimura, H. Murasato, T. Kai, K., Yokoyama, K. Hachimura, " Analysis of Japanese dance movements using motion capture system,' *Systems and Computers in Japan*, 37 No. 1 (2006) pp. 779–788.

5. S. deLahunta and F. Bevilacqua, "Sharing descriptions of movement," *International Journal of Performance Arts and Digital Media*, **3** no. 1 (2007) pp. 3–16.

6. S. Hawksley and S. Biggs, 'Memory maps in interactive dance environments,' *International Journal of Performance Arts and Digital Media*, 2 No. 1 (2006) pp. 123 – 138.

7. S. Whatley, "The Poetics of Motion Capture and Visualization Technologies: the differences between watching real and virtual dancing bodies," in *Kinaesthetic Empathy in Creative and Cultural Practices*, D. Reynolds and M. Reason, eds. (Bristol, UK: Intellect, 2012) pp. 263–280.

8. Examples of Whatley's work include *Siobhan Davies RePlay*: www.siobhandaviesreplay.com, *Digital Dance Archives*: www.dance-archives.ac.uk/, *D-TRACES*: http://dancetraces.wordpress.com/

9. The Deakin Motion.Lab operates as a collective working on creative and analytical approaches to motion capture, animation and digital performance. See J. McCormick, K. Vincs, S. Nahavandi, D. Creighton, 'Learning to dance with a human;, in this volume.

10. L. Louppe, "Hybrid Bodies," in *Writings on Dance*, Vol. 15 Winter 1996, p.64

11. S. Foster, "foreword", *my body, the Buddhist / Deborah Hay*, Wesleyan University Press, Middletown Connecticut, 2000, p.xiv

12. S. Foster, "foreword", *my body, the Buddhist / Deborah Hay*, Wesleyan University Press, Middletown Connecticut, 2000, p.xv

THE INTER-SOCIETY FOR THE ELECTRONIC ARTS REVIVED?

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Abstract

This is an edited version of an introduction written for the panel session with the same name of June 13, 2013. The editing took place after the session was held. Both the introduction and the panel session are seen as the beginning of a discussion that should help to give direction to the future of ISEA.

This article was edited by ISEA International board member Bonnie Mitchell, and received input from the panellists as well as from Wolfgang Schneider, Roger Malina and Peter Beyls. The panellists were Bonnie Mitchell, Anne Nigten (former ISEA board member), Vicki Sowry (*ISEA2013* organiser), Ernest Edmonds (presenter at the first ISEA symposia) and Peter Anders (ISEA International board member). I would like to thank them all for their constructive thinking.

The panel proposal is followed first by a mini manifesto (why cooperation?) and then an historic overview of ISEA, which is celebrating its 25th birthday this year. Before presenting the viewpoints of the panel members, I will try to give some of those viewpoints an historic context, and add to that some insights from personal experience. Finally, I will try to draw some conclusions. In that way I hope to lay the foundation for a more or less structured discussion that will continue after the panel and *ISEA2013* are over.

Keywords: Electronic Art, Emergent Art, Media History, International Symposium on Electronic Art, Inter-Society for the Electronic Arts

The Proposal

The original aim of ISEA was to connect all organisations that are active in the field of the electronic (or emergent) arts; thus ISEA would become a meta-organisation.

The goal of the first ISEA Symposium, held in 1988 in Utrecht, the Netherlands, was not to begin a series, but to establish the meta-organisation by creating a gathering at which the plan for this association of organisations could be discussed and endorsed. This is exactly what happened, and the association, called the Inter-Society for the Electronic Arts (ISEA), was founded 2 years later in the city of Groningen (the Netherlands), prior to the second ISEA symposium, in the same city. The continuation of the symposia, thus making it a series, was another result of the historic meeting in Utrecht.

Quite possibly, the goal was too ambitious, and the founding fathers too much ahead of their times. When a panel meeting was organised on the stage of the second symposium, with representatives of SIGGRAPH, the Computer Music Association, Ars Electronica, ISAST/Leonardo, ANAT, Languages of Design and others, the discussion was reasonably civilised, but behind the scenes tempers flared, as nobody wanted to lose autonomy.

Looking at *ISEA2013*'s theme and sub-themes, this is the time to put co-operation on the table! To quote from the *ISEA2013* site:

-Resistance is Futile: Electronic Art now lies embedded in the heart of our contemporary cultures.

-Histories and Futures of Electronic Art: ISEA2013 *offers a platform to explore where electronic art has come from, where it is going and what it might become.*

-Creation, Collaboration and Consumption: ISEA2013 *encourages debate, provocations and engagement in the global nets of participation.*

Mini Manifesto

for a Network Organisation for the Emergent Arts

1. We live in a world that is governed by economic laws. The economy in charge is mainly based on profit maximisation by individual enterprises (as opposed to collective initiatives).

2. Meanwhile, history is being governed by expansion of human knowledge, encompassing both insight and imagination, or science and art, together known as culture.

3. The development of science and its practical application, technology, is extremely fast, providing for rapid changes in production, medicine, social life and so on. The economic motor requires us to consider every technological advance as a potential source of profit.

4. This obscures our vision of future well-being on a global scale. The only counterweight at our disposition is art, the other side of the cultural moon. In such a serious context, it is of essential importance that all art initiatives which consciously aim at grasping the implications of technological development, put their heads together and co-operate. The aim should be to structurally and systematically (in other words, scientifically) approach the artistic potentials of our new age.

History

The idea to start ISEA was conceived by Theo Hesper, currently a resident of Indonesia. Theo was founder and board member of the Dutch Foundation for Creative Computer Applications (SCCA), of which I was the director. The SCCA partnered with the Utrecht Art School to organise the first ISEA symposium in Utrecht. The Utrecht Art School made a commitment during the first symposium to organise the next one too, in two years' time.

However, less than a year later, I received an e-mail message from Roger Malina, who had participated in the historic meeting in Utrecht. He informed me that the Utrecht Art School had told him they were not going to be able to pull off the second symposium, and he asked me whether I saw any other possibilities. I worked for the computer animation department of Groningen University (then called Polytechnic) of Applied Sciences, which boasted a famous art school (Minerva) and a Music Conservatory with an electronic music department. The school agreed to host the symposium; it sprang into action and organised a quite successful second ISEA in 1990. Nearly 500 proposals were received, and approximately 250 international and 250 Dutch participants attended.

First in Utrecht, and even more so in Groningen, an enthusiastic group of Australians insisted that they would organise the third symposium in 1992 in Sydney. That symposium was of a larger scale, involving major musea and galleries; the following symposia held in Minneapolis (1993) and Helsinki (1994) were rather modest; however the one held in Montreal (1995) was relatively large.

Before the second symposium, Theo Hesper and I founded the Inter-Society for the Electronic Arts (with the same acronym as the symposium), thus fulfilling the goals expressed at the historic Utrecht meeting. The name was coined by Roger Malina. It was an association, and it was intended that its members be institutes and organisations; however, as we had no funding whatsoever, we decided to allow individuals to join too, and managed to enrol around 100, rising to 200, members, many of them non-paying. Only a few (5-10) of the members were institutions; many were students, paying

a reduced fee. The association was run by a number of volunteers–Dirk Boon and Rene Paré in the Netherlands, and, among others, Yoshiyuki Abe in Japan and Rejane Spitz in Brazil. However, none of the volunteers could work for ISEA as part of their paid professional job.

The ISEA members wanted something in return for their membership dues, so we negotiated a symposium fee reduction for ISEA members, and produced a monthly newsletter, including an extensive event agenda, job opportunities, calls for participation, etc., that was distributed via snailmail. Over the years, more than 100 newsletters have been produced. Yoshiyuki and Rejane translated the newsletter into Japanese and Portugese (for the Brazilians), and we called them our Japanese and Brazilian branches. Our main job was to coordinate the continuation of the symposia.

The Montreal symposium in 1995 was so successful that the organisers were subsequently able to get funding to take on the running of the association, and bring 'HQ', as we called the secretariat, to their city. The organisation behind this initiative was the Société Des Arts Technologiques (SAT), and the sponsorship came from the Daniel Langois Foundation. Alain Mongeau (*ISEA95* director) and Monique Savoie (SAT) were the main players.

The Canadians were able to bring together physically the international board of the Inter-Society with several members of the advising committee, in order to discuss the future of ISEA over several days of intensive meetings. They also organised a ‘General Assembly on New Media Art’, called Cartographies, which took place from October 12-14, 1999. Its aim was to make progress ‘toward a definition of new media art’. Present were representatives of the Inter-Society, Montreal Festival of New Cinema & New Media, Banff, University of Quebec, McGill University, Daniel Langois Foundation (all Canadian), Ars Electronica (Austria), V2 (Netherlands), Art3000 (France), Muu (Finland), Mecad (Spain), DA2 (UK), Walker Art Center (USA) and others.

Taken from the flyer for this assembly: the “works of today are polysemic, multi-sensorial, interactive, virtual. In search of an identity of their own, they demand new criteria of evaluation and understanding, as well as new sensibilities”. It would, of course, have been unrealistic to imagine that this 3-day summit would result in definitive answers to the questions on the table, but it was, at least, the beginning of a collaborative effort to solve common problems.

The question of funding dominated many of the presentations and discussions. As Valérie Lamontagne described in the CIAC Magazine: “Certain initiatives did result from this discussion, mainly the desire to form a nation-wide media arts lobbying organization.” But her conclusion speaks for itself: “Media arts still remains an art practice fraught with contradictions in practice and philosophy”[1].
The most distinct observation of Valérie was: “Cartographies focused on the one hand on a movement away from computer-based art practices towards interactive projects done in collaboration with the scientific and artistic community, and, on the other hand, on projects being done in an independent fashion which no longer necessitated ‘center’ and ‘distributors’. A dichotomy was formed between a populist approach to technology and more expensive and institution-driven media arts production.”

All of this was, clearly, a very hopeful beginning to the Inter-Society for the Electronic Arts. However, around the year 2000 the Daniel Langois Foundation terminated its support, and the Montreal HQ ceased to exist. It had become apparent that funding a truly international (nomadic, even) organisation would be terribly difficult.

After the year 2000, the ISEA headquarters was, once again, run by volunteers only. In the Netherlands it became a project for a student team to maintain central communication. The team was succeeded by Angela Plohman, who contributed tremendously, practically for free. Shortly afterwards, two Dutch board members managed to obtain subsidies from the Mondriaan Foundation and the VSB Fund for building an online archive to store important ISEA documents. The project manager, Nadia Palliser, took it upon herself to direct the ISEA's HQ for the duration of the project. The archive project culminated with a presentation of the results in Singapore, *ISEA2008*.

During that same year, the Inter-Society made two major decisions. The ISEA Board decided that the symposium host city would have to pay a fee to the ISEA headquarters so that it could fund the management of the organisation. The second decision was made in consultation with the ISEA membership, and was to become a foundation instead of an association. The Inter-Society went to sleep (it still exists, but is dormant), and ISEA International saw the light of day.

The University of Brighton offered to host the International ISEA headquarters, with Sue Gollifer as the Director. From then on we charged the symposium hosts a fee of €10K, of which 80% goes to the University of Brighton; however, this still does not allow us enough room for development, so we recently raised the fee to €15K.

Policy

Where the Inter-Society was overly optimistic and naïve, the ISEA International foundation has limited its goals to what it is able to reasonably accomplish. A volunteer organisation requires professionals in order to work effectively.

ISEA International has only 3 aims: to ensure that the series of symposia continues, to maintain a secretariat (HQ), and to maintain the two websites (the general isea-web.org and the online archive)[2]. With the conception of the foundation we decided we would endorse initiatives from individuals or institutes to create ISEA projects, but we would not take on initiatives ourselves, as we lacked the capacity to carry projects through to the end.

Keeping the symposia 'in the air' has been the main concern of, first the Inter-Society (even though the official primary aim went beyond that), and then ISEA International. It is not enough to find a city or a university that wants to organise a symposium; the task of maintaining ISEA's character takes a major investment of time and energy. ISEA International does not want to duplicate what other organisations are doing. Ars Electronica, for example, existed before the ISEA symposium did; ISEA is primarily an 'academic' conference, and Ars Electronica a festival. Some of ISEA’s other characteristics were not preconceived, but grew naturally out of the original initiative: its nomadism, its 'un-institutionalised' appearance, and the feeling that the participants 'own it'.

The board of the Inter-Society, and then ISEA International, have invested a great deal of energy in developing Guidelines for Symposium Hosts [3], and also a contract to ensure commitment to the ISEA symposium character. The first thing some

organisers do, for example, is to announce ISEA as a 'festival'. The ISEA board also always needs assurance that participation in the symposium is not obstructed by financial thresholds. Currently we are revising the Guidelines and contract once more to address these issues, with the aid of a legal professional.

Improving the symposium is one of the major focal points of the board. This is not easy, due to the fact that each symposium is run by a different group of people in another part of the world. Sometimes, after signing the contract, the hosts throw away the Guidelines and forget who we are. Maybe I exaggerate, but I sometimes get the feeling that they see the ISEA International Guidelines as a burden. The symposium organisers have to pay ISEA International, provide accommodation for the board, and put a General Meeting in the program, while they, the organisers, are doing all the work!

This is a major reason why it is hard to make progress in giving the series of symposia more direction. Since the nomadic character of ISEA is one of its major charms, changing the symposium is possibly one of the most difficult problems that ISEA faces; I would like to see a panel contribution that offers a possible solution.

On the other hand, the struggle to maintain a central contact point (HQ), and the problem of an ever-changing, over-sized board (which was a characteristic of the association, whose board, by definition, was elected by the members), are past us, and we can at last think about the improvements that are needed in the symposium.

In that direction, a major issue stands out in the panellists' statements: Some suggested discussing the possibility of making the choice between a truly academic conference, and a networking event where artists meet each other. Since the main motivation behind ISEA was the need for artists and scientists to meet and collaborate, this would be an impossible choice. However, as panellist Vicki Sowry rightly stated: “it is essential that research be undertaken to identify what is of value to which group of attendees and what the barriers/incentives to attend ISEA for each of these groups really are”.

One thing we can conclude, even without the named research, is that the original academic pretensions are not met. Panel member Ernest Edmonds pointed out that, even though the (paper) proposals and the final papers are double blind reviewed by a competent International Programming Committee, the Proceedings often appear only after the symposium. The problem here is that ISEA, with its extended exhibitions, concerts, performances, screenings and general events, is a much larger organisational structure than a standard academic conference. Besides that, there are strong objections, not only by the artistic community, to having people read their paper to an audience that might as well have stayed home and read the proceedings. Having final papers double reviewed and corrected would mean writing them far in advance of the symposium, thus causing actuality and spontaneity to suffer. However, if we want to be taken seriously by the academic community (and make it possible for academics to get funding to attend), it is essential that the Proceedings are published before the symposium. This would enable us to re-establish the co-operation that we previously had with Leonardo, as mentioned by panellist Ernest Edmonds and commentator Roger Malina. There would have to be rather strict rules for presenting the paper, as reading aloud must be avoided.

A number of the panellists (including Vicki Sowry and Roger Malina, among others) pointed to the funding problems that are often inherent in an international organisation. This also emerged as the most common problem when the organisations met at the Cartographies meeting in Montreal. If any organisation understands funding problems, it is ISEA International.

Let us be practical and state that funding issues may be the primary motivation in encouraging emergent art organisations to come together and discuss co-operation with industry, education, government, social services, health care and so on.

Now that I have again used the word 'emergent' instead of 'electronic' (and several panel members questioned the term 'electronic' in the name of the symposium, as have ISEA International board members), I would like to say a few (personal) words on that subject.

The Name

ISEA was born at a time when the most important current developments were:
-computer graphics had reached a state of maturity,
-while electronic music had an even older history,
-but the two worlds (graphics and music) were not connected
-and it had become clear that new art forms (especially interactive) were possible
-while the traditional division of art disciplines had become obsolete and
-last but not least, the personal computer had advanced in both everyday life and in art education.
The new element was clearly the computer and its introduction into the art world. In the course of the last 25 years the computer has become completely integrated into everyday life (at least in the West), whilst electronics have become integrated into the world around us, from the kitchen to the car. In addition, other technologies have developed in a spectacular way (mostly thanks to the underlying electronic revolution), such as biological and medical technology, nanotechnology and so on.

With these developments, isolation of electronics alone as the interesting new element in the arts has become problematic; in practice, the symposium nowadays focuses rather on the broader connection between 'modern technology' and art.

Especially given the current intersection of electronic technology and the life sciences, 'electronic art' does not cover the whole spectrum of what we at ISEA encompass.

However, I think that changing a name that has a (I hope) positive reputation is not wise. A new problem would arise: both press and public would wonder what 'emergent art' is. So, in practice, ISEA has become a symposium on emergent art, but so far without a change in the name. After all, the largest association in the Netherlands is called the General Dutch Bicyclists Association (ANWB), although today its membership consists of motorists not cyclists (the ANWB provides free assistance to stranded members); and I doubt Linz will change the name of its famed festival to Ars Emergencia because of a shift in philosophy.

Conclusions of the Panel

Theses (*in italic*) that the panel debated and some conclusions drawn were:

PROCEEDINGS
-Papers should be double blind reviewed, even when it means they will

not be published until after the symposium.

The latter part of the thesis was dismissed: Universities need to be sure the contributions of their employees are published in serious Proceedings at the time the symposium takes place. During the symposium a Book of Abstracts should also be distributed. The published papers may help ISEA to be taken seriously by academic institutions. ISEA International should look into the possibility of taking the production and publication of the annual proceedings in their own hands - or find a partner, such as ISAST, to negotiate a structural cooperation on this endeavour.

RESEARCH
-We need to research what the barriers/incentives are to attending ISEA, not only of the current attendees (participants and community members), but also of potential attendees (especially scientists). This research could radically affect the format of the symposium. A survey must become both an integral part of each ISEA symposium, and the basis for ISEA International as a learning organisation - a point that Anne Nigten stressed. From this survey, lessons will be able to be learned regarding the composition of the ISEA constituency, and how that composition might be influenced. It could also be instrumental in the fee-waiving policy that the symposium organisers are encouraged to practice. ISEA International should also investigate the possibilities of practice-based research, from symposium to symposium.

GOALS
-We need to formulate the long-term goal of ISEA. I propose it should be 'a structured approach to the potentials of electronic (or emergent) art'. Original panellist Peter Beyls (who could not be present) formulated it as follows: "[ISEA´s] emergent functionality [consists of] the synthesis of both material means and knowledge to foster the creative contribution to (electronic) culture in a global networked society". For this we will need cooperation on as large a scale as possible.

STRATEGY
-If we aim at getting emergent art institutes to cooperate and meet, what would be the best strategic plan?

SUGGESTIONS:
The term 'meta' should preferably not be used, as it has hierarchical connotations to many. We should use the term 'network organisation'.

"If ISEA regularly hosted the meeting that it always has been doing at SIGGRAPH, this time between representatives of organisations that happen to be there, then maybe coming out of these discussions some joint activity could emerge" (Roger Malina).

"Link with the other growing set of specialist meetings in the area" (Ernest Edmonds).

"Have partner events (…) especially those from science and technology fields". (Anne Nigten).

Look into the possibility of organising 'affiliated events' with ACM [4], and/or allow the organisation of ISEA to host affiliated events.

Negotiate with symposium organisers the inclusion of Institutional Presentations, BOF-meetings [5] and Meetings of Organisations & Institutes.

Other suggestions to further the goal via the symposia: "Special projects sponsored by ISEA International", "SIGs [6] within ISEA symposia", "New Topics Sessions", "Speakers from the Sciences and Technologies", "Publication of dialog between arts and technology" (Peter Anders).

Get more visibility by using social media, especially YouTube. Use YouTube to draw attention to Proceedings and Online Archive.

And, very obvious: start an active search for organisations for ISEA to cooperate with (SIGGRAPH, Computer Music Association, etc.)

Conclusion

The need for an organisation-of-organisations has not diminished since ISEA's birth. This organisation should, however, not be called a meta-organisation, but rather an assembly, a union or - why not? - an inter-society. For ISEA, the word 'emergent' has become more relevant than 'electronic'; thus: Inter-Society for the Emergent Arts.

The opportunity to realise an inter-society may have substantially improved, and the road to get there is partially clear. This consists of ISEA International demanding certain policies from the future symposium hosts; it is up to ISEA International to formulate both these policies, and also a strategy for the longer term.

References and Notes

1. Lamontagne (1995) magazine.ciac.ca/archives/no_9/en/compterendu02.html. Accessed june 16, 2013.

2. isea-web.org and www.isea-webarchive.org.

3. isea-web.org/symposia/how-to-bid/guidelines-jan-2013/.

4. ACM (Association of Computing Machinery) is the mother organisation of Siggraph, Sigchi and other annual academic conferences.

5. BOF: Birds of a Feather.

6. SIG: Special Interest Group.

INNOVATIVE FORMS OF HEALING: NEW MEDIA ART AS A CATALYST FOR LASTING CHANGE IN THERAPEUTIC SETTINGS

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Abstract

Through this paper I suggest that new media art has the potential to become a catalyst for real and lasting change in therapeutic environments. New media art practice is intrinsically focused on human experience and user engagement. It is this focus that so positively predisposes artists working in this realm to the development of works promoting health and wellbeing. New media artists are well versed in managing the indeterminate boundary between art and other disciplines and can take this experience into the therapeutic context [1] to effectively collaborate with doctors, specialists, patients, scientists and the public to generate powerful artworks.

Keywords: Trans-disciplinary collaboration, empathy, new media art practice, therapeutic environments.

Trans-Disciplinary Collaboration In Therapeutic Environments

New media art practice is trans-disciplinary by nature. It requires the coordination of experts from a variety of fields to bring to life projects that span disciplines and sectors. Thus new media artists are well versed in managing the indeterminate boundary between art and other disciplines. At the core of trans-disciplinary practice is the necessity to speak a range of technical, scientific, medical or design languages. Within the therapeutic context this flexibility has the potential to facilitate powerful work as artists effectively collaborate with doctors, specialists, patients, scientists and the public.

In their article "Mapping the Domains of Media Art Practice" Jacobsen and Søndergaard introduce the idea of trans-formative creativity and suggest that "art…is practice, the facilitator of movements across domains and the dialogue between different fields of competencies" [2]. The trans-disciplinary experience also has the effect of transforming traditional roles and behaviours, or as Jacobsen and Søndergaard suggest: "The trans-disciplinary paradigm not only transforms the roles and competencies of old domains, but, more importantly, it also challenges the players on the field with new ways of arranging knowledge and creating interfaces with reality" [3].

Within the therapeutic context it is the capacity to move seamlessly across traditional boundaries that enables the new media artist to create powerful works in collaboration with doctors, specialists, patients, scientists and the public. As with any project that moves across disciplinary domains and fields of expertise there is a danger of ending up with a cluster of results, rather than a cohesive outcome. I propose that the role of artist within this context is to provide and coalesce some form of creative vision to drive the project towards a cohesive outcome. As Lindberg et al. suggest "Some form of overarching communication is needed that helps team members in multi-professional projects to develop a mutual understanding in order to integrate what would otherwise remain splinters of knowledge" [4].

Empathy as a fundamental factor in therapeutic art projects

Artists working within therapeutic contexts need to have the ability to communicate across traditional roles in order to bring a project to life. Though, more than just a capacity to effectively communicate the new media artist working within a therapeutic context requires the ability to empathise with a wide range of people. Arguably at the core of any new media art project is the experience of a person (or user) who is interacting with the work. The artist working within a therapeutic context requires the ability to speak a variety of languages and embody the viewpoints of a community of others. This assists when thinking about the human at the end of the making process and allows us to ask questions such as:

- What is the impact of the work on the patient in the emergency waiting room, or who is trying to manage pain – physical or psychological?
- How can this project positively impact on the psychological experience of the patient?

This ability to take on the world-view of the final audience for the artwork is key to new media projects in therapeutic contexts. This empathy enables the artist to understand the project from a range of viewpoints – from the medical, scientific, administrative angles in addition to the embodying the experience of the final user and their family. Lynn Hogard, Denise Kratz and Rainer Schultze suggest that the digital revolution has necessitated new qualities of mind including "a capacity for empathic understanding of the other and the ability to collaborate and communicate across barriers of language and culture" [5].

Empathy is defined as "the ability to imagine oneself in another's place and understand the other's feelings, desires, ideas, and actions" [6], or "mental entering into the feeling or spirit of a person or thing; appreciative perception or understanding" [7]. Natalie Depraz [8] proposes that there are four stages of empathy: firstly, the passive association of my lived body with the lived body of another; secondly, the imaginative transposal of myself to the place of another; thirdly, the interpretation or understanding of myself as another for you; and finally, ethical responsibility for the Other. While working in therapeutic settings the new media artist needs to experience and embody these four stages of empathy.

The first stage refers to the intersubjective recognition of another person as being like us – an embodied subject of experience open to empathy. This first stage has been termed 'coupling' or 'pairing' and serves as a support for other types of empathy. Within Depraz' second stage of empathy (imaginative transposal of oneself to the place of another) we imagine that we are in the place of the other person, experiencing their emotions. This stage suggests a shift from non-conscious bodily recognition to conscious experience in which we imagine ourselves in the others' situation. It is during this second stage that the individual attributes mental and emotional states to the other person and tries to understand their behaviour in light of this knowledge. The third stage of empathy: the interpretation or understanding of myself as an Other for you, allows for the swapping of viewpoints. That is, one does not just imagine oneself in the position of the other but the exchange becomes bi-directional. The final type of empathy deals with the ethics that arise through the experience of empathetically connecting with another. It is during this stage that the individual recognizes the other as deserving respect and concern.

Within the context of working in therapeutic settings these four stages translate to:

1. Subconsciously recognising the existence of the user/patient.
2. Understanding from their point of view what the issue is – for example dealing with anxiety while waiting in A&E; or managing pain during medical procedures.
3. Changing places with the patient and experiencing their pain or discomfort.
4. Acknowledging the patient's need for and right to a solution to this pain/discomfort.

Evan Thompson points out that empathy is an 'intentional' process: "As an intentional capacity, empathy is the basic ability to comprehend another individual's experience, a capacity that underlies all the particular feelings and emotions one can have for another. To exercise this capacity is to engage empathy as an intentional act and an intentional process. As a unique kind of intentional act, empathy is directed toward, and thereby has as its intentional correlate, the experience of another person" [9].

This idea of intentionality connects strongly with the motivation for making works within healthcare settings. New media projects within healthcare settings are almost universally focused on providing a positive experience for users. They are arguably less focused on challenging or shocking users, as the target audience are people who are already in a vulnerable state. This may be attributed in part to organisational ethics processes but also may reflect a perception of what is considered the 'appropriate' thing to do. While new media art projects may seek to stir debate around medical issues or shortages of resources, few, if any, have the motivation to shock or disturb patients within therapeutic settings. The work of Peta Clancy and Helen Pynor is an exemplar of a new media project which, through working with the Heart and Lung transplant unit at St Vincent's Hospital, seeks to explore and reveal truths around the complex relationships between mind and body while maintaining the dignity and privacy of the families involved [10].

Case Studies: New media Art projects in Therapeutic settings

There are many examples of new media art projects being developed in therapeutic environments. Within the frame of this paper I will look at two key projects that embody a sense of empathy for the user and are completely contingent on

Fig. 1. George Poonkhin Khut, Distillery: *Waveforming*, prototype heart rate controlled iPad app for *BrightHearts* research project. Still image from heart rate controlled visualisation. Visual Effects software by Jason McDermott (left); George Poonkhin Khut, BrightHearts app (heart rate controlled prototype iPad app), photo by Julia Charles (right). (© George Khut)

trans-disciplinary collaboration. The first of these projects is 'Designing Sound for Health and Wellbeing' undertaken by George Samartzis' and David Brown in collaboration with the St. Vincent's Hospital Emergency Medicine Department and the RMIT School of Art. In this project the sound artists developed original sound compositions to determine whether sound and music compositions may reduce the anxiety of patients and their families who were waiting in the emergency department at St Vincent's Hospital in Melbourne. The project involved a research team of composers, art producers and historians, writers, emergency medicine practitioners and health psychology researchers. It ran over the course of several years and has culminated in a series of music and sound recordings that have been clinically tested. The process of testing the recordings has enabled the researchers to demonstrate scientifically that the use of the sound recordings did indeed reduce patient anxiety within the waiting room context.

As the researchers write: "The results of this particular study lend themselves well to daily use in busy Emergency Departments. Anxiety is a common feature of Emergency attendance, not least because many of us sense a lack of control over our own health when we are faced with an acute medical emergency. Any measure that helps alleviate that anxiety may have a positive effect on the whole patient experience" [11].

This is a strong example of a new media art project that is intrinsically trans-disciplinary and has at its core a sense of empathy with the final user. In a similar vein is George Khut's work with *BrightHearts* in which he has developed biofeedback enabled 'relaxation-training games' to help young children manage pain and anxiety. These visualisations of heart rate help young people undergoing painful procedures to focus their attention on controlling the circular visualisation. This in turn may have the effect of reducing anxiety.

Emergency Jewellery – creating devices for health and wellbeing

Within my own practice I am engaged in developing projects that aim to improve or even save life. These projects include jewellery to administer insulin through the skin for diabetics, vessels to remove arsenic from drinking water, a swallowable 'seed' which unfurls like a flower in the digestive tract to detect disease, a programmer which helps you to adapt the experience of your hearing aid, and emergency jewellery to identify allergies and identity in times of medical crisis. In the context of this paper I will discuss the SOS Emergency Jewellery project – being developed in collaboration with Keely Macarow from the RMIT School of Art and a large Melbourne Hospital; and the Hearing Pod, a programmer being developed in collaboration with Blamey and Saunders Hearing.

We are developing SOS Emergency Jewellery to address the need for well-designed jewellery for times of medical emergency. In addition to telling ambulance drivers and healthcare workers

about your allergies and personal information the jewellery may also operate as a drug delivery or diagnostic device. Through using micro-technology the jewellery has the capacity to sense critical biosignals (ECG, EEG, respiration) and also to administer drugs when required. We are also investigating the use of micro-projection devices to beam your medical information on the wall of the ambulance, or on the road – at the site of the emergency.

This project is also investigating the development of a neckpiece to replace the traditional cardiac holter monitor that serves the triple purpose of (1) collecting and storing cardiac wave forms for analysis by medical professionals; (2) storing the patients' emergency contact information and medical history, and (3) being a small, visually appealing piece of jewellery that is less intrusive than traditional cardiac Holter monitors, allowing the wearer to wear the device for an extended period of time. The neckpiece would be aimed at patients who had recently suffered a heart attack or who were experiencing heart rhythm problems. As the neckpiece would have the capacity to collect data over an extended period of time, it may be worn on a permanent basis.

Fig. 3. Diabetes Jewellery – Applicator Neckpiece and Reloader. (Project © Leah Heiss and Nanotechnology Victoria. Photograph by Narelle Sheean); Hearing Programmer - Additive manufactured prototypes (Project © Leah Heiss and Blamey and Saunders Hearing. Photograph by Narelle Sheean)

Hearing Programmer

In collaboration with Blamey and Saunders Hearing I am engaged in developing a programmer, or 'hearing pod', which enables the user of a hearing aid to tailor their hearing experience on-the-go. This allows the wearer to discreetly change their hearing program – for instance, from one designed for bike riding to one designed for a church environment – to ensure they have full hearing in all acoustic conditions. The programmer sits between the hearing aid and a mobile device (phone, computer).

Central to the project is the idea of destigmatising therapeutic technologies. As Elaine Saunders writes: "There are three and a half million people in Australia who would find life easier with a hearing aid - but about two and a half million of those people do nothing about it, partly because of the cost. And more - hearing loss is associated with feelings of isolation, loneliness, insecurity, mental health issues, depression - it has even been associated with triggering early onset of dementia..." [12].

The Hearing Pods actively address the issue of stigma in hearing loss. Through a process of low-tech sculpting and high-tech additive manufacturing I developed three approaches to the technology. Each of these was premised on four ideas:

1. The pod should be desirable – resembling smooth river stones or jewels – and not be identified with existing languages of hearing impairment technologies.
2. The pod should fit the body – slipping easily into a pocket or in a handbag – allowing for maximum mobility and in-situ reprogramming.
3. The pod should look toward a future in which hearing technologies are aesthetically designed personal technologies – as normal as glasses are now.
4. The pod should have an indeterminate function – through disregarding the existing aesthetic languages of disability this would allow the user the power of disclosure – to decide whether or not to disclose the function of the technology.

At the very core of the project is trans-disciplinary collaboration – working across audiology, electronics and art practice; and empathy – developing a deep understanding of the emotional condition of the user who in this case is someone dealing with the stigma attached to hearing loss.

Negotiating the ethical and regulatory landscape of healthcare environments

There is undoubtedly significant innovation that may occur when artists and therapeutic practitioners collaborate to create projects, particularly when these projects have at their core a strong sense of 'intentional' empathy and a strong focus on the health and wellbeing of the final user. However, there are significant

Fig. 2. *SOS Emergency Jewellery* project showing projection bracelet. (Project © Leah Heiss and Keely Macarow. Render by Tom Frauenfelder, Photographs by Narelle Sheean)

challenges to working as an artist in therapeutic settings. I will attempt to address some of the issues around: ethics, privacy, intellectual property and organisational uptake.

1. Ethics

There are significant ethical considerations when working in a therapeutic environment, such as a hospital or healthcare facility. These may be informal – for instance, determining the 'right' thing to do within the environment that will have maximal impact with minimal distress or discomfort to those involved. At this juncture a strong sense of empathy is key to establishing the right ethical framework for the project. The ethical considerations may also be formal – requiring ethics approval from the regulatory authorities within the healthcare environment. Ethics approval can be a lengthy and rigorous process that has the core motivation of ensuring the artist has thought through the complexities of their research [13]. While the acquisition of ethics approval can seem like a long and complex process, Judy Redman [14] summarises the key reasons that it is a necessary step for projects that have some an impact on human health:

1. Responsibility towards research participants: to ensure they can give free and informed consent to their participation and ensure their safety, particularly vulnerable groups.

2. To provide fair access to the benefits of research to all participants.

3. To comply with the regulatory requirements of large scale funding bodies such as the ARC who can withdraw funding if the project is found to be in breach of the *National Statement on Ethical Conduct in Human Research* [15].

2. Privacy Issues

Working within therapeutic settings is complex as it encompasses issues of privacy, particularly when you are working with children or people with illness. This may also include access to patient data that can be an essential part of the artwork. This could be in the form of bio-data, for instance ECG waves or EEG waves. While working on the *Emergency Jewellery* necklace we need to be careful with patient's ECG data as this can disclose private information about the user's state of heart health.

3. Intellectual Property

When developing projects within therapeutic contexts artists need to be conscious of the issues surrounding intellectual property. This becomes particularly critical when the artist develops technology or devices that embody scientific or medical innovation. At this point some knowledge of the processes of intellectual property is critical to protect the role of the artist during the development framework. In 2007 I developed the *Diabetes Jewellery* project whilst artist in residence with Nanotechnology Victoria. Through the *Diabetes Jewellery* project I created jewellery-based wearables to utilise Nanotechnology Victoria's transdermal patches that replace syringes for drug delivery. The patches enable pain-free and continuous delivery of therapeutic drugs - for example, insulin - in a convenient format [16]. The project demonstrated a level of design and technological innovation and so could not be published in the public realm until patent and design registration searches were undertaken. Ultimately it was decided to register the designs to ensure they were protected and to develop a contract that ensured my on-going participation should the product be commercialised.

4. Uptake

The final area of potential complexity new media artists face is entrenched organisational resistance to project uptake. In this instance a collaborative project may be 'proven' to have impact but long term organisational change needs to occur to facilitate uptake.

Conclusion

There is a great richness for new media artists looking to develop works within therapeutic environments. New media art practice is so focused on human experience and user engagement and it is this focus that so positively predisposes artists working in this realm to the development of works promoting health and wellbeing. By virtue of the trans-disciplinary nature of new media art practice, artists are well versed in managing the indeterminate boundary between art and other disciplines. So, in a therapeutic context this can facilitate real innovation as artists effectively work with myriad specialists to generate powerful and engaging artworks.

When artists are effectively engaged in trans-disciplinary groups and work with intentional empathy the possibilities for developing innovative and profound works are increased. Through looking towards successful trans-disciplinary projects working within healthcare settings such as Designing Sound for Health and Wellbeing and George Khut's *BrightHearts* I have sought to explore issues and key strategies within my own practice which seeks to de-stigmatise therapeutic technologies.

These precedents provide a landscape in which empathy and emotional engagement with users and their families is critical to the success of works as is the ability to effectively navigate the ethical and regulatory landscape of therapeutic environments.

References and Notes

1. Within the context of this research 'therapeutic context' refers to any environment in which the individual is engaged in diagnostic or therapeutic treatment. This may be in a health care setting or a personal environment.

2. Jacobsen, Mogens, and Sondergaard, Morten, "MAPPING the domains of media art practice, A trans-disciplinary enquiry into collaboratoive creative processes." *Technoetic Arts: A Journal of Speculative Research*, Vol 8, Number 1. Pp 77-84. (2010).

3. Jacobsen [2] pp 95.

4. Tilmann Lindberg, Christine Noweski and Christoph Meinel, "Evolving Discourses on design thinking: how design cognition inspires meta-disciplinary creative collaboration", *Technoetic Arts: A Journal of Speculative Research*, Volume 8 Number 1, pp 31-37. (2010).

5. Lynn Hogard, Dennis Kratz and Rainer Schultze, *Translation Studies as a Transforming Model for the Humanities*. http://translation.utdallas.edu/docs/FIT.html, accessed July 2013.

6. Encyclopedia Brittanica, http://www.britannica.com/EBchecked/topic/186011/empathy, accessed July 2012.

7. Macquarie Dictionary online edition, accessed June 2013.

8. Natalie Depraz, "The Husserlian Theory of Intersubjectivity as Alterology", in Evan Thompson (Ed.) *Between Ourselves – Second-person issues in the study of consciousness*. (Charlottesville, VA: Imprint Academic, 2001).

9. Evan Thompson [8].

10. http://petaclancy.com/articles/PC_ARTERY.pdf accessed June 2013.

11. David brown, Keely Macarow, Elizabeth Grierson, Philip Samartzis, George Jelinek, Tracey Weiland, Craig Winter, Designing Sound for Health and Wellbeing. Australian Scholarly Publishing, Melbourne, 2012.

12. Dr Elaine Saunders' Acceptance Speech, The 2011 Victorian Pearcey Entrepreneur Award. http://www.pearcey.org.au/2011_Vic_Award, accessed July 2013.

13. Jerry Booth, http://thesiswhisperer.com/2013/05/01/ethical-approval-an-opportunity-for-development/, accessed July 2013.

14. Julie Redman, http://thesiswhisperer.com/2012/06/26/human-ethics-applications-with-a-minimum-of-pain-part-one/, accessed July 2013.

15. http://www.nhmrc.gov.au/guidelines/publications/e72, accessed July 2013.

16. http://www.materialthinking.org/sites/default/files/papers/SMT_V8_P05_Heiss.pdf.

MANIPULATING SPACE, CHANGING REALITIES: SPACE AS PRIMARY CARRIER OF MEANING IN SONIC ARTS

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Abstract

Space is an essential element of human experience. In our daily lives we move about in a multi-dimensional sound field, constantly processing spatial cues in our encounters with our surroundings. Awareness of space as a fundamental component of sound is nevertheless limited among artists and listeners. This paper presents a framework for recognizing, analyzing and working with sonic space, based on identifying and categorizing spatial components from the level of the individual sound, via the combination of sounds in virtual spaces, to the experience of the fusion of composed space and the listening environment.

Keywords*:* space, sound, spatialization, acousmatic, sonic art, aesthetic experience, spatio-structural theory

There is a spatial context to any listening, with respect to where the sound is heard, one's listening position relative to the sound, whether it is heard indoors or outdoors, whether recognition of the source of the sound necessitates action based on the perception of its relative movement or placement, and so on. Further, there are conventions, expectations and specific use patterns related to the space in which the sound is presented – is it a public or private space, gallery or concert hall, art or non-art space, urban or natural environment … ? The space that we hear and perceive is quite complex, in that it combines many factors: spatial elements of the individual sound and any associations it carries, spatial characteristics of the room that the sound excites, the spatial relationship between you, the listener, and the sound - that is, where is it coming from, and is it stationary? If you recognize the source, what images does it trigger? Is it likely to change position – towards you, away from you? What does it tell you about the space you are in – its size and extent, if it is empty or filled?

In this paper I outline a framework for recognizing and manipulating sonic space, developed as a result of my work as a composer of acousmatic music, a musical genre in which the work is typically composed onto a fixed medium, for listening solely over loudspeakers. Space has been a focus of practice and thought in acousmatic music, and integral to composition and presentation of the genre, since its very beginning. Spatial considerations in the composition process – the choice and arrangement of sound material in terms of spatial characteristics and associations – are fundamental to the creation of acousmatic work. The 'spatio-structural theory' outlined here seeks to classify the individual spatial components of sound. It is primarily intended as an aid for artists in developing an increased awareness of sonic space, and unlocking possibilities for implementing space with greater depth and effect in works of sonic art. Using digital technologies, spatial aspects of sound can be manipulated and controlled to an extent where auditory space becomes the primary carrier of meaning in sound-based works, and a powerful tool for artistic expression and communication.

Theoretical background

Space is an essential dimension of human experience. We move about in relation to objects and other people, and hear sounds in a multi-dimensional sound field. Our interpretation of spatial relations is largely shaped by cultural knowledge and experience of spatial communication in everyday life, such as patterns of interpersonal communication, experience of rural and urban life, and the architectural environment in which we live, as well as the manner in which space is represented in language. This knowledge informs our encounters with each other and with our surroundings, both visually and aurally. Space communicates and establishes types of relationships between participants in situations of interpersonal interaction, and shapes the individual's relationship with the surrounding natural and cultural environments.

Anthropologist Edward T. Hall studied intercultural variations in the meaning and use of space in communication [1, 2]. To Hall, culture is defined by communication itself, in which the uses of time and of space are fundamental elements of a 'silent language' [3]. Based on his findings of spatial organization and interaction within and across cultures, Hall defines interpersonal distance-setting as a psychological, dynamic space that moves with the person and varies in size according to situation. This is characterized by the four spatial distance zones of 'intimate space', 'personal space', 'social space' and 'public space', which are based on interactional relationships and circumstances.

Lyman and Scott [4] propose a theory centered on the notion of 'personal territories', which they describe as various types of marked-off areas within which intrusion will be responded to, either as internal, emotional reactions or as external, physical actions. In contrast with Hall's dynamic spaces, personal territories are relatively stationary and do not necessarily follow the individual person. Lyman and Scott categorize personal territories into four groups, which can be seen in parallel with Hall's four distance zones: 'body territory', 'interactional territory', 'home territory' and 'public territory'. Body territory is then further separated into 'internal space' and 'external space'; with the former being an internal, psychological space, the most private and intimate of spaces.

Hall points out that many of the communicational aspects of space and distance-setting are so deeply embedded in the individual's personality that they exist outside of awareness, and are rarely subject to conscious thought. Space is, in some form, always present, and spatial processing and decision-making are constantly carried out, whether or not we are actually aware of it. Thus, the artist's choice and organization of spatial elements in the creation and presentation of a work, as well as the audience's perception and experience of it, are influenced and shaped by their own knowledges of space from everyday life. Recognizing that these unconscious factors exist, and developing an understanding of key aspects of space as a communicative element, are fundamental to successful integration of space as a powerful device in artwork.

In addition to the high-level processing of spatial information outlined above, knowledge of fundamental mechanisms of spatial hearing and auditory perception, as well as a basic understanding of acoustics, are helpful for knowing the limitations of our hearing. Such knowledge can also assist an artist to find the most effective ways of presenting a work in a given place, in order to convey spatial information in the work as intended.

Spatio-structural theory

The spatial elements of sound are intertwined, and cannot be experienced in isolation. However, they need to be identified and discussed separately in order that the different expressive and communicative aspects of sonic space can be considered and emphasized.

The framework of spatio-structural theory is comprised of three basic levels corresponding to source material, creative process and listening experience,

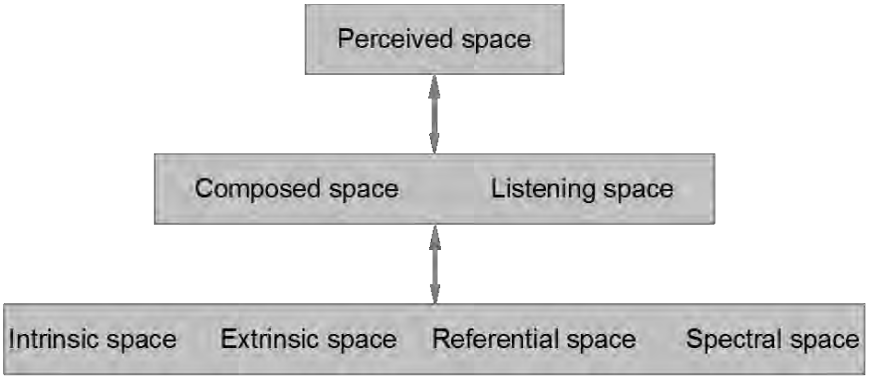

Fig. 1. Levels of Spatio-structural theory. (© Frank Ekeberg.)

respectively: 1) spatial elements of individual sounds in terms of 'intrinsic space', 'extrinsic space', 'referential space' and 'spectral space'; 2) the spatial arrangement of individual sounds and events into a 'composed space' which is played in, and becomes affected by, the 'listening space'; and 3) 'perceived space', which constitutes the listening experience of the combination of composed space and listening space (fig. 1).

An element of the individual sound, intrinsic space concerns the sound as space, and comprises components such as 'magnitude', 'density' and 'morphology'. These aspects can be discussed independent of any external acoustic environment, although the sound's interaction with the surroundings in which it is heard might still influence the spatial interpretation of it. Magnitude is a subjective characteristic which refers to the perceived size of the sound, and is based on a number of variables related to listening circumstance, source recognition and spectral makeup. A sound's magnitude is in particular affected by intensity and low-frequency energy: magnitude seems to increase as the frequency goes down, and as intensity increases. Duration is another important factor, as a sound of longer duration is given more time to interact with, and spread in, its acoustic environment, and thereby increase its perceived magnitude. Density refers to the compactness or solidity of the sound. A sound of high density seems hard and impenetrable, while a low-density sound can be experienced as having a hollow or resonant quality. The notion of density can also be based on associations with the perceived source of the sound, or the gesture behind its excitation. Finally, morphology refers to how the spectral composition of the sound varies over the course of its existence, and can be tied to changes in magnitude or density.

The element of extrinsic space concerns the sound *in* space, and refers to the sound heard in a sound field, where it can be localized in terms of 'distance', 'direction' and 'movement' relative to a listening position. The sensory information is derived from the interaction between the sound and its surroundings. How we perceive direction and distance is based on a complex combination of inter-aural time differences (ITD), inter-aural intensity differences (IID) and head-related transfer functions (HRTF) [5], phenomena that can be manipulated electroacoustically to steer localization. In addition, we utilize acoustic cues such as the Doppler effect, reverberation, diffraction and absorption. Normal spatial hearing is extremely accurate, and even the slightest deviation can be detected with a spatial resolution that varies somewhat according to the direction, distance, loudness, duration and spectral makeup of the sound. There are important instinctive and associative differences in the experience of sounds localized in front of, above, or behind the hearer, or of sounds that are nearby or far away. Movement adds another aspect to extrinsic space, by incorporating changes in distance and direction, as well as elements of speed, range, acceleration, deceleration and perspectival change.

Referential space is the sound *of* space, that is, sound that contains environmental cues that point to a valid spatial setting, whether real or surreal. Referential space can be a powerful device in sonic arts, as it is tied to a recognizable source that carries with it associations with spaces known from real-life experience. Such associations arise in relation to physical, spatial settings, and also in relation to other properties that are related to such settings, for example social, psychological or historical phenomena, by incorporating cues to specific events, situations, persons or activities associated with such phenomena. Referential space can influence the experience of intrinsic space and extrinsic space, and indicate possible dimensions of a virtual space, as well as the listener's point of view relative to it. For instance, outdoor environmental cues can suggest a much larger virtual spatial setting than an indoor listening space implies.

The fourth element of the individual sound is spectral space. This spans the lowest to the highest audible frequency, and is a vertical space where sounds are localized based on spectral focus, such as pitch or nodal spectrum [6], spanning the continuum from 'note' to 'noise' and covering a certain 'spectral range'. It is a psychologically and psychoacoustically based sense of elevation and vertical placement, and as such, physical localization of the sound is less relevant. It is primarily a space where sounds are described as 'high' or 'low' in relation to some frequency reference, whether relative or instinctive. In pitch-based tonal music, high and low notes have historically had important metaphorical functions related to meanings of ascent and descent. Spectral space is an influential factor in the spatial experience of sonic art, and must be considered in any investigation into sonic space.

Composed space

Composed space is the organization of the sound material into an artistic context in which spatial relationships are established, and virtual spaces based on the sounds' intrinsic, extrinsic, referential and spectral spaces are set up. It is a temporal space in which spatial configurations connect and evolve in a structural manner as the work progresses. Structure, in the context of composed space, concerns temporal shaping of spatial parameters as variations in intensification, motion and growth. These are important aspects of directivity that guide expectation and anticipation in listening, and form the basis for evolution and expression in a work. Spatio-structural content can be expressed in terms of spatial references, spatial interrelations among the sound material, extent and intensity of spatial movement, boundaries of virtual spaces, clarity and definition in spatial placement, and vertical organization in spectral space.

On a high structural level, the spatial composition tends to be focused toward one or more of four spatio-structural categories built on combinations of

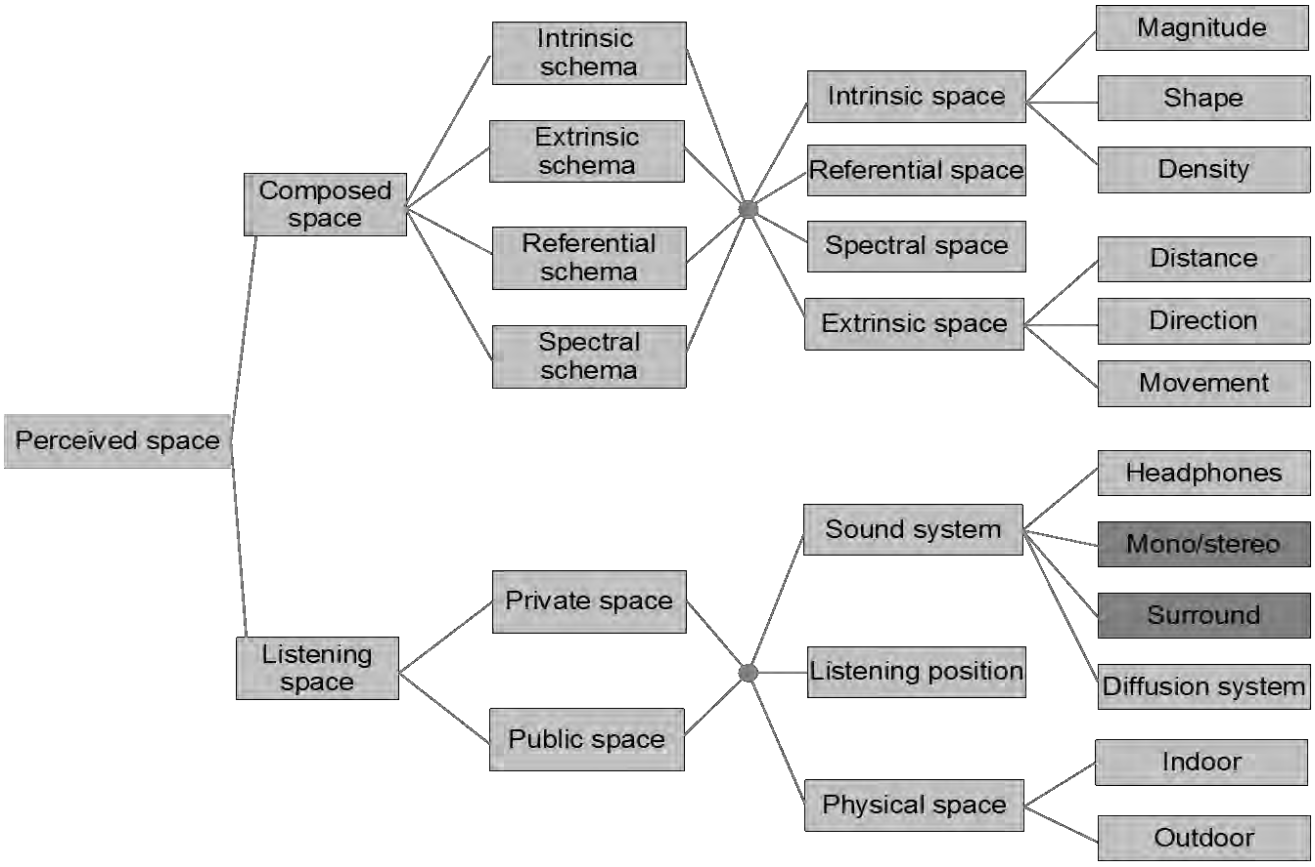

Fig. 2. Schematic overview of Spatio-structural theory. (© Frank Ekeberg.)

sounds into larger-scale contexts that I refer to as 'schemas'. The notion of schemas is established on the basis of spatial characteristics identified on the level of the individual sound, and extended into identifying tendencies in spatial configurations of sounds over longer time spans: 'Intrinsic schema' is when spatial development is carried by temporal change in spectral distribution and spatial shaping inherent in the sound material. 'Extrinsic schema' is when the focus is on placement and movement of the sound material, and locational relationships among sounds. 'Referential schema' is based on referential spaces as creations or re-creations of known sonic environments, including cues to dimensions of virtual space and extensions into real space, as well as the listener's perspective relative to a sound stage. Finally, 'spectral schema' is where sounds are primarily organized in a vertical space based on pitch relationships or pronounced nodal spaces. Shifts from one spatio-structural schema to another can occur in composed space, and a layering of two or more spatio-structural schemas can also take place.

Within the schemas, relationships are established on the basis of the nature of the individual sounds – their spectro-morphological qualities as well as associative qualities regarding source and context – and on the basis of the sounds' spatial behavior relative to each other and to the space they are in. Spatial movement, envelopment and distance are effective structural devices, and different directions and combinations of movement can incite different psychological reactions in the listener, and be of different communicative significance in the artistic context. Sequences of spatial counterpoint, and other combinations of movements, can effectively underline or counteract spatial and other types of expressive elements, such as dynamics and tempo, and function as intensifying or de-intensifying devices in the compositional structure. In addition, speed and the extent of movement are effective means for conveying energy levels and spatial dimensions in the work. Virtual spaces that are set up are dynamic, can undergo transformations over the course of the work, and can be juxtaposed into a multi-spatial sound field.

A vocabulary for labeling spatial properties of sounds is helpful in the process of discovering and identifying those properties. Based on the notions of intrinsic, extrinsic, referential and spectral space, a number of descriptors come to mind that specifically reference spatial properties of individual sounds:

- small/large
- dense/transparent
- dispersing/converging
- succinct/diffuse
- stationary/mobile
- directional/non-directional
- distal/proximal
- elevating/falling
- oscillating/circling
- pointed/enveloping

To further describe properties related to composed space and virtual spaces, the following descriptors may be added:

- spatial dimensions
- perspective
- sparseness/crowding
- pace/energy
- definition/diffusion
- collaboration/opposition
- references/associations
- envelopment/encirclement
- vastness/smallness
- intrusion/distance
- directions/paths of movement
- range/speed of movement

Listening space

The spatio-structural intelligibility of the

work is often dependent upon a successful interaction between the spaces composed into the work, and the space in which the work is heard. Variations in the spatial potential of different listening environments pose different possibilities with respect to how the work acoustically reaches the listener, and ultimately how it is perceived and experienced. The best sonic result comes from the best possible combination of sound material, listening environment and sound system. The room and the loudspeakers operate as one acoustic system. I use the term 'listening space', therefore, to mean the combination of listening environment and loudspeaker configuration.

There are significant differences in spatial potential between mono, stereo and surround systems. Mono is limited in terms of spatial depth, but flexible with regard to listening position. Stereo relies on a symmetrical configuration and a fixed listening position, but can convey a convincing frontal spatial image. Both techniques provide portability, although often at the expense of spatial complexity and precision. 2D and 3D surround sound techniques add the dimension of a real space by providing an arena for environmental cues that allows for complex spatial treatment, decorrelation and envelopment of the sound material. They also have the potential for covering a greater listening area with a higher spatial resolution, but require multi-loudspeaker systems that are often large and complex.

Differences in listening circumstance between private and public space, indoor and outdoor space, and any combinations or variations thereof, can significantly influence the listening experience with regards to acoustic characteristics, size and layout, and available listening position, but also social context, and expectations and conventions associated with space and circumstance.

In a typical concert situation each audience member is oriented differently toward the position of the loudspeakers, and thereby receives a different spatial image. Installing a loudspeaker system in a public space such as a concert hall or an art gallery often requires compromise in order to create a spatial average of the highest possible quality for as many listening positions as possible. In contrast, for headphone listening room acoustics are bypassed, and the spatial image becomes unaffected by listening position. The mobility of headphones further implies that any environment can be a listening environment. The use of headphones as a listening format has great potential for spatialization, as realistic simulations of 3D space can be created. However, the influence of sensory information external to the audio still apply, and must be taken into account.

Perceived space

The space the listener hears is the combination of composed space and listening space. The aesthetic experience is based on this resulting 'perceived space', and depends on how spatial cues in the work are understood in terms of communicational function in the artistic context. Perceived space is a multi-sensory space influenced by a complex web of factors, such as visual and tactile information, the circumstance of where and how the work is presented, cultural and experiential background, social context, interpersonal space and territory in the listening situation, and the listener's mood and receptivity. Familiarity with the genre and its expressive devices is often helpful in order to connect with and comprehend the various structural levels in the work.

Hall argues that people from different cultures inhabit different sensory worlds in which spaces are not only structured differently, but also experienced differently [7]. Hence, spatial interpretation and response are likely to vary among listeners, and also vary with listening space and context. Even with all the variables involved in spatial listening, space remains a powerful tool for artistic expression, and an essential element for aesthetic experience.

Conclusion

Space in sonic arts permeates aspects of the work at all stages of creation, presentation and appreciation, from choosing and manipulating the individual sound through to the overall listening experience of the work in a private or public setting. Space as an element of individual sounds and virtual spaces can be represented by means of spatial localization, as well as references to real spaces associated with the sound source, or with the composed virtual space, and can be articulated in terms of placement, envelopment, movement, opposition, enclosure, distance and intimacy, all of which can be treated as structural devices in the work. Even though spatial elements have been part of sonic artworks for a long time, awareness of the potential and complexities of space remains limited among art practitioners and audiences alike. However, because space is such an omnipresent part of communication in daily life, as well as in artistic contexts, it demands the artist's attention. Identifying spatial elements of sound, their interrelations and communicative significance is crucial for fully appreciating space as an artistic tool. I hope my spatio-structural theory is beneficial in that regard. See fig. 2 for a schematic overview of spatio-structural theory.

References and Notes

1. E. T. Hall, 'Proxemics', in S. Weitz, ed., *Nonverbal Communication: Readings with Commentary* (New York: Oxford University Press, 1979).

2. E. T. Hall, *The Hidden Dimension* (New York: Anchor Books, 1966, reprint 1990).

3. E. T. Hall, *The Silent Language* (New York: Anchor Books, 1959, reprint 1990).

4. S. Lyman and M. Scott, 'Territoriality: A Neglected Social Dimension', *Social Problems* **15,** No. 2 (1967).

5. J. Blauert, *Spatial Hearing: The Psychophysics of Human Sound Localization* (Cambridge, MA: MIT Press, 1997).

6. A term originally coined by Pierre Schaeffer (referenced in Smalley [12]). It refers to sounds with a strong spectral emphasis, but without a clear identifiable pitch.

7. Hall [3].

8. A. H. Benade, *Fundamentals of Musical Acoustics* (New York: Dover, 1990).

9. A. Bregman, *Auditory Scene Analysis: the Perceptual Organization of Sound,* (Cambridge, MA: MIT Press, 1994).

10. S. Handel, *Listening: An Introduction to the Perception of Auditory Events* (Cambridge: MIT Press, 1989).

11. F. E. Henriksen, *Space in Electroacoustic Music – composition, performance and perception of musical space,* PhD thesis, (London: City University, 2002).

12. D. Smalley, 'Spectro-morphology and Structuring Processes', in S. Emmerson, ed., *The Language of Electroacoustic Music* (London: Macmillan, 1986).

13. D. Smalley, 'Spectromorphology: Explaining Sound Shapes', *Organised Sound* **2,** No. 2 (1997).

14. D. Smalley, 'Space-form and the acousmatic image', *Organised Sound* **12,** No. 1 (2007).

15. J. Tenney, 'Temporal Gestalt Perception in Music', *Journal of Music Theory* **24,** No. 2 (1980).

ARTiVIS DIY Forest Surveillance Kit

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Abstract

Surveillance has become ubiquitous. From video cameras in public places to Internet-enabled devices, wireless sensor networks and flying drones, privacy is becoming a scarce resource. What if, instead of resisting the use of surveillance technology, we could harness it for the public good? *ARTiVIS* is a research project exploring how real-time video can be used as a powerful tool for environmental awareness, activism and artistic explorations. *ARTiVIS* aims to create a citizen-run peer-to-peer forest surveillance network through the use of affordable open source hardware and software, such as the DIY kit we are developing both online and in community workshops.

Keywords: Real-Time Video, Surveillance, Sustainability, DIY, Open Hardware, Internet of Things.

Fig. 1. *ARTiVIS DiY Forest Surveillance Kit* development during workshop, kit components, and deployment in the wild. Photo © Mónica Mendes.

Living in places that have been extremely exposed to forest fires like Portugal [1], makes us very sensitive to the destruction of forest patrimony by fire hazards, which also applies to a world scale. In fact, "Globally, 95 percent of all fires are caused by various human activities" [2]. Despite previous measures [1, 3, 4], a serious approach regarding prevention remains pertinent and urgent [2].

ARTiVIS – *Arts, Real-Time Video and Interactivity for Sustainability* [5] – is a research project in digital media exploring the use of real-time video of forests for sustainability purposes. The project's aims are:

» To create digital contexts of aesthetic contemplation of nature by exploring the beauty and danger of trees and forest fires;

» To raise awareness on the natural environment by establishing a bond between people and forests, using technology in artistic contexts;

» To empower local populations with a way to share the beauty of their forests and help prevent forest fires through monitoring by online communities;

» To explore new ways to use real-time streaming video of forests for awareness, activism and artistic purposes;

» To help prevent forest fires by extending surveillance systems to on-line communities through "the emotion of real-time" monitoring.

To achieve these aims, we are creating interactive experiences that are meant to stimulate awareness and prevention of fire related damages to the forests, while engaging community members to participate with a sense of wonder and enthusiasm.

The ARTiVIS outputs are a tradeoff between aesthetic pleasure from contemplative observation and interactive experiments with real-time videos of forests. With the goal of promoting a more sustainable world through digital media and experimental design, the outcomes of this iterative process include:

» Interactive installations for public exhibition that use real-time video of forests as raw material, such as *B-Wind!* [6], *Hug@ree* [7], and *Play with Fire* [8];

» The prototype design of an online video sharing platform, in order to display real-time forest videos and corresponding artistic explorations, working as the ARTiVIS community hub;

» The design of an open source hard-ware and software DIY (Do-It-Yourself) forest surveillance kit that repurposes surveillance technology to bring people and their communities together to protect their forests. Resulting video streams and collected data will be uploaded and become part of the online platform network.

We foresee that these interactions will provide the experience of contact with nature – contributing to a feeling of belonging, strengthening the relationship with the forest, and leading to local communities' growth and empowerment. The online platform was initially conceived as the core output of the ARTiVIS project, under the general concept of participative video surveillance [9]. This platform combines existing technologies that are customizable and that provide the needed resources for fast prototyping, enabling a proof of concept to evaluate the structure proposed. The ARTiVIS platform is conceived as a libre and open framework, with open data free for use and development, using open formats, and with open content. Altogether, these factors contribute to enhance creative explorations with the real-time video stream or video archives of the forests.

The platform is designed to link forest video streaming nodes provided by members of the community with consumer nodes like art installations or community surveillance users. The goal is to achieve a fully distributed peer-to-peer platform for forest video streaming. This openness is becoming a mainstream approach in the design of interactive environments and was adopted as an effective setting for fast prototyping and to empower community sharing.

Please reference as: [Author(s)-of-paper] (2013) [Title-of-paper] in Cleland, K., Fisher, L. & Harley, R. (Eds.) *Proceedings of the 19th International Symposium on Electronic Art*, ISEA2013, Sydney. Page numbering begins at 1 at the start of the paper.

As with contemporary development methods in digital media, ARTiVIS also explores the potential of experimental approaches in local contexts where mobility is crucial for its implementation, like real-time video connectivity, contributing to local communities' growth and empowerment. Moreover, "mobile devices and network infrastructures open the possibility for new forms of information access or storytelling while visiting physical places" [10].

This paper presents the design and development of the *ARTiVIS DIY Forest surveillance Kit*. The initial motivation for this kit came from the limitations found in standard IP Cameras during the development of the interactive installations in the ARTiVIS project. These cameras usually do not allow customization of their imaging sensors and lenses for different purposes, have very limited ability to interface with external sensors and are limited to using wi-fi and ethernet for networking.
We have designed this kit to overcome these limitations and to empower individuals and communities to deploy autonomous video streaming nodes that connect to the ARTiVIS network and can be used as source material for aesthetic contemplation, environmental activism and artistic experimentation.

Related Work

Community-run sensor networks are an emerging paradigm of social empowerment made possible by the combination of open, low cost hardware and Internet connectivity. Existing examples of these networks can be found in the *Safecast* network for radiation monitoring [11], the *AirPi* network for weather monitoring [12] or the *Blitzortung* network for storm detection and localization [13].
Over time it has become significantly easier to create these sort of networks, by taking advantage of open source platforms like *Thingspeak* [14], *MediaSense* [15] and *Nimbits* [16]. More recently, we have noticed the appearance of projects like *Sapphire* [17] and *Smart Citizen* [18] that combine an open, customizable hardware base with a generic cloud infrastructure.

The interest in opening up imaging hardware is not new. While the *OpenIPCam* project [19] provides a solid Linux-based replacement firmware for some popular models of commercial IP surveillance cameras, the *Apertus* project [20] goes one step further and hosts a community developing a high-definition professional quality digital video camera from the ground up.

The server infrastructure needed for hosting a centralized video streaming network is an important concern for a community-based project. In order to reduce these costs and to avoid having a single point of failure in our network, we are looking into peer-to-peer video streaming strategies such as those proposed by the *Goalbit* [21] and the *P2P Next* [22] projects.

Refarm the City is a good example of the kind of approach that has informed the design of the ARTiVIS hardware kit for surveillance. Their work is based on community developed open source hardware sensor nodes for urban farmers [23]. Additionally, their field work strategy of knowledge dissemination is undertaken through workshops organized in local communities in areas in which there is good potential for becoming new urban farms.

Another important reference is the *Vigília Open Design* project. This system involves the development of new sensors that enable the automatic capture of a wide variety of field data including images in real-time, which allow people "to draw tables with indices of fire risk, to detect fires in the shortest time, to act faster and in coordination in case of fire, and to accurately evaluate the real impact of fires already extinct" [24]. *Vigília Open Design* has some overlap with the ARTiVIS kit, and we are paving the way for future collaboration.

Kit Design

An *ARTiVIS DIY Forest Surveillance Kit* is composed of a series of hardware modules that can be chosen from common off-the-shelf parts depending on cost, power, network bandwidth or infrastructure restrictions. These hardware modules are controlled by a set of software modules connected to the ARTiVIS online platform. In technical terms, the kit is provided as:
» Open documentation that allows anyone to build similar hardware;
» An open hardware reference implementation that is used for community workshops and to develop the ARTiVIS interactive experiences;
» Open source software that runs on the hardware and can interface with the platform.

Hardware Components

The *Power Module* provides power to the whole kit. For the kit's intended function in remote forest locations it is important that it is autonomous in terms of power. This can be accomplished by using a rechargeable power supply, such as a lead or solid state battery coupled with a generating power source like a solar panel, a small wind turbine or a fuel cell.

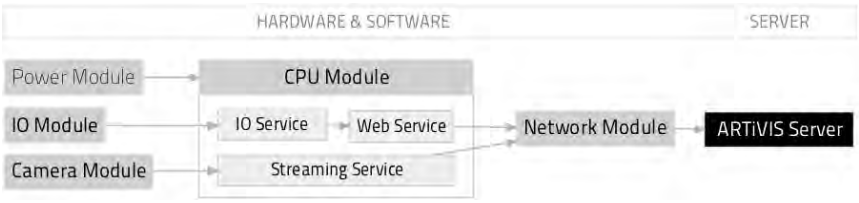
The *CPU Module* (Central Processing Unit) connects to all the other hardware modules and runs the ARTiVIS node software. Since the kit's design should take into account both portability and energy efficiency requirements, our first prototypes were based on the *Raspberry Pi* [25], a popular low-cost single-board computer.

The *Camera Module* connects to the CPU Module and provides the images to the CPU for live video streaming. At its simplest configuration, the Camera Module can just be a good USB webcam connected to the CPU Module, but for a more integrated solution we are looking towards interfacing high quality image sensors like the Raspberry Pi Camera Module.

The *IO Module* interfaces the CPU Module with a set of sensors and actuators that can be read and/or controlled remotely. For this we can use an *Arduino* [26] board or a similar microcontroller-based Input/Output hardware or rely on the CPU module's native GPIO (General Purpose Input/Output) functionality.

The *Network Module* provides an interface to the Internet for the CPU Module. In the first prototypes we used any network connectivity available to the test board, like wi-fi or ethernet, but for the final reference design we will make use of external USB modems that provide 3G or 4G/LTE connectivity as

Fig. 2. *ARTiVIS DiY Forest Surveillance Kit* system architecture.



these are more likely to be available in remote forests than wifi or wired Ethernet.

Software Components

The kit's CPU Module runs a set of software applications that allow the kit to perform its task and interface the hardware with the online *ARTiVIS server*.

The *Streaming Service* is the heart of the system. At its core there is a video processing pipeline based on the *GStreamer* framework [27] that captures the live images from the Camera Module, encodes them using a free lossy codec like *Ogg Theora* [28] or *WebM* [29], and streams them to the ARTiVIS server for online distribution. It could also optionally record the video locally for backup purposes.

The *IO Service* interfaces with the IO Module hardware, multiplexing access and providing to applications a "virtual firmware" API that abstracts the underlying hardware, thus permitting access to the sensors and actuators connected to the IO Module. It also provides a *Websocket API* [30] that allows for external control and connectivity to and from the ARTiVIS server to enable the uploading of sensor data to the platform and the downloading of actuator commands.

The *Control Service* is a web application that runs on an embedded web server on the CPU Module and provides a simple way for the kit's owner to control and configure it.

The *ARTiVIS Server* is currently based on *Icecast* [31] as a streaming server and we are exploring the use of open data syndication platforms like *GISS* [32] for video and *ThingSpeak* regarding sensor data.

Development Process

Early development work on the kit's design was performed throughout the development of the ARTiVIS interactive installations. Initial hardware prototypes were done during the first part of an artist in residency program at *Madeira Interactive Technologies Institute* [33], to connect with the *SINAIS* project, and are being further developed in order to become part of the ARTiVIS project's final setup.

Recognizing that "to prevent and control destructive forest fires, the involvement of communities is crucial" [2], we propose to foster people's participation from the project's outset, involving the ones who wish to participate in the expansion of the raw material database through community workshops. In these workshops, participants can assemble an open hardware kit for forest surveillance, help with the kit's development and experiment with real-time video streaming for creative applications.

By promoting these community workshops, not only can we teach participants how to set up their own ARTiVIS node, but we can also explore with them the potential of participatory surveillance through the possibilities offered by real-time video streams of forests.

Conclusions and Future Work

In this paper we have presented the design and development of the *ARTiVIS DIY Forest Surveillance Kit*, a flexible open hardware kit for video streaming built from low cost open hardware components and custom open source software. The kit has been successfully used as a video source in the deployment of ARTiVIS interactive installations and as the base for streaming video experiments in community workshops.

Current development work involves improving streaming reliability and the user experience regarding the setup and configuration of the kit. Future work will be focused on building a solar energy module to allow testing autonomous deployments in forest locations, and on developing the IO module for connecting sensors and actuators.

Further iterations will allow the registration process for the ARTiVIS online platform and a broad dissemination of this open source hardware and software surveillance kit [34]. Moreover, we foresee a growing developer community sharing "the emotion of real-time" – whether this means that they adapt the project kit to specific environments with other purposes (such as replacing expensive hardware setups that remotely watch animal behavior), collaborate on maintenance, or even pursue unanticipated projects.

Fig. 3: Presentation of the DiY Forest Surveillance Kit workshop at ISEA 2013 in Sydney. Photo © Mónica Mendes.

References and Notes

1. Filipe Catry et al., "Spatial Distribution Patterns of Wildfire Ignitions in Portugal", *Proceedings of the 4th International Wildland Fire Conference* (May 2007).

2. Food and Agriculture Organization of the United Nations, "Involving Local Communities to Prevent and Control Forest Fires", *FAO Newsroom* (Rome, Italy: July 26, 2004), <http://www.fao.org/newsroom/en/news/2004/48709/index.html>.

3. Forest Data and Information Systems, Joint Research Centre, European Commission (2009), <http://forest.jrc.ec.europa.eu>, accessed 16 September 2009.

4. Global Monitoring for Environment and Security (2010) , <http://www.gmes-forest.info>, accessed 22 August 2010.

5. ARTiVIS – Arts, Real-Time Video and Interactivity for Sustainability (2013), <http://artivis.net>, accessed 1 July 2013.

6. B-Wind! (2013), <http://bwind.artivis.net>, accessed 1 July 2013.

7. Hug@ree (2013), <http://hugatree.artivis.net>, accessed 1 July 2013.

8. Play With Fire (2013), <http://playwithfire.artivis.net>, accessed 1 July 2013.

9. Mónica Mendes, "RTiVISS – Real-Time Video Interactive Systems for Sustainability", *Proceedings of 5th International Conference Artech 2010* (April 2010) pp. 29-38.

10. Nuno Correia and Mónica Mendes, "Interface Design for Mobile Devices", *Proceedings of Future Places Festival* (2008) pp. 47-49.

11. Safecast Network (2013), <http://safecast.org>, accessed 1 July 2013.

12. AirPi (2013), <http://airpi.es>, accessed 1 July 2013

13. Blitzortung (2013), <http://blitzortung.org>, accessed 1 July 2013.

14. Thingspeak (2013), <http://thingspeak.com>, accessed 1 July 2013.

15. MediaSense (2013), <http://mediasense.se>, accessed 1 July 2013.

16. Nimbits (2013), <http://www.nimbits.com>, accessed 1 July 2013.

17. Sapphire (2013), <http://sapphireos.com>, accessed 1 July 2013.

18. Smart Citizen (2013), <http://www.smartcitizen.me>, accessed 1 July 2013.

19. OpenIPCam (2013), <http://www.openipcam.com>, accessed 1 July 2013.

20. Apertus (2013), <http://www.apertus.org>, accessed 1 July 2013.

21. Goalbit (2013), <http://goalbit.sourceforge.net>, accessed 1 July 2013.

22. P2P Next (2013), <http://www.p2p-next.org>, accessed 1 July 2013.

23. Refarm the City Project (2013), <http://www.refarmthecity.org>, accessed 1 July 2013.

24. Luís Botelho Ribeiro, "Vigilância Electrónica da Floresta", *III Jornadas Ambientais da Beira Interior* (February 2004)

25. Raspberry Pi (2013), <http://raspberrypi.org>, accessed 1 July 2013.

26. Arduino (2013), <http://arduino.cc>, accessed 1 July 2013.

27. GStreamer (2013), <http://gstreamer.com>, accessed 1 July 2013.

28. Ogg Theora (2013), <http://theora.org>, accessed 1 July 2013.

29. WebM Project (2013), <http://webmproject.org>, accessed 1 July 2013.

30. Websocket API (2013), <http://www.w3.org/TR/websockets/>, accessed 1 July 2013.

31. Icecast Streaming Server (2013), <http://icecast.org>, accessed 1 July 2013.

32. Global Independent Streaming Support (2013), <http://giss.tv>, accessed 1 July 2013.

33. Madeira Interactive Technologies Institute (2013), <http://www.m-iti.org>, accessed 1 July 2013.

34. ARTiVIS DIY Forest Surveillance Kit, <http://diy.artivis.net>, accessed 1 July 2013.

Breathe – wearing your air

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Abstract

Breathe – the air we wear proposes wearable and mobile technologies for reading and rendering in real time the air we breathe. The project proposes the 'actioning' for better air quality through individuals' capacity to record air pollution. The project initiates a walk-able protest by taking air quality directly to the individual and through critical mass counter the massive problems facing our urban atmospheres. In particular, the article focuses on the pollution problems facing China today.

Keywords; Real time data visualization, wearable environmental sensing devices, personal pollution monitor, civic engagement.

Volatile atmospheres

…His hanging face, like a devil's sick of sin;
If you could hear, at every jolt, the blood
Come gargling from the froth-corrupted lungs,
Obscene as cancer, bitter as the cud
Of vile, incurable sores on innocent tongues…

The above selected lines by the soldier and poet Wilfred Owen forms his testimonial to the chemical weapon Mustard Gas widely used during WW1. Penned in the last year of the war (1918), Owen's poem titled *Dulce et Decorum Est* [1] portrays the effects of breathing the deadly poisonous gas: the burning of the lungs, throat, eyes and skin. Once released from its canister, the yellow coloured gas was at the mercy of the breeze, floating across *no man's land* and onto lines of men holed-up in dug out trenches. Often the breeze would shift direction returning to its source and back again. This quite visible air took the lives of the unprepared as they fumbled for their masks. Cut to an image of a number of cities around the world and you will see people wearing white masks and shielding their eyes from vapours in the air. These are not images of war but urban everyday images of people and cities shrouded in the thick haze of air clogged with particles. This we know is air pollution.

Once invisible, air has now been rendered visible by pollution, such as the emission of gases and smog from factories, coal-fired plants, car-exhaust fumes, homes and jets. Like Mustard Gas that roamed with the breeze intoxicating men in their trenches, pollution is subject to mass migration within the atmospheric turbulence [2] circling the earth. This natural turbulence: beautiful vortexes, eddy flows and emigrational currents have become the unnatural enemy of people when mixed with pollution. Dramatic as this may sound, air is killing people. The choking of thousands of men assigned to death from Mustard Gas in Owen's poem finds an echo in the choking of tens of millions assigned to lung and blood diseases from polluted air.

The article is divided into five parts. The first, *The archaeology of air,* explores the visibility of air. The second, *"The sociology of air"*, discusses the social interaction of the air we share with others. The third part *"The capital of air"* accounts for air and industry, production and profit. The forth, *"Wearing your air"* discusses the prototypes under development in our project, the methodologies for wearable 'urban architectures' and their implementation in terms of hardware and software, sensing technologies, mapping, domains and user testing. The article concludes with a speculation on *"The future of air"* and the consequences of living in unstable environments. In particular, the article focuses on the pollution problems facing China.

The archaeology of air

The years of rapid economic growth and industrial expansion have led to dangerous levels of air pollution in many cities across China. At a workshop in Beijing held on March 31 2013, a study by Global Burden of Disease (GBD) [3] estimated that in 2010 1.2 million premature deaths (40% of total premature deaths in China) and the life loss of 25 million healthy years were attributable to air pollution. According to the GBD research team this ranks China as the single most affected country in the world in terms of health problems stemming from air pollution [4]. The Chinese multimillionaire businessman Chen Guangbiao's recent marketing campaign (more self promotional than political) to combat the problem by handing out oxygen cans to the public, nevertheless highlighted the endemic situation facing China. Graphically resembling Andy Warhol's popularisation of the Campbell's Soup cans, yet operating like Coca-Cola cans - where the peeling off the aluminium seal releases the air - created images of Beijing's residents walking the streets inhaling the oxygen not unlike images of teenagers sniffing glue. While it highlighted the problems of air pollution, the oxygen cans campaign inadvertently subverted its message by fetishing the problems of air pollution as only marketing campaigns do. The reality of Beijing's air pollution is radically changing how its society responds and functions, or perhaps dysfunctions.

On days of extreme air pollution in Beijing, children are advised to stay indoors and refrain from attending school or participating in outdoor physical exercise classes. Weibo, the Chinese equivalent to Twitter, is a platform that attracts young people who communicate their concerns about air quality with hashtags such as: #itsucks and #statedepartment. The use of microblogs and social networks like Weibo confirms a burgeoning level of awareness to Beijing's extreme air pollution and the problems facing China [5]. Recent announcements by Chinese officials have identified 'cancer villages', a term being used to described areas unfit for human inhabitation due to industrial waste and toxic water, soil and air pollution.

Beijing is not alone. Mexico City, Lagos in Nigeria, Delhi in India and Salt lake City, Utah have air pollution levels that are also threatening people's lives. In the city of Ahvaz, Iran, road traffic congestion, heavy industry and oil extraction have created some of the highest readings of air toxicity in the world. Efforts to curb pollution levels during the 1970s in the developed countries (e.g., the city of Los Angeles in the United States) have been overtaken by the rapidly developing countries of India and China. After decades of action, air has in fact become increasingly more harmful and deadly.

Pollution is a global condition. Wind currents drive the pollution plumes of industry from their source to locations thousands of kilometres away. Thus China's pollution reaches America, America's reaches China, India's reaches the pacific and all pollution reaches Antarctica - home to the largest o-zone hole in the world. The nature of pollution is to 'fold' within the turbulence of the urban atmospheres that surround us. To suggest an *archaeology of air* is not to mount a 'historical dig' to discover its roots in the centuries of miasma and foul air [6], or to mine history to understand how air became 'vandalised' from the late eighteenth century onwards in the industrial revolution. Rather, *the archaeology of air* asks us to fathom our present relationships to air.

The sociology of air

Air in its purity is the invisible life force upon which we share. Microscopic molecules of air are taken into our bodies with every breath we take, every few moments throughout our lives. Air is the element we continually and unconsciously share. This perhaps romantic notion of air becomes undone when air is visible and tinged with odour, taste, form and colour. The sociology of air exists through the constant exchange between others and us, yet this exchange is increasingly being filtered through materials of separation from the hazardous environments we inhabit.

The 1976 film *The Boy in the Plastic Bubble* [7] portrays a boy who, born without an immune system and by default allergic to the 'world' and its people, is forced to grow up alone inside a transparent plastic environment. As the boy turns into a young adult, his sexual awareness becomes apparent through his attraction to a young woman who visits him. His life, a life without touch of another human being, is reinforced by his desire for intimacy. This intimacy is realised in the film through their kiss performed on either side of the plastic separating them and their 'worlds' (Fig. 1). This naive yet startling image of protection and material separation is now not an isolated case.

The ubiquitous facemask is increasingly becoming a part of the 21st twenty-first century clothing accessory. Worn by millions in China to filter the air they breathe, the mask reinforces the material separation between them, and from an environment deemed harmful. Covering the mouth and nose, the facemask has become a protest symbol to graphically symbolise and, to a degree, fetishise an awareness of air pollution. Masks with large lips and unhappy smiles sown onto the surface display this new separation. Not unlike *The Boy in the Plastic Bubble*, air pollution is turning people into millions of walking microenvironments, hemmed-in by the capitalisation of air.

Fig. 1. Image from the film *The Boy in the Plastic Bubble*, Randal Kleiser, (1976).

The capital of air

In the film *An Inconvenient Truth* [8], former US Vice President Al Gore lectures about the changes in the earth's climate from the past millennia to the present and onto a predicted catastrophic future. In this vision of the future, ice melts, smoke stacks blacken the sky and air is choked with toxins. Gore understood that data collected from a multitude of sources needed to be accentuated so as to readily communicate the depth of the problem to the public. The statistics graphically designed for his presentation weren't lies; conversely they were made possible by a breakthrough in the visualisation of data usually the reserve of physicists, biologists and environmental scientists. We were, I think, already aware of what Gore was telling us. People around the world do small things: they recycle, cycle and walk and aim in some way to consume less. On the other hand, capital depends on consuming a lot of products that, for their making, pollute the air we breathe.

To maintain manufacturing and mass consumption requires companies to dig, drill and remove the raw materials resulting in vast swathes of land degradation across the globe. Pollution from car exhaust fumes has not stopped carmakers from continuing to mass-produce the combustion engine in spite of readily available and environmentally sustainable alternatives. It is predicted that the present 1 billion cars around the world will increase to 4 billion by 2050. It is also predicted that the world's middle class, which presently approximates 1.8 billion, will increase to 4.5 billion in 2030. It seems that what we have been told by Gore and by others about how we manage this burgeoning problem goes unabated as capital depends on continuing growth at all costs.

Air pollution is produced by capital. It circuitously returns us to Marx's concept of commodity fetishism [9], whereby one's labour for the production of goods and wages affords the ability for the buying of those goods. From the beginnings of machinery (and pollution) in the industrial revolution in the cities of Manchester, Liverpool and Düsseldorf to name a few, to the mechanisation of labour in the assembly lines of Ford Motor Co. labour, industry and pollution have been intertwined. Capital and industry have outreached labour not only from the increased profiteering from products made by their workforce but also from the indiscriminate pollution of air made from their factories. The production of goods makes up the 'third tier' of profit (after labour and production) that drives the pollution plumes of industry. Two of the world's biggest polluters - China and America - struggling with the economies of capital and production are also engaged with the on-going environmental destruction of our urban atmospheres.

The stimulus for attaining better air quality is to combine air and capital. Set by governments, the ballooning trade in carbon emissions between companies and countries is now one way to cut pollution around the world. Still in its infancy, the buying and selling of carbon emissions around the world is a trade not unlike any stock market transaction. Nevertheless, for good or bad, this shift in pollution management emanating from commodity production and mass consumption has

Fig. 2. Prototypes under development: gloves, ear protection, mask and T-shirt react to air pollution through various visualisations in real time. Images © Authors

made air more visible, and anything made visible is capitalized upon. Air is capital and emissions can be profitable. The quality of our air is intrinsically aligned to the capital of production.

The future of air lies not in its ability to be further capitalised but instead relies on the equalizing of labour and profits. "Cheap labour", mass production and vast profits are the capital up for renegotiation if we are to hold onto our air. To recapitalise air is to bring air back to its purity. To re-establish air purity requires us to apply the methods by which we record air quality directly to the body.

Wearing your air

To bring awareness to the present problem and find ways of 'reading' the harm that circulates in the atmospheres around us, detachable mobile tools (Fig. 2) have been developed that visually render air pollution levels. As precedents to our project, we selected 'Citizen Sensor'; a DIY open-source hardware and software designed by Joe Saavedra. The project developed a sensor pack and data contextualization system that allows users to collect readings of air quality from their immediate surroundings using sensors that record the environmental conditions. One of the main goals of the project is to bring pollution monitoring from the maker into educational settings and further into communities [10]. Users choose

Fig. 3. Top image: 'Citizen Sensor' sensing technology - DYI sensor pack and smart phone interface. Bottom image: 'Air Quality Egg' by Sensemakers.

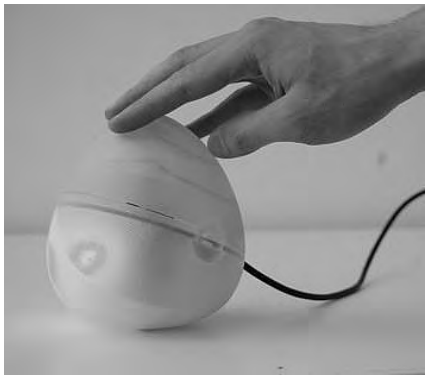
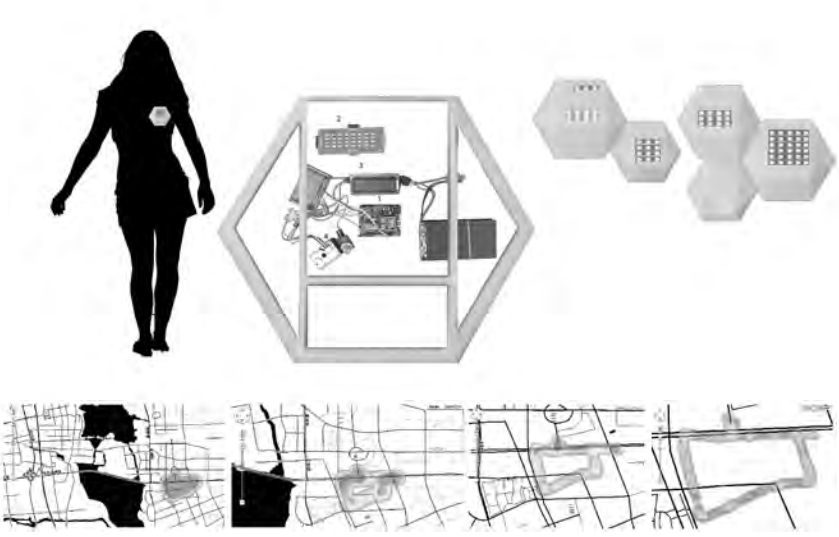


Fig. 4. "Breathe – wearing your air' - sensing technology for the air quality recording 'brooch': 1. Arduino microcontroller board 2. Led's PCB 3. LCD monitor. 4. PM sensors. Image below, the project's online live website that maps users routes and air quality data. Maps of a user route in SIP, Suzhou, China. Images © Authors



what environmental characteristic to sense and then connect with others around the world to analyze, interpret, and share the data and knowledge gained online. The project was recently further developed as the 'Air Quality Egg' [11] - a static device containing a small electronic sensing system that, once plugged into a wall socket, can read the outside air quality in the immediate vicinity. The device has an RF transmitter that sends the data wirelessly to an Egg-shaped base station placed inside. The base station (Fig. 3) receives the transmitted data from the sensor box outside and relays that data to the internet via a wired ethernet connection.

In our project the focus is centred on the immediacy of rendering air quality onto people's bodies. The accessories we are currently designing are a mask, gloves and t-shirt (Fig. 2). These comprise the series of portable wearable devices able to read the air particles per micrometre (PM 2.5) [12] of pollution and display this information in the location via global positioning (GPS) in real-time. One device, which has been designed like a 'brooch' to be pinned onto the wearer's clothes, emits via LED (light emitting diode) information that classifies the quality of the air the wearer is breathing. The 'brooch' makes visible the air quality through cells that display variations in colour to indicate varying levels of pollution. That is, red or purple indicate variant toxic levels and green or blue indicate variant good air quality levels. Configured as a body extension, the 'brooch' establishes an interface between people and air, allowing them to become informers, renderers and surveyors of the air they breathe. This interaction between people and pollution is designed to incite a critical mass of walking protests aimed at galvanizing the public to pressure governments and industries to take responsibility for the increasingly unpredictable urban atmospheres that exist around the world.

The main components of the hardware prototype implementation (Fig 4) are an Arduino-based controller board. The board controls and coordinates the functioning for the other devices contained in the 'brooch'. The on-board java program reads the data from the sensors and compares that data with on-board parameters. Once the comparison is completed (undertaken in micro-seconds), the program decides the air quality value and displays this value by selecting what LED lights to turn on or off to visualize the air quality value. Designed in different sizes, the 'brooch' components can be easily assembled, which will eventually result in reducing costs for their manufacture. The project has also developed an online interface that maps people's routes within the environs they live, recording the data taken of the air quality in real-time.

The future of air

The philosophical and historical context of this project draws on contemporary comparisons through the discursive nature of our project and the 'currents' that surround it: societies, governments, industry, mass production and consumption and individuals. Wearing the detachable

'brooch' operates as both a piece of design and a stance of resistance to the problems of pollution by focusing on an essential element that sustains our lives - air. Each breath is the taking-in of this essential outside element that 'lives' temporarily inside our bodies. The 'brooch' performs the reading and visualisation of our breath in the streets. This basic step to make people the renderers of air aims to bring about a radicalization of society for the protection of air.

Breathe - wearing your air is aimed at 'actioning' governments to rethink our environments [13] to create healthier living and ultimately economically viable health systems for future generations. The 'brooch' takes air quality responsibility directly to individuals who, when they collaborate/come together as a critical mass, can counteract the massive problems facing the air we breathe. To seek to counter pollution through critical action in this way involves visualising our project as a type of collective diaphragm that redraws the economic and political lines of power that exist, and formulates a new 'osmosis' between societies and air, countries and air, and within the outer urban atmospheres that oscillate around us all. *Breathe – wearing your air* is designed to confirm that we are presently living in unstable and turbulent environments. The aim of project is to incite behavioural change through a wearable protest device. *The future of air* lies in our ability to protect the air we breathe.

References and Notes

1. Wilfred Owen, *Dulce et Decorum Est* (8 Oct 1917 – Mar 1918). This disturbing portrayal of the mass slaughter of men by any means during WW1 is highlighted in Owen's cynical last line of the poem: *Dulce et decorum est pro patria mori.* This line originates from the *Odes* by the Roman poet Horace and translates to *It is sweet and right to die for your country.*

2. According to the oxford dictionary turbulence is "An eddying motion of the atmosphere that interrupts the flow of wind." "Stormy or tempestuous state or action… violent commotion, agitation, or disturbance." Scientifically, turbulence is formulated as a flow of properties where "Dispersion numerical models in the atmosphere are frequently employed to simulate continental and regional scale air pollution transport. Moreira, Virnei Silva *Atmospheric Pollution Research* 2 (2011) 384-393.

3. Outdoor Air Pollution Among Top Global Health Risks in 2010 is a report released by Bob O'Keefe and Aaron Cohen of the Health Effects Institute - www.healtheffects.org
Source:http://www.healtheffects.org/International/HEI-China-GBD-PressRelease033113.pdf

4. Greenpeace East Asia (2013), <http://www.greenpeace.org/eastasia/news/blog/time-the-mep-walk-its-talk/blog/45186/>, accessed 30 May 2013.

5. Yanzhong Huang in his article: *Choking to Death: Health Consequences of Air Pollution in China reported that* 'readings near Tiananmen Square on 28.02.2013 measured the concentration of PM2.5—fine particles in the air that are smaller than 2.5 micrometers in diameter and are considered dangerous because they tend to penetrate the gas exchange regions of the lungs—at 469 micrograms per cubic meter, which corresponds to a U.S. EPA Air Quality Index reading of 479 (the scale stops at 500). Anything above 301 is considered "hazardous" in that it can cause "serious aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly," and there is a "serious risk of respiratory effects in general population." The PM2.5 levels in other famously polluted cities pale in comparison to those in Beijing; for instance, the highest PM2.5 level in a 24-period recorded in Los Angeles was 43 micrograms per cubic meter.' East Asia Environment Region China March 06, 2013 <http://thediplomat.com/2013/03/06/choking-to-death-the-health-consequences-of-air-pollution-in-china.html/>, accessed 1 April 213.

6. John Snow's breakthrough in London's 1854 Cholera outbreak (where he identified contaminated public water supplies as the source of the epidemic) and the concepts of Miasma (foul air) that were thought to be the source of disease. Johnson, S. 2006, *The Ghost Map* Penguin Books London.

7. Randal Kleiser, *The Boy in the Plastic Bubble (*1976), film.

8. The 2006 documentary film *An Inconceivable Truth* directed by Davis Guggenheim focuses on a powerpoint presentation of images about the damages of global warming on the environment delivered by former US Vice President turned environmental figurehead Al Gore.

9. The Marxist concept of commodity fetishism, everything that Marxism was supposed to eschew: "To fetishize commodities...is to fetishize the invisible, the immaterial, the supra-sensible. The fetishism of the commodity inscribes immateriality as the defining feature of capitalism." Strallybrass, P., 1998, *Marx's Coat* from *Border Fetishisms: Material Objects in Unstable Spaces*, Spyer, P., (edit), Routledge, *pg.184.*

10. 'Citizen Sensor; DIY Environmental Monitoring Development Blog <http://thesis.jmsaavedra.com/> accessed 11 June 2013.

11. 'Air Quality Egg' <http://airqualityegg.wikispaces.com/AirQualityEgg>, accessed 11 June 2013.

12. PM2.5 is the concentration of fine particles in the air that are smaller than 2.5 micrometers in diameter and are considered dangerous because they tend to penetrate the gas exchange regions of the lungs causing respiratory effects.
Source:http://thediplomat.com/2013/03/06/choking-to-death-the-health-consequences-of-air-pollution-in-china/

13. Vallero, D. 2008, *The Fundamentals of Air Pollution,* Academic press Burlington, USA.

***The Walk Series* (c) 1973-74 / 2010 Peter d'Agostino distributed by eai.org**

Techno / Natural Interfacing: walking and mapping in the age of climate change

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Abstract
The *techno / natural interface* examines a series of *World-Wide-Walks* projects from the 1970s to the present. The inquiry extends our work on *The Techno / Cultural Interface: tracking the boundaries of high-tech and traditional cultures* presented at TISEA, Sydney, 1992, and published in *Media Information Australia*, August, 1993. Originally inspired by Gregory Bateson's 'dialogues' and 'metalogues', concepts of mind and nature as 'sacred and necessary unities,' the *techno / cultural* ideas evolve from theories of *interfacing, identities, and consciousness* [1] to *techno / natural* concepts examined through the sensuous kinesthetic experience of walking and its mapping.

keywords: techno, natural, walking, mapping, World-Wide-Walks, eco-art

Walking: Perception to Cognition

The techno / natural interface examines the theoretical foundation underlying a series of *World-Wide-Walks* projects from the 1970s to the present. The *World-Wide-Walks* documentation / performances explore 'natural / cultural / virtual identities' mediated by video / web / GPS tools, and contextually framed *between earth & sky* and *between earth & water*. [2] The current projects examine an art/science interchange of water related issues.

The *World-Wide-Walks* project assembles micro meaning within natural and mediated cultural environments. The act of walking, literally and metaphorically, from first steps to daily routines, contributes to the formation of the individual and his/her human identity, forged by the individual's navigation, thought, and participation in shaping a changing global eco-environment.

The *World-Wide-Walks* project bridges a broad territory. The territory combines technology - its development and study; nature -monitoring the myriad and many changes in flora, fauna, climate; and the arts - an agency negotiating humanity's relationship to eternal questions of meaning and understanding. In this era of human-made global warming, technology challenges the "natural" order. The arts strive to meet this challenge. The *World-Wide-Walks / between earth & sky / Donegal*, a Leonardo / Art & Climate Change project in Ireland focused on community, the landscape, tradition, and its preservation, beneath the umbrella of modern civilization [3]. *W-W-W / between earth & water / ICE* performed at glaciers in Alaska, Iceland, and Terra del Fuego, Argentina, at the top and bottom of the globe, provides compelling global warming evidence, as it relates to 'glocal' issues of local now global communities.

The *World-Wide-Walks* project, performed on five continents over the past four decades, began in 1973 with *The Walk Series*, Peter d'Agostino's documentation / performances in San Francisco. In this first series, d'Agostino explored boundaries, the relationship of earth to sky, a fence separating park and freeway, and the beach separating the ocean from the land on the edge of a continent. The first walk, *Roof Walk*, an 'absurd exercise' walking a roof, maps the gravel surface and captures the great vision of the City beyond the (l)edge. The next walk in the winter of that year, *Fence Walk* moves back and forth along a metal cyclone fence separating a small city park from the state freeway, which strictly prohibits walking.

Beach Walk, the final (1974) walk of this trilogy, moves across San Francisco's Ocean Beach. Symbolically, it marks the separation of the West from the East [4]. *Beach Walk* proceeds across the Great Highway, down a concrete barrier stairway to the beach and ends at the Pacific Ocean. While the coast marks the finite limits of the City, of the State, of the Country and the Continent, it also marks the end of an important, and potent signifying era in American history, the migration across the continent in the quest for new horizons, new land, new opportunity - the West. Ironically, with nowhere to go, d'Agostino leaves the camera on a tripod. The video continues recording the walker on his passage across the beach eastward, toward the City. The video ends when the walker disappears through the stream of traffic moving north and south on the highway.

Further east during the summer of 1974, d'Agostino's walk project continued as he backpacked California's Sierra Nevada Mountains. His *pond / pass / peak* (1974) resonates alongside Ansel Adams' historic Yosemite photographs, and Cheryl Strayed's recent memoir *WILD*, as shared experiences of the Sierra Nevada Mountains. Miles became "long, intimate straggles of weeds and clumps of dirt, blades of grass and flowers that bent in the wind, trees that lumbered and screeched. They were the sound of my breath and my feet hitting the trail one step at a time…" [5]

Walking redefines knowledge on a human scale of a world hovering between the virtual and real. Walking also represents a challenge, a quality of life struggle, for many indigent and elderly people. Walking mediates their relationship with their internal health, with the external environment, and with life itself.

Beyond mobility, walking covers a gamut of experience, an infinite terrain of perceptually driven cognitive concerns. Along each path, each walker

can locate different signifying junctures: registering notable landmarks along the path - "wayfinding," mapping the path taken - "sequence," combining the two into a mental configuration. Treading new and retreading old paths, individuals survey their knowledge, forging an odyssey of history and discovery [6].

Walkabout: located and lost in the Twentieth Century

In a traditional rite of self-discovery, initiation and education, young Aboriginal men came of age by walking their country to learn about history, politics, time and space, geography, horticulture, fauna, natural boundaries, language. Walkabout lived the coding and decoding of family and tribal history. The natural features of the earth inscribed that history. The people made sense of the earth in human terms, generating narrative that stirred the imagination, defined the Law, and delineated relationship [7].

In the age of television, walkabout diminished. Losing that profound contact with the environment, losing the stories shared, the Law, the community suffers. Identity at best becomes confused, damaged, at worst disappears in the miasma of self-abuse. The earth, no longer a source of human identity, becomes vulnerable. As the walker struggles to reclaim the natural in nature, the land relinquishes its reservoir of history, identity, the essence of meaning [8].

Aboriginal people still walk the earth in bare feet, to feel the connection with the soil, with country. Walking remains grounded, the body navigating a temporally defined space. Walking, however, changes over time. Even in central Australia with walking traditions that lingered long into the Twentieth Century, the "Toyota" (a generic word for "car") prevails. The outback tracks now accommodate the trucks. The tracks have become wider, straighter, and more meaningless than the old trails, which led to rock holes, family country, and spiritual sites [9].

Walking has taken on a different meaning, beyond transportation. Walking offers meditative space amidst numbing sensory overload. Walking can heighten engagement, resurrect the contact lost between the individual and the environment, help mediate the human condition - the frail body treads a changing, volatile environment. Each "temporary" landmark denotes meaning, a space inscribed with memories, histories, and a spiritual connection with the mystery beyond any contemporary capacity for understanding. The art from walking helps navigate that complex inner scope of fear, love, desire, disappointment, and satisfaction.

Art: Historic Contexts from 1913 to 2013

Leah Dickerman, a curator at New York's Museum of Modern Art, argues that the transformation of 1913 shook " the foundations of art conception." It remains unmatched by all of the cultural movements that have since transpired. Historian Valerie Paley notes that the *Armory Show* in 1913 paralleled Einstein's imminent new theory of gravity, Freudian psychology, electric lights, architectural heights, the dawn of a different time, a new way of thinking [10].

In the 1920s, Dziga Vertov, founder of the *Kino-Pravda* group, championed the use of media technology to heighten awareness, if not revolutionary thinking. In his manifesto, Vertov writes

> Cinema is … the *art of inventing movements* of things in space in response to the demands of science; it embodies the inventor's dream… - that which cannot be realized in life… Drawings in motion. Blueprints in motion. Plans for the future. The theory of relativity on the screen [11].

In Vertov's manifesto, technology enhances primary vision. In *Man With a Movie Camera*, Vertov forges random distilled events in the life of a city into systemic operations.

A number of artists have integrated walking as part of their explorative methodology, most notably, the Situationist International's practice referred to in Guy Debord's, *The Naked City* (1957); Richard Long and Hamish Fulton's photo/text works beginning in the 1960s. The recent *Walking Artists Network* in the United Kingdom examines walking as an art practice integrating "the related fields including, but not limited to, architecture, archaeology, anthropology, cultural geography, history, spatial design, urban design and planning." [12]

Some media artists conjoin the cinematic linearity of the walk experience as a diaristic construction. Media tools help to map out the many signs chosen along the trail. In their recording (constructed memory), the coherent observations and/or statements form a larger text.

A century later, the mapping of the human genome, the looming implications of the singularity, the burgeoning human population, the explosion of human communication, the proliferation of flying, the formation of new alliances, the threat of climate change challenge "figurative, oral, literate, and electronic representations to form not merely a continuous but an ever-widening stream, one in which there is now the potential for combinations and synergisms…" [13]

Taking note of the present, looking at traces of the past, searching for signs of the future, the *World-Wide-Walks* project represents one part of that collective effort.

Walking: Pointing to Recording

Biped walking liberates the upper limbs to point, mark, and negotiate the environment. Mobility expands the capacity to explore and acquire language. Children point to the objects in their environment. They reach, probe, define their relationships, forming a neural network "continuously linked to the visual parameter." "The dynamics of the system in the cycle" link motor control with surrounding perceptions. (de Rugy et al. 2002) Pointing to a target implies some experience negotiating the terrain. On the most elemental level, walking integrates form, context; muscular knowledge of the topographic experience. The tracking skills of an Indigenous native embody the most sophisticated form of engagement.

Recording distinguishes human walking from the movement and marking of other animals. In the caves, humanity left imprints of hands, and painted bison, forming ritualistic spaces. Over time, recording methods and machines become more mobile and sophisticated. GPS devices from unseen satellite observation posts transform the reflective experience.

Situating the recorded walks within a virtual environment, such as the World-Wide-Web, mapping territory creates new meanings. The map no longer represents the territory but transforms it (as discussed in Baudrillard's *Simulacra*). How ironic, in a world where behavior mimics television, video reconstructs memory of place. "Although life can only be lived forwards, it can only be understood backwards… The complexities of time, culture, and

World-Wide-Walks / between earth & water / RIVERS **Gauge: Mississippi / Nilometer: Egypt (c) 2011 Peter d'Agostino**

environmental change over the last 10,000 years are such that a unified and comprehensible historiography is still some way off." [14] The memory turns in on itself, compounded by new thoughts, connections and observations becoming another social dimension of collective experience.

The walk combines kinesics (i.e. body movement), anthropology, politics, nature, physics, art… The walker strings together the associations, the dialectic, the recollections. If recorded, the walk becomes a footprint on the sand with all sorts of indexical markers. "History shrivels into a mere wrinkling or furrowing of the surface as in an aerial relief-map…" [15] The markers remain fixed but interchangeable memories.

As the inventory of walks compile, the multiplicity compounds the experience individually and collectively by placing each walk into a larger context, sometimes a much larger context as the *World-Wide-Walks* stretch on over many years. As the years compile, those patterns form footholds in the ongoing recording experience, an indelible part of the encounter with the subject, an inscribed but fragile map. Even digital worlds remain subject to the contingencies of an uncertain environment. Traces of footsteps can disappear in a heavy rain. As stated by Maya Lin (an architect and environmental artist), "A flood doesn't exist except in our memory banks. It's a temporal event. It's not the river and it's not the land. It's neither here nor there." [16] Digital footsteps can disappear without a cyber trace. Every footstep occupies a temporal moment, forever inscribed in a universe without history beyond society's capacity to forge that history. Walking captures that fragility on the ground.

Walking forms a part of the universal mapping project. Footsteps become paths when retread many times. Highways supplant footpaths; footpaths replace rail beds. A walker's vision embodies each step, each muscular cue, each visual synapse and the constituent linkage(s). Images become more meaningful when viewed repeatedly. The *World-Wide-Walks* map solitude, contemplative time and space in the real world.

> While we have been primed to appreciate parks as restorative preserves of 'nature', not as remnants or fabrications of what was, the aestheticization of natural environments is fast creating a global museum in which everything from species through land-use systems to whole eco-systems are 'preserved', as they are elsewhere threatened, transformed, erased. [17]

The walker as artist deactivates the environment as a factory of production separate from the preserve of nature. The walker taps the territory as a human frontier. As the outer frontier on the planet diminishes, a micro frontier of discovery beckons.

Environmental Change and Eco-Art

With the cyclical chaos of nature wrestling with humanity's economically driven development, the land changes (from coastal marshes and barrier islands to housing tracts) as does its border configurations. The memory of a particular place might linger for a generation or two, before its transformation relegates it to a story, retold over and over again.

A new virtual environment emerges, an augmented space. The augmented landscape becomes a temporal trace of a non-existent space, a moment that only has meaning as memory. That memory may embrace a larger world undergoing significant climate change. In May 2013, instruments atop Mauna Loa, the volcano on the big island of Hawaii, ground zero for monitoring global carbon dioxide levels, recorded a significant milestone. Carbon dioxide reached a daily average of 400 ppm, a "concentration not seen on earth for millions of years." [18] Humanity cannot survive the separation of ‘actual’ and ‘augmented' identities. They combine to form the broader realities.

Technologists ponder solving environmental problems using technology. Naturalists seek a restorative resolution by reintroducing wetlands. Art negotiates the culture in the center. "Eco-artists" Newton and Helen Mayer Harrison's work begins

> when [they] perceive an anomaly in the environment… the result of opposing beliefs or contradictory metaphors. Moments when reality no longer appears seamless and the cost of belief has become outrageous offer the opportunity to create new spaces – first in the mind and thereafter in everyday life. [19]

The generation of Buckminster Fuller, who contemplated putting a dome over Manhattan, John Cage, who warned that improving the world might simply make matters worse, and their contemporaries used irony, the latent absurdity of things, as a strategy.

World-Wide-Walks

The *World-Wide-Walks* have been performed on coastlines in the U.S., Venice, and Australia; and along rivers in the U.S. (the Delaware in Pennsylvania; the Mississippi in Louisiana; and the Sacramento in California) and along the Egyptian Nile. [20] Recent walks beside glaciers in Alaska, Iceland, and Argentina note cataclysmic evidence of climate change.

World-Wide-Walks / between earth & water / COASTS **Atlantic City / Venice (c) 2013 Peter d'Agostino**

With global warming's shifting thresholds, extreme weather events threaten to trump average conditions. Lagoons and coastal wetlands mark the transitional zone between terrestrial ecosystems and the adjacent seas - "the most changeable and vulnerable environments on Earth." [21] *World-Wide-Walks / between earth & water / COASTS* focus on this zone of transition.

New York / New Jersey Atlantic Coast. Along the New York and New Jersey coasts with nearly twenty million residents, Hurricane Sandy swept ocean surf into communities and river water across parts of Manhattan's financial district, into its subterranean transportation and electronic systems. Two weeks later, *Atlantic City Walk* along the beach captured Army Corps of Engineers Caterpillar devices restoring sand to the coastline, rebuilding the beach. No longer natural, the beach becomes fantasyland, a playground of umbrellas, blankets, and recreational activities. Unlike Disneyland, however, the beach embodies
still the total illusion concealing its augmented nature.

Venice (City of Water). Venice hovers between recurrent flooding (as recently as 2012), and drought, which exposes and rots the wooden beams upon which the city rests. "A time series at least 50–60 years long must be used to identify a meaningful tendency." [22] The *Venice Walks* span twenty years of that half-century. Venice, too, moves from the real to augmented reality. With ever increasing climate related extreme weather conditions in Venice, a hi-tech artificial gates project, the MOSE (MOdulo Sperimentale Elettromeccanico, Experimental Electromechanical Module) will allegedly provide some protection for this historic city after 2014. Nothing in this technology, however, counteracts drought.

Queensland (droughts and flooding rains). *Cairns Walks* along Australia's coastlines, performed in 1993 and in 2003 presaged Queensland's recurrent "hundred year" river flooding events from 2010 through early 2012.

With coastal regions under siege, walls and mobile gates may only provide temporary solutions for the wealthiest cities. A better understanding of wetlands, those naturally occurring areas between earth and water, might provide a key for addressing these coastal problems - not that this or any other problems can literally - in the words of Saint Augustine "*Solvitur Ambulando*" - be *solved by walking*. But recording walks on coastlines, along rivers and beside glaciers over a period of time creates a heightened awareness of disappearing natural resources. These direct experiences lead to knowledge and awareness that ultimately contribute to mobilization.

References and Notes

1. "Techno/Cultural Consciousness across the digital divides." (2002)
"Techno/Cultural Identities: from Ships to Gigabits" (2004)

2. http://peterdagostino.net/WorldWideWalks/

3. “World-Wide-Walks / Between Earth & Sky / Donegal” (2010-11) Peter d'Agostino, Deirdre Dowdakin, David I Tafler. *LEONARDO Journal* Vol 45, Issue 2, 2012.

4. The Pacific boundary foreshadows d'Agostino's *East-West* project with Taka Iimura twenty-five years later.

5. Cheryl Strayed, *WILD: From Lost to Found on the Pacific Crest Trail*. (New York: Alfred A. Knopf, 2012), p. 191.

6. Marieke van Asselen, Eva Fritschy, and Albert Postma, "The Influence of Intentional and Incidental Learning on Acquiring Spatial Knowledge During Navigation," *Psychological Research* 70(2) (2006): 151–156, p. 151.

7. From conversations with Donald Frazer, and other tjilpis (elders) on the Anangu Pitjantjatjara Yankunytjatjara Lands from 1998-2007.

8. David I. Tafler, "The Use of Electronic Media in Remote Communities. Australian Aboriginal Studies, " (1 & 2) (2000): 27–38.

9. In 1998, Tafler traveled the Anangu Pitjantjatjara Yankunytjatjara Lands with an elder, who deviated repeatedly off the graded track to show him the old rock holes and spiritual sites that he charted as a young man. Now, his children "are too busy watching television."

10. “Armory Show” That Shocked America In 1913, Celebrates 100 : NPR 2013 http://www.npr.org/2013/02/17/172002686/armory-show-that-shocked-america-in-1913-celebrates-100, accessed February 17, 2013.

11. Alex Danchev, ed., 2011 *100 Artists’ Manifestos: From the Futurists to the Stucklists*, (Penguin, 2011), p. 214.

12. Walking Artists Network N.d. Walking Artists Network. http://walkingartistsnetwork.org/, accessed May 14, 2013.

13. I. G. Simmons, “To Civility and to Man’s Use”: History, Culture, and Nature. Geographical Review 88(1) (1998): 114–126, pp. 121.

14. Simmons [12] pp. 115-116.

15. Mary McCarthy, "Dejeuner Sur L’herbe", *The New York Review of Books*, (February 1, 1963).

16. Carol Kino, "Maya Lin’s 'Here and There' at Pace Gallery." *The New York Times*, (April 25, 2013). http://www.nytimes.com/2013/04/28/arts/design/maya-lins-here-and-there-at-pace-gallery.html, accessed April 28, 2013.

17. Cindi Katz, and Andrew Kirby. "In the Nature of Things: The Environment and Everyday Life," *Transactions of the Institute of British Geographers* 16(3) (1991). New Series: 259–271, p. 265.

18. Justin Gillis, "Carbon Dioxide Level Passes Long-Feared Milestone," *The New York Times*, May 10, 2013, http://www.nytimes.com/2013/05/11/science/earth/carbon-dioxide-level-passes-long-feared-milestone.html, accessed May 12, 2013.

19. Helen Mayer Harrison, and Newton, Shifting Positions Toward the Earth: Art and Environmental Awareness. *In* Women, Art & Technology. Judy Malloy, ed., (MIT Press, 2003), pp. 160-179, p. 160.

20. "World-Wide-Walks / between earth & water / Rivers" (2011).

21. Pierluigi Viaroli, Pierre Lasserre, and Pierpaolo Campostrini, "Lagoons and Coastal Wetlands," *Hydrobiologia* (577)(2007), pp. 1-3, p. 1.

22. Laura Carbognin, Laura, Pietro Teatini, Alberto Tomasin, and Luigi Tosi, "Global Change and Relative Sea Level Rise at Venice: What Impact in Term of Flooding", *Climate Dynamics* (35) (2010): 1055–1063, p. 1059.

THE POINTLESS CHAT-ROOM? COPING WITH ABSENCE IN ONLINE PERFORMANCES

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Abstract

This paper addresses the role of chat functionality when included in online performances that do not fundamentally require it. The explanation that chats are included to reintegrate forms of co-presence is supported by a series of interviews but immediately challenged by the author. This papers argues that the need for co-presence is not a universal one, but is rather rooted in theatre practice. Online performers with a background in the visual arts tend instead to emphasise a purely visual relationship between audience and artwork. This study also elaborates on the use of chat logs as a form of documentation.

Keywords: online performance, chat-room, audience experience, real-time, documentation, liveness, participation

The impact of Information and Communication Technologies on performance practice has forced scholars into a deep investigation of the nature of co-presence between artists and audiences, and on the capacity of technology to produce presence. On the one hand, researchers have identified a series of negativities, for example, the fact that aspects of the artwork get lost when a performance is mediatised (broadcasted or webcasted, turned into a screen based experience). On the other hand, they also acknowledge that technology is offering a range of possibilities to enhance the experience of a remote viewer [1]. Sensor and wearable technologies, for instance, can support a mediated feeling of touch across distance, while diverse forms of interactivity allow for an intervention of the audience during the piece.

This paper explores the role of chat functionalities as a basic means to overcome the physical divide between performer and audience. Even though many artists adopt chat as a medium or thematic focus, or choose to perform in chat rooms as a specific intervention in the public domain, the aim of this study is to concentrate on online performances where chat functionality is accessory and does not carry out any essential task in the piece. A lack of literature on the subject suggests a general attitude of taking for granted the need of audiences to participate and the need of artists to let them actively take part in the piece. I will argue that this is not always so and will call upon two distinct approaches in the performing arts to explain how only performances rooted in theatre, dance or music traditions require the 'being there' of the audience. This is related to the collective and ritual dimension of theatre, which requires mutual awareness and shared feelings between spectators and performers, and between spectators themselves [2].

Performance rooted in the visual arts, by contrast, does not conceive immediate feedback as essential and, as is the case with a video or installation piece, visual artists working with performance are used to dealing with a deferred viewer experience. Such work is mainly interested in a perceptual relationship with its audience. Furthermore, I look at current trends in documentation of live events and explain the inclusion of chat functionalities in online performances as a tool for evaluation and documentation. Following the gradual evolution in contemporary art categorisation of the public from spectator to prosumer [3], a shift in the notion of documentation itself is taking place that embraces audience experience and audience behaviour as part of the work and therefore as worthy of being recorded.

The Inseparability of Audience and Performer

When a performance is mediatised and transferred to a private screen in a private space, even though it is in real time, there are several qualities of the live experience that tend to get lost. These include ambiance, awareness of the same context among audience and performers, physical proximity, shared feelings, the possibility of collectively expressing a reaction on the part of the public (an applause for example) and apotential for intervention. While denying a radical ontological difference between live and mediatised performance, Steve Dixon points out that recorded media "can never break out of that frame and personally confront us. Most live performance never actually does this, but it always can; there is a potential for the performer to see you, or speak to you, and break out of the stage frame to confront you directly" [4].

Other theorists address the issue of liveness by claiming the unfinished status of every performance until its direct encounter with the audience takes place: reception is an integral part of the piece [5]. If the co-presence of audience and performer is seen as intrinsic to liveness, it is natural for the performer to look into ways to reintegrate it across the distributed, remote dimension of the network. I conducted a series of interviews with artists performing online, all of which support the idea that chat functionalities are an effective way to maintain the potential for a spectator intervention, and to overcome the separation between artwork and viewer.

Director and researcher Christina Papagiannouli for instance describes the presence of the public in a theatre setting as a shadow, not clearly perceived by the actor, but crucial for "the magic of theatre" [6]. In her *cyberformances* the online spectators, by accessing the chat room, become an electronic version of this shadow, and re-introduce a sense of presence.

However, there is another important issue that goes beyond the potential of reciprocal interaction between artist and audience, and lies in the collective, ritual dimension of attending a performance. This is something that can be traced to/recalls Greek classic tragedy, a form of mass entertainment with deep social, religious and educational relevance. The myth depicted in the action in fact tended to directly address the citizens with more or less implicit references to issues relating to the democratic life of the polis (the Ancient Greek city). Furthermore, the well-known notion of catharsis (a form of purification from the irrational passions of the human being reached through the emotional and cognitive involvement in the tragedy) tends to be described as a collective process [7]. Significantly, Dixon recalls this feature of classic theatre in his interpretation of online audience participation as "therapeutic catharsis-overload" [8]. According to Erika Fisher-Lichte, the communal foundations of performance were affirmed by the movement of theatre practices away from traditional buildings and into alternative spaces from the 1960s onwards. Theatre becomes the access point to autonomous social groups, insofar as both actors and spectators were ready to temporarily sacrifice their individualities. [9] As Fisher-Lichte states, by appropriating domains of the everyday life, theatre "create[d] shared communities between actors and spectators, and institute[d] a participatory form of democratic activity" [10]

Creating community is thus a fundamental dimension for theatrical performance, and requires the audience to be able to express and mutually understand feelings and beliefs raised in real time by the performance itself.

Helen Varley Jamieson suggests that the intrinsically participatory nature of the Internet adds a further layer to the collective dimension of performance. The "almost hyperactive expectations of some netizens", in fact, include the desire "not only to participate but to have authorship and agency within the work" [11]. The performer then, finds himself dealing with his own need for the presence of the audience, and the Internet audience's expectation of interactivity. The inclusion of chat functionalities in the piece, even though the piece itself would maintain its integrity and meaning without the audience contribution, is to be understood as a response to this double necessity. The influence of Internet conventions on remote audiences however goes beyond its tendency to generate interactivity. The performers Grossi Maglioni point out how the uniqueness of online performances clashes with the web-surfers custom to consider the Internet as a repository of constantly accessible content, available and retrievable at any time. Observing the number of users hitting the webpage of an online performance festival they organised, they noticed how the attendance during the live event was low (on average 14-20 people), while the number of site visitors during the whole day when the event was programmed was in the thousands. This is symptomatic of an approach to the online dimension that contrasts with the effort of the artist to create a tension around an unrepeatable live action [12]. In this framework, online performances need to distinguish themselves from video and other forms of recorded web content, by providing the possibility to verify their real-time dimension [13].
Chat functionalities then can work as evidence of synchronicity and liveness.

Theatre Vs Visual Arts

Though the expectation of co-presence between audience and performer seems an inescapable factor, the information gathered through the above mentioned interviews demonstrates that this is only partially true, and the unfinished dimension of the piece without direct feedback is not universally valid. Field Broadcast's practice is based on live streaming of audiovisual content from remote natural settings to a dispersed audience across the Internet. Rebecca Birch, part of this collective alongside Rob Smith, explains that they do not use chat rooms because "We want people to pay attention to the broadcast, to the artist broadcasting to them; this is the relationship, between artist and viewer, that we are most interested in, so to try and cut across that and interact ourselves with the viewers, or to encourage viewers to interact with each other slightly jars with our intentions" [14]. She also stated that: "Artistically we rather like the sense of the artist staring into the void, and the viewer, somewhere else entirely, staring back at them through the 'hole' or 'window' of the Field Broadcast screen." [15]

These statements support the position that a performance can exist as a finished work without any perceivable presence of the audience, and this calls upon a distinction between two traditions and two different kinds of online performance. Works rooted in theatre, dance or music cannot be conceived without an audience, but when the artist's background is in the visual arts the artist-audience relationship is significantly different. The aim of the artist in this performance strand is to encourage in the audience an act of viewing (and thinking), rather than a responsive action. Thus even when they are engaging with liveness the attitude is not dissimilar to that associated with an object-based exibition This might be a crude classification as I am polarising what is a rather porous spectrum. However, it is clear that this distinction is a useful one in the context of this study.

The difference between online performance and video is obviously important, but it is also necessary to reclaim the strong association with performance that characterises the origins of video art. If we think of Bruce Nauman's repetitive performance actions in his studio [16], or Vito Acconci's recordings of basic physical gestures [17], we immediately get a sense of a genealogy of performance essentially detached from an audience. The potential of video-tape between the 1960s and 1970s, just after the introduction of the first Portapak system by Sony, was explored by artists focusing on the conceptual value of action and gesture, and generated a practice of performing without an audience, in the artist's studio, for the technological eye only. A case in point to confirm the heritage of these practices today is media artists Jeremy Bailey, who describes his online performances as

"rooted in the history of performance video art. In this early video work, the body's mediation by this new technology is often investigated. I have always been specifically interested in the reflective circuit that this 'performance for the camera' creates. Specifically in the description outlined in Rosalind Krauss' *Aesthetics of Narcissism*. Gesture, in this context, can be as simple as a diverted gaze or as complicated as the creation of a persona. In either case, the technology fundamentally shifts our understanding of our bodies (including psyche). It reflects and extends the human body in real time within an electronic circuit" [18].

Krauss explicitly talks about "performance-for-the monitor" [19] and portrays the first experiments in video art as situations of "self-encapsulation" [20], "spatial closure" and "self-reflection" [21]. By using the camera as a mirror, the artist gained a condition of self-sufficiency, where the simultaneous reception and projection of an image produced instant feedback [22].

Acconci's work is also taken as a case in point by Auslander to demonstrate the performativity [23] of performance documentation. By describing how performers like Acconci or Gina Pane privilege the documentation of their actions that take place in absence of public, he demonstrates that it is the documentation itself which frames the act as performance. The presence or lack of audience is irrelevant to the artistic value of the work. Therefore the audience these pioneers of performance art have in mind is always a deferred one [24].

Evaluation and documentation

Theories that resist the mediatisation of performance tend to deny the possibility of documenting it accurately or of claiming emphatically that performance exists only in the present [25]. However, since the origins of performance in contemporary art, artists have used photography and video recording as evidence that the action took place, and as archival material to reconstruct the work for future publics or research purposes. Alongside these recordings, chat logs can also become part of the documentation of the piece, and prove particularly useful to research and evaluation purposes, especially for the artist unable to analyse audience reaction during the performance.

Recent studies have addressed the conflict between the ephemeral character of a great part of new media art and the fixedness of documents. Ana Carvalho for instance identifies three essential moments within performance practice: creative phase, action and community gathering. The third one has only recent-

ly begun to be considered relevant enough to be included in the documentation [26]. Performers maintain an ambivalent position in this respect. Some of them still prefer to emphasise the uniqueness of the live action and are very careful to include chat logs as part of the documentation, especially when this means that a text is untied from the audiovisual recordings of the action [27]. In other cases chat logs are adopted as a tool for ethnographic investigation of the audience [28]. This approach challenges the traditional notion of documentation, conceived as a way to reproduce the work for larger audiences rather than to "capture the performance as "interactional accomplishment" to which a specific audience and a specific set of performers coming together in specific circumstances make equally significant contributions" [29].

It is arguably the case that this shift from the documentation of the work to the documentation of the interactional event might be partially motivated by the increasing need for artists to account for their achievements in funding applications [30], where they need to demonstrate their capacity to be inclusive, engage and encourage audience participation.

Conclusion

This is an exploratory study based on the examination of artworks, chat logs, and qualitative methods. The information gathered by interviewing a small number of artists cannot be taken as universally applicable. It provides, however, a provisional answer to the question of why chat functionalities are included as an accessory to online performances, and opens new fronts for investigation. One of these could concern a reading of the audience chat as an autonomous performance in itself.

Furthermore, the inclusion of chat is explained as a way to attest the synchronous dimension of the work, and to overcome the physical divide between performer and audience. This would allow the performer to feel the audience presence in the background, and to let the communal, choral experience of the audience be expressed. However, it is not clear that it has been demonstrated whether or not the latter goal is actually met by chat interventions. According to the evidence gleaned from both chat logs and interviews, the range of behaviour and comments made by spectators in chat vary extremely. It is often used for technical and practical issues, such as checking if the connection is in place or asking questions about what is happening [31]. Sometimes people introduce themselves or give information about their location or contingent activities, sometimes they comment on the work or the technology used, sometimes they have side conversations with other users [32]. In addition, "traditional theatre behaviour is often mimicked, with typed responses such as 'LOL' or 'applause'" [33]. The unfamiliarity of a great part of the audience to online performances [34] is responsible for a lack of uniform codes of behaviour that could mediate between the intimidating effect of an artwork and the easiness of self-expression that accompanies online communication. Such a heterogeneous landscape of behaviours makes it difficult to assess whether or not chat functionalities are able to restore the collective, cathartic character of live performance, especially because these elements might not be entirely translatable into words.

From the mid-1990s onwards, online performance had already developed a strong trajectory and its audience behaviour has been subject to a parallel evolution, also in relation to the exponential growth of social networks that certainly transformed people's approach to online interactions. This development opens up the potential for further research that could not be included within the scope of this paper. Such research could shed more light on the limits of chat functionalities in relation to spectators' identities - generally reduced to a nickname, agency - restricted to discourse, and sharing of context - where the offline part of the spectators' environment always remains hidden to everyone else.

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References and Notes

1. See Matthew Causey *Theatre and performance in digital culture: from simulation to embeddedness* (London: Routledge, 1996); Steve Dixon *Digital Performance* (Cambridge, MA: MIT Press, 2007); Gabriella Giannachi and Nick Kaye, *Performing Presence: Between the Live and the Simulated* (Manchester: University Press, 2011).

2. Erika Fischer-Lichte, *Theatre, Sacrifice, Ritual: Exploring Forms of Political Theatre (*Routledge, 2005).

3. See Alvin Toffler, *The Third Wave* (New York, NY: Bantam, 1980) and Henry Jenkins, *Convergence Culture*. (New York, NY: New York University Press, 2006).

4 Dixon [1] p.130.

5. See Susan Bennett, *Theatre audiences: a theory of production and reception* (London, New York: Routledge, 1997); Monika Wunderer, "Presence in front of the fourth wall of cyberspace", in S. A. Schrum, ed., *Theatre in cyberspace : issues of teaching, acting and directing (*New York: P. Lang, 1999); Roberta Mock (ed.). *Performing Processes: Creating Live Performance*. (Intellect, 2000); Erika Fisher-Lichte, *The Transformative Power of Performance: a New Aesthetics*, (Routledge, 2008).

6. Christina Papagiannouli, private communication, March 27th, 2013.

7. See Dominique Barrucand, *La catharsis dans le théâtre, la psychoanalyse et la psychothérapie de Groupe* (Paris: Epi, 1970); Adriene Jenik, "Desktop Theatre: keyboard catharsis and the masking of roundheads"; Stefan Meisiek, "Which Catharsis Do They Mean? Aristotle, Moreno, Boal and organization Theatre" *Organization Studies* 25.5 (2004) 797-816 DOI: 10.1177/0170840604042415 http://oss.sagepub.com/content/25/5/797

8. Quoted in Helen Varley Jamieson *Adventures in Cyberformance: experiments at the interface of theatre and the internet.* (Master thesis, Queensland University of Technology, 2008) p.70.

9. Erika Fischer-Lichte, *Theatre, Sacrifice, Ritual: Exploring Forms of Political Theatre (*Routledge, 2005).

10. Fisher-Lichte [9]

11. Varley Jamieson [8] p.71.

12. Grossi Maglioni private communication, March 29th, 2013.

13. Grossi Maglioni [12]

14. Rebecca Birch, private communication, March 25th, 2013.

15. Birch [14]

16. Janet Kraynak, *Please Pay Attention Please. Le Parole di Bruce Nauman*. (Milano: Postmedia Books, 2004).

17. Frazer Ward, Mark C. Taylor and Jennifer Bloomer (eds.), *Vito Acconci*. (London - New York: Phaidon, 2002).

18. Jeremy Bailey, "Interview with Jeremy Bailey" [interview by G.J.Smith] in *Rhizome*, December 1st, 2010. <http://rhizome.org/editorial/2010/dec/1/interview-with-jeremy-bailey/>

19. Rosalind Krauss "Video: the Aesthetics of Narcissism" *October* 1 (1976) p.56.

20. Krauss [19] p.53

21. Krauss [19] p.54

22. Krauss [19] p.52

23. Performativity is intended here to describe the active function of documentation to frame the performance as an event of a particular kind.

24. Philip Auslander, "The performativity of performance documentation.", *PAJ: A Journal of Performance and Art* 28.3 (2006) pp. 1-10.

25. Peggy Phelam, *Unmarked: the politics of performance*. (Routledge, 1993).

26. Ana Carvalho "The ephemeral in audiovisual realtime practices: an analysis into the possibilities for its documentation", *The 17th International Sym-*

posium on Electronic Art (2011)
http://isea2011.sabanciuniv.edu/paper/ephemeral-audiovisual-realtime-practices-analysis-possibilities-its-documentation

27. Grossi Maglioni [11].

28. Papagiannouli [6].

29. Auslander [18].

30. Birch [12].

31. Grossi Maglioni [11].

32. Helen Varley Jamieson, private communication, March 25th, 2013.

33. Varley Jamieson [8].

34. Grossi Maglioni [11].

OPENPATHS: EMPOWERING PERSONAL GEOGRAPHIC DATA

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Abstract

OpenPaths, created by the New York Times Company R&D Lab, is a platform that demonstrates the collective value of personal data sovereignty. It was developed in response to public outrage regarding the location record generated by Apple iOS devices. OpenPaths participants store their encrypted geographic data online while maintaining ownership and programmatic control. Projects of many kinds, from mobility research to expressive artwork, petition individuals for access to their data. In the context of locative media practice, OpenPaths expands the notion of the tracing to address the components of an ethical implementation of crowd-sourced geographic systems in the age of "big data".

Keywords

locative media, big data, data visualization, privacy

The "tracing" as a mode of locative media art practice was established through projects such as *Amsterdam Realtime* [1]. Conducted in 2002, participants were given Global Positioning System (GPS) devices to carry as they traversed the city in the course of their everyday lives. The result was a compelling display of the collective routes, a tracing of the urban topology through which, moment to moment, the city was given form. At the time, such work was speculative, anticipating mobile phone networks. Yet *Amsterdam Realtime* already hints at the eeriness of a city inhabited solely by disembodied, moving coordinates, and the centralization required to pull off the project demonstrates the involvement of commercial or military infrastructure in tracing and its potential use for surveillance. Such concerns fuel a broad critique of much subsequent locative media and data visualization practices that do not address the political implications of their technological underpinnings [2]. Recently, the disclosure of the PRISM initiative of the United States' National Security Agency provides a dramatic confirmation of the danger of centralized data gathering and the collusion of state and corporate interests in tracking individuals [3].

Fig. 1. ***Amsterdam Realtime***
© 2002 Esther Polak

Nevertheless, there is great potential for the tracing to serve the public interest. In 2006, Mark Hansen and colleagues at the Center for Embedded Networked Sensing at UCLA introduced the term "participatory sensing" [4]. Recognizing the ubiquity of mobile phone users and the devices' capacity to gather data, they proposed that individuals might opt-in to ad hoc sensor networks to address issues in "urban planning, public health, cultural identity and creative expression, and natural resource management". They note that "we know something about what distributed sensing can be used for in the sciences, industry and the military. We know much less about its function and utility in the public sphere when the components are owned and operated by everyday users". Personal geographic data in this context might be used to observe mobility patterns and identify opportunities for improving public transport or to allocate social services. Such research is appealing as, due to the penetration of device ownership, the potential reach is vastly larger than what would be possible with traditional methods.

Yet this potential remains untapped, even as vast datasets are gathered for commercial purposes. iPhone and Android users, which as of June 2013 make up 56% of the adult US population [5], have at least two corporations tracking and storing where they are at all times. This is the network operator, such as AT&T, who by definition knows your location in the course of delivering cellular service, and the software provider, such as Apple, who actively monitors your location to enhance their applications. The result, for these companies, is so-called "big data", a buzz word signifying both databases of a magnitude that requires specialized computational techniques as well as an epistemological approach that places an absolute value on emergent patterns [6]. However, despite, or because of, its value, these corporations do not have interfaces or policies in place that would allow the release of these datasets to the individuals who generated them, let alone to user-endorsed third-party research programs. As Natasha Singer of the *New York Times* reports,

> ...when I called my wireless providers, Verizon and T-Mobile, last week in search of data on my comings and goings, call-center agents told me that their companies didn't share customers' own location logs with them without a subpoena [7].

Location data are commonly generated in three ways. Network operators find the position of a device by the triangulation of its signal strength to nearby cell towers. Additionally, most contemporary smartphones are equipped with a GPS sensor, by which it may locate itself in latitude and longitude via signals from geosynchronous satellites [8]. Finally, a device may note the identifiers of nearby cell towers and Wi-Fi nodes and infer its position from a database that lists the coordinates of these signals. Apple's iPhone uses this latter method together with GPS in what is known as "hybrid positioning" [9]. Originally, Apple leased their database from Skyhook Wireless, but in 2010 implemented a system to generate their own [10]. Essentially, Apple employs the iPhone-carrying public as a giant "wardriving" [11] sensor network – the location of novel Wi-Fi nodes and cell towers detected by iPhones are logged and sent back to Apple to contribute to an extensive map of the topology of wireless signals across the world [12].

In April of 2011, researchers Pete Warden and Alasdair Allan publicized a fact already known in digital forensics circles. Beginning in April of 2010, the data collected by individual iPhones and iPads for Apple's database were stored in a cache file automatically synced to the users' computers via iTunes. By default, this file was not encrypted, and it could be readily examined by anyone with access to the computer [13]. Though Apple stated that "The iPhone is not logging your location. Rather, it's maintaining a database of Wi-Fi hotspots and cell towers around your current location" [14], in practice the distinction was somewhat semantic, as the file clearly reflects location history spanning a year's time. The result was dubbed "Locationgate", a scandal which indicated that users were uncomfortable at how such data were being collected. Senator Al

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Franken demanded that Apple explain themselves [15], 27,000 Koreans sued the company for violation of privacy [16], and even *South Park* weighed in [17]. As Kord Davis puts it, "The decision to use that technological method had clear and direct ethical consequences in the real world" [18].

However, there is a certain irony in the outrage, as consumers were agitating for Apple to restrict access to what was in essence the largest publicly accessible Cartesian document in human history – a year's worth of data for over 50 million iPhone users. Locationgate came to an end on May 4th, 2011, when Apple released iOS version 4.3.3, which no longer logged location data to a cache file. But while users can no longer access these data, Apple certainly continues to collect them. Further, Apple shares individual portions of those data with applications – a large percentage of apps for both iOS and Android request access to a user's location via a confirmation box with the options "Don't Allow" and "OK" that lacks subtlety. An approved app may collect continuous personal geographic data. Yet this infrastructure lacks the means for the user to know exactly what data have been collected or how they will be used, and unless an application developer has built an interface to do so, there is no way for users to access their own data for their own purposes. So while Locationgate helped raise public awareness about the nature of personal data, in the end the discussion fell short of asking what rights individuals should have over their location histories, what might be done with the data as a public resource, and what a more ethical implementation for collecting data might be.

In response to the discussion around iOS cache files, in May of 2011 the New York Times Company Research and Development Lab launched OpenPaths <https://openpaths.cc>. Initially, the platform consisted of two components. First, we wanted to create a tool that would allow non-technical users to locate SQLite location databases within their iTunes backup directories. Our tool, built in Python for both OS X and Windows machines, searched the archives of all devices that had been synced with the computer in question, as well as any connected backup disks. Once presented to the user, the files could then be uploaded to the OpenPaths server. Since Apple's "fix" was already released, this

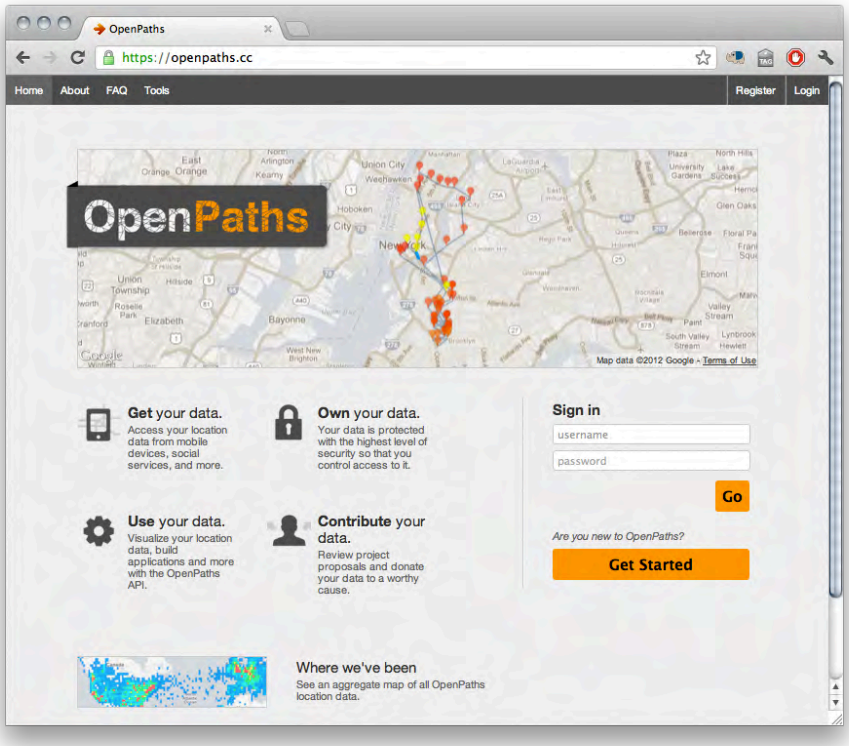


Fig. 2. OpenPaths homepage, © 2012 The New York Times Company

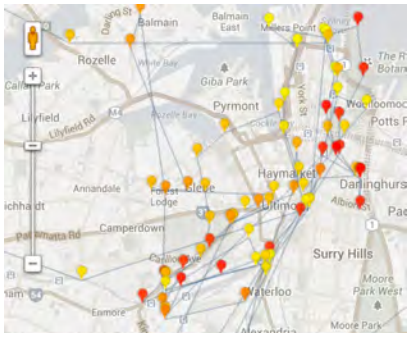
effort was designed to salvage as much historical data as possible before they were deleted or overwritten by updates, and approximately 4000 datasets were collected in this way.

We designed the OpenPaths server as a data "locker" of sorts, one that would embody the idea of "personal data sovereignty". Generally, "data sovereignty" is a business term that acknowledges, marketing language about "clouds" aside, that data lives on physical machines and are hence subject to the local laws in which the data centers are located [19]. This is a liability for corporations if valuable assets are stored by a third-party hosting service, such as Amazon S3, that may be subpoenaed by a state power, such as the US government under PRISM. Personal data sovereignty extends this concept to the level of the individual – it is an alternate model of data collection that empowers that individual with control over the data they generate that is not site-based, but access-based. There are technological and legal aspects of the implementation. From a technological perspective, we propose that data are under your control either when they are stored on a machine to which you physically restrict access or when they are encrypted with a key that only you have. The basic concept of OpenPaths is that by encrypting your data but not storing the key (which is generated from the user password), the service maintains a remote infrastructure without reserving any privileged access to the data themselves (nor is access ceded to the hosting provider, in this case Amazon). This straightforward technological feature is simply a literal interpretation of our user agreements, which state that you own your data, and that your data cannot be accessed without your express permission and participation. The shift that we hope to exemplify is that by leaving out the ability to mine or sell data, the user is no longer an asset in that regard – collective value for OpenPaths users is produced by mutual participation, as we explain below.

Public interest in the project motivated us to provide a means for individuals to continue to collect their data on an ongoing basis without the cache files. Our solution was apps for iOS and Android designed for the single purpose of collecting location data and uploading them to the OpenPaths server with as little friction as possible. The primary technical challenge was to ensure that the apps could run continuously in the background without causing undue battery drain. This largely precludes the possibility of using GPS sensing, which is power-intensive – we use the iOS and Android location services that provide

updates when “significant location change” [20] events occur based on cell-tower and Wi-Fi-node triangulation. The resulting data are similar in resolution to Apple's original location caches, with a topography that suggests a trail of bread-crumbs rather than an uninterrupted GPS path. Likewise, it is of higher quality in dense urban areas with well-documented WiFi – noise is frequently present in suburban locales. Regardless, the apps are effective in tracing individual movements, with a total of ~10000 active users as of this writing.

Fig. 3. The author’s path at ISEA2013
Map data © 2013 Google



Participants access their data through the OpenPaths website. Once you are logged in, the platform is able to decrypt your location history and provide access in a variety of ways. CSV, JSON, and KML formats can be directly downloaded, and an OAuth API [21] allows the system to be polled for updates. Our intent is to provide a minimum viable feature set – however, we do include a basic tool to explore your data on a map.

With this interface, you can watch an animation of your travel unfold. Viewing one's geographic tracing is undeniably a compelling framework for personal narrative. When you look at a map of your activity, you see stories, and cannot help

Fig. 4. 3D print of Chris Woebken’s path
Photo © 2012 Brian House

but populate the representation with your personal experience. There is, in other words, a meaning in the data beyond the encoding, and OpenPaths has been used by individual artists applying a variety of tools to produce a wide range of interpretive pieces. These include a Processing sketch by Bert Balcaen that recreates a month in New York as a dance of particle systems [22]; a 3D representation of Chris Woebken's path that he printed with a MakerBot (Fig. 4); and a laser-cut necklace showing a network of significant points by Michael Massie commemorating a trip to Zurich [23]; my own work, *Quotidian Record*, which maps 365 days of location data to 365 rotations worth of music on a vinyl record [24]; a tool by the team at CartoDB that estimates total carbon consumption by mode of transport [25]; and Wes Grubbs’s workshop code (for Eyeo Festival, 2013) for finding the distance between two people over the course of their travels, an exercise which proved most compelling when applied to the data of two supposed strangers.

After Sue Huang's phone was stolen in July of 2011, it continued to report its location to OpenPaths. With her assistance, we interpolated positions between each point and pulled the corresponding Google Street View tiles, creating a video showing a point of view as if Google was driving the getaway car, which we called *Joyride* [26]. This project points at the fiction of representation woven by our media platforms with data, and the estrangement possible when personal data are separated from the person. In fact, part of the pedagogical purpose of OpenPaths is to ask what inhabits the tension of that abstraction.

To that end, we have conducted OpenPaths workshops at Rhode Island School of Design, Eyebeam Art and Technology Center, and the School of Visual Arts in New York, following a model initially proposed by design educator Daniel Goddemeyer [27]. Participants use OpenPaths for a week to generate datasets and then anonymously trade with someone else in the group. Each participant develops a presentation on what can be inferred from the data based on cross-examining them with other information together with personal knowledge and intuition. Finally, this report is compared with testimony from the actual subject. We have found, unsurprisingly, that a tremendous amount can be learned about an individual through this process, even without advanced computational tools. The workshops are intended both to increase literacy as to the potential of location data (and the subsequent privacy implications) as well as to further demonstrate that the data are not inert and are subject to narrative and interpretation.

We feel that this is an important exercise in the era of big data. Kord Davis writes,

> Any context we create to turn data into information automatically assigns new characteristics to it, causing data *itself* to become less anonymous and more meaningful. And if we have enough data, we can correlate, extrapolate, query, or extract some very useful new information by understanding the relationships between those characteristics ... while the value of that utility is growing exponentially in our time, so too is the unknown potential for unintended consequences... [28]

Hence a fundamental respect for the individual is necessary when aggregating personal data, as the resulting computational models are tethered to pieces of the real world that carry personal weight. From the standpoint of both pedagogy and practice, we need to cultivate empathy for the people involved in systems [29].

“Participatory” implies individuals who are supplying personal data from a personal device to a study or project because they have an investment or interest in the result. The population of OpenPaths users is constantly collecting data a priori of any particular study, which creates the possibility of assembling ad hoc datasets for larger investigations. OpenPaths includes the infrastructure for “projects” conducted by third parties. Project proposals are not curated by the platform admins, but are sent directly to individual OpenPaths users who then decide whether or not to contribute their personal data. Proposals must include information on how the data will be used, how they will be kept secure, and how the project will benefit the OpenPaths community or the public at large. On average, this opt-in model has produced response rates typically around 600 participants (6%) per project. This is small from a commercial standpoint, but significant for epidemiological or artistic initiatives.

Maintaining the encryption model of OpenPaths while allowing third-party access requires what we think is an innovative security system. We employ an

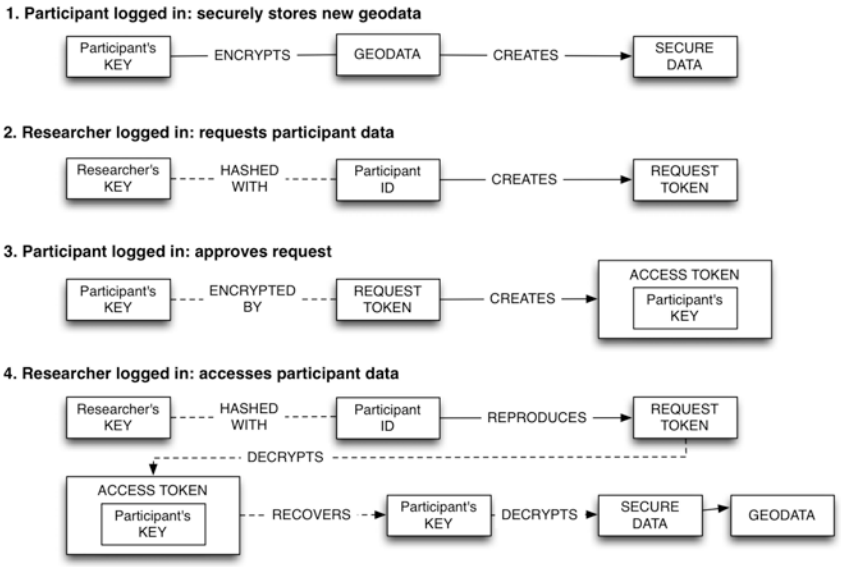
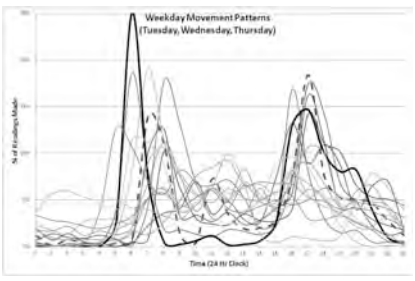


Fig. 5. OpenPaths security model, © 2012 The New York Times Company

exchange of revokable tokens, a simplification of which is as follows. First, project owners (who must be registered OpenPaths users) request participation. This produces a request token for each user that is a hash of the researcher's key and the participant identifier. If the participant approves the request, their key, which is not otherwise stored in the system, is encrypted with the request token to produce an access token. Meanwhile, the request token is eliminated. When the researcher logs in to retrieve the data, the request token is re-created and used to unlock the access token, recover the participant's key, and decrypt the data. This happens in parallel across all participants. The platform facilitates the exchange of data but does not store them unencrypted and so does not maintain for itself any privileged access.

The result has been myriad projects in mobility research, art, urban planning, self-tracking, data visualization, and entrepreneurialism. Highlights include a "re-mapping" of China via longboard [30], a comparison of human mobility

Fig. 6. OpenPaths commuting patterns, <http://researchthecity.com/> © 2013 Niamh Rabbit, Trinity College Dublin

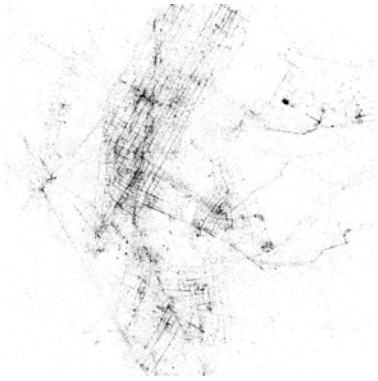


patterns with the spread of the tiger mosquito [31], and the "Science of Getting Lost" [32]. Critically, OpenPaths does not curate or otherwise exclude project proposals, other than to verify their completeness and legibility. Further, the platform supplies participants' unfiltered data to projects – there is no provision to attempt degrees of anonymization, as such a process is likely to fail [33]. This puts the onus on the participants to make informed choices about how their data should be used.

A collective tracing of New York City, produced daily via participants in the New York Times Company Research and Development Lab's own "Mapping Habitual Geographies", has much in common with *Amsterdam Realtime*. It is a portrait of a city defined by its transitory dynamics. Yet where the earlier work operates aesthetically and carries with it a certain foreboding, OpenPaths projects are characterized by a situated politics. First, the data mirrors that which have already been collected by the network operator and software provider, and subsequently by unknown corporate or government entities. As such, they already hold presumed utility from a commercial or surveillance perspective, but that utility is restated, in an act of détournement, in terms of scientific or artistic value as the participants see fit. Secondly, the dataset held by AT&T, for example, comprises an unwitting collective formed solely by consumer habits and/or the practical necessity of using a cellphone. The voluntary and informed formation of a group of participants in an OpenPaths project has a markedly different nature, and, in contrast, is an intentionally political body.

Mark Tuters and others have identified a post-locative practice that shifts emphasis away from the tracing of individuals to the networks of interactions between objects [34]. Projects like MIT's Trash Track initiative [35] or Christien Meindertsma's *Pig 05049* (2008) [36] exemplify the proposition of theorists such as Latour to consider perspectives beyond the human subject [37]. Yet the post-locative should not ignore the human trace, given its ineluctability, and should seek to interrogate the nature of its data. In other words, the communication protocols, encoding schemes, and user interfaces by which location information is formed are not given – Google Maps, for example, may be the de facto standard on Android, but it is a system with designed biases and can be contested as such.

Fig. 7. "Mapping Habitual Geographies" © 2012 The New York Times Company



OpenPaths seeks to inhabit this inflection point where the collection of location data creates a context in which to assess personal data in general, even while acknowledging the particularly vital connection of the geographic tracing with the personal narrative about how it came to be. We suggest that the erasure of context that comes with the encoding of data can be restored through an actual, functional relationship with the individual via a respectful infrastructure. Our hope is that what we have proposed with OpenPaths will serve as one model for how the ethical exchange of data is both possible and necessary.

References and Notes

1. Esther Polak, *Amsterdam Realtime* (2002), media artwork, <http://realtime.waag.org/>, accessed June 28, 2013.

2. Mark Tuters and Kazys Varnelis, “Beyond Locative Media: Giving Shape to the Internet of Things”, *Leonardo* **39**, No. 4 (July 2006) pp. 357-363.

3. Barton Gellman and Laura Poitras, "U.S., British intelligence mining data from nine U.S. Internet companies in broad secret program", *Washington Post* (June 6, 2013).

4. Jeff Burke, Deborah Estrin, Mark Hansen, Andrew Parker, Nithya Ramanathan, Sasank Reddy, Mani Srivastava, "Participatory Sensing", *Proceedings of the International Workshop on World-Sensor-Web* (Boulder, U.S.A.: ACM, October 31, 2006).

5. Aaron Smith, “Smartphone Ownership 2013”, *Pew Internet* (June 5, 2013), <http://pewinternet.org/Reports/2013/Smartphone-Ownership-2013.aspx>, accessed June 28, 2013

6. Steve Lohr, “Sizing Up Big Data, Broadening Beyond the Internet”, *New York Times* (June 19, 2013).

7. Natasha Singer, “If My Data Is an Open Book, Why Can’t I Read It?”, *New York Times* (May 25, 2013).

8. “Global Positioning System”, *Wikipedia: The Free Encyclopedia* (Wikimedia Foundation Inc., updated July 3, 2013, 19:09 UTC), <http://en.wikipedia.org/wiki/GPS>, accessed June 28, 2013.

9. “Hybrid positioning system”, *Wikipedia: The Free Encyclopedia* (Wikimedia Foundation Inc., updated June 27, 2013, 13:36 UTC), <http://en.wikipedia.org/wiki/Hybrid_positioning_system>, accessed June 28, 2013.

10. Brian X. Chen, “Why and How Apple Is Collecting Your iPhone Location Data”, *WIRED* (April 21, 2011), <http://www.wired.com/gadgetlab/2011/04/apple-iphone-tracking/>, accessed June 28, 2013.

11. “Wardriving”, *Wikipedia: The Free Encyclopedia* (Wikimedia Foundation Inc., updated June 27, 2013, 18:31 UTC), <http://en.wikipedia.org/wiki/War_driving>, accessed June 28, 2013.

12. Chen [10].

13. Alasdair Allan and Pete Warden, “Got an iPhone or 3G iPad? Apple is recording your moves”, *O’Reilly Radar* (April 20, 2011), <http://radar.oreilly.com/2011/04/apple-location-tracking.html>, accessed June 28, 2013.

14. “Apple Q&A on Location Data”, Apple Inc., press release (April 27, 2011).

15. Al Franken, letter to Steve Jobs (April 20, 2011), <http://www.franken.senate.gov/files/letter/110420_Apple_Letter.pdf>, accessed June 28, 2013.

16. Jun Yang, “IPhone Users in South Korea Sue Apple for Collecting Data Without Consent”, *Bloomberg.com*, (August 17, 2011), <http://www.bloomberg.com/news/2011-08-17/apple-s-iphone-users-in-south-korea-claim-data-collection-breached-privacy.html>, accessed June 28, 2013.

17. “HUMANCENTiPAD”, *South Park* (April 27, 2011), television.

18. Kord Davis, *Ethics of Big Data*, (Sebastopol, U.S.A.: O’Reilly Media, September 28, 2012), p. 1.

19. “Data sovereignty”, *WhatIs.com*, (updated March 2013) <http://whatis.techtarget.com/definition/data-sovereignty>, accessed June 28, 2013.

20. See APIs for iOS <http://developer.apple.com/library/ios/#documentation/userexperience/conceptual/LocationAwarenessPG/CoreLocation/CoreLocation.html> and Android <https://developer.android.com/google/play-services/location.html>.

21. See <https://openpaths.cc/api>.

22. Bert Balcean, “35 days in NYC” (September 2012), blog post <http://www.theworldneedsmoredreamers.net/35-days-in-nyc/>, accessed June 28, 2013.

23. Michael Massie, “Geo2Jewelry” (November 14, 2012), blog post <http://www.michaelmassie.com/blog/our-mapping-data-from-openpaths-during-our/>, accessed June 28, 2013.

24. Brian House, *Quotidian Record* (2012), media artwork, <http://brianhouse.net/works/quotidian_record>, accessed June 28, 2013.

25. See <http://geostats.herokuapp.com/>.

26. Brian House, *Joyride* (2011), media artwork, <http://brianhouse.net/works/joyride>, accessed June 28, 2013.

27. Daniel Goddemeyer, Amit Pitaru, Noa Younse, “Data Narratives”, workshop <http://www.danielgoddemeyer.com/teaching.php>, accessed June 28, 2013.

28. Davis [18], p. 35.

29. Jer Thorp, “Make Data More Human”, *TED* (November 2011), online lecture, <http://www.ted.com/talks/jer_thorp_make_data_more_human.html>, accessed June 28, 2013.

30. See <https://openpaths.cc/projects/GEYDAMBQGEZQ>.

31. See <https://openpaths.cc/projects/GEYDAMBQGA4Q>.

32. See <https://openpaths.cc/projects/GEYDAMBQGIYA>.

33. Nate Anderson, “‘Anonymized’ data really isn’t—and here’s why not”, *Ars Technica* (September 8, 2009) <http://arstechnica.com/tech-policy/2009/09/your-secrets-live-online-in-databases-of-ruin/>, accessed June 28, 2013.

34. Mark Tuters, “Forget Psychogeography: The Object-Turn in Locative Media”, paper presented at the “Unstable platforms: the promise and peril of transition” conference, MIT (May 2011), <http://web.mit.edu/comm-forum/mit7/papers/Tuters_DMI_MIT7.pdf>, accessed June 28, 2013.

35. See <http://senseable.mit.edu/trashtrack/>, accessed June 28, 2013.

36. Christien Meindertsma, *Pig 05049* (2008), print artwork, <http://www.christienmeindertsma.com/index.php?/books/pig-05049/>, accessed June 28, 2013.

37. Bruno Latour, *Reassembling The Social: An Introduction to Actor Network Theory* (Oxford: Oxford University Press, 2005).

ART, MEDIATION AND CONTEMPORARY ART EMERGENT PRACTICES

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Abstract

The emergence of new, social and creative media practices has added to a disciplinary mash up, drawing participants from, amongst others, computer science, engineering, visual arts, science studies, literature, philosophy, film and media studies. The question of emergent practices is taken up in the work of Andrew Pickering. In The Mangle of Practice: Time, Agency and Science (1995), he writes about temporally emergent forms in experimental science laboratories. He makes a strong case for a re-conceptualization of research practice as a 'mangle,' an open-ended, evolutionary, and performative interplay of human and non-human agency. While Pickering's ideas originated in science and technology studies, the concept of 'mangle' captures what he describes as an entanglement between the human and the material.

Key words: emergent practices, Pickering, social sciences, 'mangle' captures, creative practices.

As my colleague, Chris Slater on our ISEA panel, ART, MEDIATION AND CONTEMPORARY ART : EMERGENT PRACTICES (SYDNEY, 2013) commented, 'The recent "new materialist" shift that Janis Jeffries references on this panel that is taking place in the arts, humanities and social sciences seems at first radical: a new kind of "ontological theatre" in a world of continual becoming (Pickering); a universe in which self-sufficient objects "withdraw from us" and our "correlationist" bent of defining the world in relation to human subjects (Harman and Meillasoux) and finally, the confrontation with "vibrant matter" and the "politics of thingness" (Bennett) seems poised to remedy the long standing obsession with discourse, language and theory without grounding that has long plagued the humanities (and indeed, with conceptualism, the arts)". My concern is not so much with mediation (as in the title of the panel for ISEA 2013) but rather with emergent practices and material agency.

Though the (re)turn to studies of materiality and its interference with research processes is a major achievement of science studies, it is in Pickering's work simply a point of departure. The question posed is how materiality should be considered within explanations of research that cannot be reduced to 'pure' scientists' accounts of their work. In Pickering's view, neither material nor human agency should be privileged within scientific accounts, but rather both reveal different influences which are temporally emergent from ongoing practice as worked through in a lab. Pickering calls it temporally emergent practice and he specifies that it occurs at the technological interface in response to what he calls "material agency".

Pickering is identified with the sociology of scientific knowledge (SSK) discipline. In his work, he seeks a real-time understanding of scientific practice as we might seek a real-time understanding of arts practices. The question he poses: so what happens when we are actually engaged in a task in the moment of its happening, is co-connected to what might occur within an artists' studio. He calls the place where work happens the "performative idiom," and within this place agency is the driving force for accomplishment.

One can start from the idea that the world is filled with agency. "The world... is continually doing things, that bear upon us... as forces upon material beings" [1]. His ideas can be summarized in terms of an entanglement between the human and the material and therefore, practiced culturally and historically as I outline below. In addition, scientists and artists spend time dealing with this force of agency, which, he claims, may come from within or outside of the human realm. For Pickering, agency is the ability to do things, and intentionality is the ability to set agency in motion, on both micro and macro levels; it is the desire to do [2]. I think it is safe to say that human goal setting has no counterpart in the technological world. Our desires are temporally emergent as we work alongside and co-operate with things of unlike kinds, whether through other disciplines (across the arts and sciences) or the machines through which we create our social networks and virtual collaborations. Pickering argues that the difference between people and machines is not found in the things we do or the quality of those things (a human will never be able to do what an electron microscope does is his example), but in the ability to change or ignore plans within the situatedness of our endeavours and research projects.

Tuning and the Mangle of Practice

"Tuning," allows goals to be met when things do not go as planned – it is the force behind the action in situated action [3]. Like other practice theorists, Pickering defines the concept of practice as a cultural and historical activity, which is "the work of cultural extension and transformation in time" [4].

Pickering's "tuning" metaphor is also helpful in that it invokes the sense of shared adjustment. A technology and a culture, with all its components must similarly work toward a mutual "tuning," which Pickering suggests has to proceed through repeated and routinized practice that occurs over time, giving rise to experiences that can be modified and changed [5].

Until something is done and happens, we cannot predict with certainty that it will happen – it is unpredictable. This is the temporal nature of the mangle. Neither success nor failure is guaranteed beforehand, and obstacles do not exist until we face them head on.

If scientists do not simply fix their goals once and for all in a predetermined manner, then neither do artists. The process of "tuning" is as powerful for science as it is for practice based research in the arts and humanities. "Tuning" and a "truth to materials" is where I want to turn next under the guise of a 'new materialism'.

The Material Turn: Body, Process, Time

Though there is a growing world of literature that deals explicitly with the subjects of materiality and material culture, it may appear that there is hardly anything to say about materials. Indeed Salter (ISEA panel 2013), noted that "the new materialism is something of an misnomer: a conglomeration of different intellectual traditions that have little to do with each other and have radically different political and epistemological stakes, yet seem to be called forth as a new kind of turn".

The concept of new materialism is increasingly to be located within the flows of specific areas of cultural and critical thought. Its "rhythms of arrival and departure", to borrow Brian Massumi's expression [6], as well as connections with concepts, are becoming increasingly regular and rich in intensity across current cultural, social and feminist theory and digital media culture.

Nonetheless, in the work of Estelle Barrett and Barbara Bolt [7], questions are asked as to how the nature of artistic practice and the notion of "truth to materials" begins to have an impact on what might be understood as the 'new materialism' within artistic and creative practice. There is, as Slater points out and as the essays in Barrett and Bolt's antholo-

gy argue, a theoretical onslaught that presents a case for there to be much more in the world than representations, signifying structures and ideologies — that non-human things exist, independently of us, and that for us to understand matter and embodiment, we need to see it as active, dynamic and stemming from the primacy of relations.

The human view of the transformation of matter into form in what western artists have called "truth to materials" was first articulated in 1911 by the English art critic Roger Fry, who claimed that in order to get at material beauty it is "necessary to respect the life and quality of the material itself " [8]. Art, or those practices which reference material and visual culture, is indeed a material practice and that materiality, it is argued here, lies at the core of creativity. As Poe suggests, if there is a humanistic view that art comes into being as a "human creation of things, then this view of art sees humans as the active creator in the creation of things" [9]. Even as far back as Heidegger [10], a material was thought to be matter which was not dumb or mute but which artists worked with (and not on) in a collaborative relationship. In fact, Heidegger suggested that there is a co-responsibility and indebtedness between the artist, tools of production and material as matter which can lead to a view of art as a co-collaboration of care and ethical conduct.

Heidegger's 'praxical knowledge' and his theoretical ideas that formed the material basis of knowledge provided a philosophical framework for understanding the acquisition of human knowledge as emergent. As a consequence, we can understand knowledge as emerging through material processes developed in time and built on tacit experience and logic which cannot be predetermined in advance.

This takes us back to Pickering and his accounts of switching from representational accounts of scientific culture to his observations of what scientists do in real time in their laboratories. His observations make the reader aware of how the materiality of scientific practice needs to be more fully explained. Scientists are not simply the mediators who represent the real world, neither are there are 'facts and things' out there waiting to be discovered and turned into 'knowledge'. Pickering believes that the world is full of agency and that the world is constantly doing things. The point being that doing things, whether in a laboratory or in a studio, gives rise to performatives action or in Pickering's terms, a 'performative idiom'. A "performative idiom," then is more attentive to activity than to knowledge alone, and could surpass the limitations of the "representational idiom" that is common in the scholarly appraisal of science. Pickering advocates the move to a performative idiom which enables him to thematise the agency of machines, objects, instruments and human beings. These elements when bought together are dynamic, open (perhaps even open-ended), and suggest the emergent nature of scientific practice itself. During scientific practice if things do not work, goals have to be shifted and accommodations made in the very "plane of practice itself" [11]. Pickering's insistence on such an emergent, temporal, and performative understanding of practice characterizes a new, practice-oriented cultural studies of science which changes over time. Scientific practice involve a process of "tuning" or "delicate material positioning" in which material agency emerges through an interaction among parts of the material environment -- some of which are human [12].

In this discourse, material as matter has as much agency as the scientist whose individual agency works not on but in dialogic exchange with materials. New materialism allows for the study of the two dimensions in their entanglement: the experience of a piece of art is made up of material as matter, and matter as meaning. The material dimension creates and gives form to the discursive, and vice versa. Similar to what happens with an artwork, new materialism sets itself to rewriting events that are usually only of interest to natural scientists. Here it becomes apparent that a new materialist take on "nature" will be shown to be transposable to the study of "culture" and vice versa.

When we think about the materials that make up the term "fiber art" for example (textile art, soft sculpture or a name which varies according to time, place, history and culture) then we can rethink sisal, rope, burlap, handspun fleece, raw silk, thick cotton, strands of wool, pulp and paper as types of living, organic matter which have powerful agency in themselves. Such materials play a co-evolutionary role in the production of artistic work as the material body of the artist that enables the art (as a production of that work) to come into being.

Metaphors of the Mind: What can we know?

Together in a co-evolutionary sense of being entangled together, material – the stuff itself, the artist's body – come together in the production of work as new knowledge, a way of knowing the world as co-inhabitants of being more conscious of living, being and occupying their spaces and places. For example, in "Metaphor of the Mind: Art Forms as a mode of thinking and a way of being", Danielle Bouter [13] argues for the creative practice based in a studio as a place, not for a kind of thinking where answers are found, but where questions are posed, situations are contemplated and experienced, reflected upon and re-imagined. The question now becomes, "What can we know"?

There is a further extension to body and world which is that materials, the stuff of matter, play a co-evolutionary role in the production of artistic work. The material body of the artist enables the art (as a production of that work) to come into being. In his essay, "The Visible and the Invisible" [14], Merleau-Ponty refers to the lived body and the world as flesh, not inert matter, but "perpetual pregnancy, perpetual parturition, generativity and generality, brute essence and brute existence, which are the nodes and the anti nodes of the same ontological vibration" [15]. It is the potency of Jane Bennett's work on vibrant matter [16] that brings material agency or effectivity of nonhuman or not-quite-human things together. What is at issue here it that a vital-material ecology embraces the complexity of bodies and embodiment in ways that mangle and entangle all kinds of emergent practice yet to be fully formed.

References and Notes

1. Andrew Pickering, *The Mangle of Practice, Time, Agency and Science*, (Chicago: Chicago University Press, 1995. p.6).

2. Pickering (1) pp.17-20.

3. Pickering (1) p.20.

4. Pickering (1) p.5.

5. Pickering (1) p.20.

6. Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham NC: Duke University Press, 2002. p.20).

7. Estelle Barrett and Barbara Bolt, *Carnal Knowledge: Towards a New Materialism in the Arts* (London: I.B. Tauris, 2012).

8. Roger Fry quoted in Susan Hiller "'Truth' and 'Truth to materials': reflecting on the sculptural legacy of Henry Moore'" in *Henry Moore: Critical Essays*, Jane Beckett and Fiona Russell (eds.) (Burlington, VT: Ashgate Publishing, 2003. pp.68-69).

9. Andrew Poe, “Review essay: things-beyond-objects” in *Journal of French and Francophone Philosophy, Vol.X1X. No.1* (2011 pp.53-164).

10. Martin Heidegger, *The Question Concerning Technology and Other Essays*, Lovitt, trans New York: Harper & Row,1977;Garland, 1978).

11. Benjamin J Kleiman, *Magnifications of Time and Agency: A Role for Technology in Communities of Practice.* A thesis in the John W. Draper Master’s Program in Humanities and Social Thought submitted to the faculty of the Graduate School of Arts and Sciences in partial fulfillment of the requirements for the degree of Master of Arts at New York University (2002). This can be downloaded as a pdf at http://www.benkleinman.com/professional/ben_kleinman_thesis.pdf

12.Pickering (1) p.20.

13. Danielle Boulet, “Metaphor of the Mind: Art forms as a mode of thinking and a way of being” in Estelle Barrett and Barbara Bolt (1)

14. Maurice Meleau Ponty, *The Visible and the Invisible*, Claude.Lefort (ed.) Alphonso .Lingis (trans.), Evanston: North Western University Press, 1968).

15. Meleau Ponty (14).pp. 248-249

16. Jane Bennett, *Vibrant Matter: A Political Ecology of Things*. Durham NC: Duke University Press, 2010).

COLLABORATIVE REGISTERS OF INTERACTIVE ART

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Abstract

The ubiquity of interactive technologies has given rise to new forms and opportunities for interactive digital art. Collaboration has been identified as a way for artists to engage in complex technologically based projects. This paper considers different forms of collaboration in relation to two interactive art projects. Collaborative and participatory art practices operate on multiple registers. The findings of the research discussed in this paper corroborate previous work on co-creativity and interactive art and extend to considerations of institutional collaboration, materiality, prototyping and the advantages of creative collectives.

Keywords: Interactive art, collaboration, screen-based, e-textiles, prototyping

Introduction

Interactive technologies have become ubiquitous, giving rise to new forms and locations for interactive digital art. Co-creation through collaboration has been identified as a productive way for artists to engage in such complex, technologically based, projects. This paper considers different types of collaborative production that have taken place in the context of two interactive art projects run through *Colab*, a trans-disciplinary *collaboratory* for creative technologies based at the Auckland University of Technology. The first project, *Digital Art Live* (DAL), is an ongoing programme that has co-produced and presented over twenty-two original screen-based interactive works in partnership with THE EDGE Performing Arts Centre. The second project, *Dynamic Textiles*, involved collaboration between research staff and students from different discipline areas in the development of interactive e-textiles for dance and performance.

Two different interactive formats - screen and e-textile – distinguish the two projects under discussion. These formats embody fundamental differences – of medium, types of engagement and forms of sensory perception engaged in the making and drawing of meaning - which highlight the fuzziness of the term 'interactive art.' The particular methodologies, aesthetic concerns and contexts of these interactive art projects informed different collaborative strategies. This study recognises such formal and proccessual distinctions, while acknowledging broader trans-disciplinary groundings such as affect theory, which underpin the discourse of interactive art.

The development of interactive systems, such as consumer games consoles and commercial marketing platforms, has driven some remarkable technical innovation over the past decade, overcoming certain technical issues (for example motion detection and gesture recognition) that once presented considerable hurdles for interactive artists. While collaboration between artists and technologists in the production of interactive art has been recognised by other researchers [1], forms of collaboration are changing in response to the introduction of new development platforms, new data capture and display systems, maker cultures and associated forms of knowledge sharing and the ubiquity of interactive systems.

In light of the widespread availability of interactive media, the relevance of interactive art has been called into question. However, in the current context, the study of interactivity as a medium that produces meaning remains an important area of artistic and philosophical inquiry [2]. The specialisation of art separates it from everyday life and opens up a critical and experimental space that can facilitate people's engagement with deeper understandings of art, culture and technology. This study recognizes that while audience engagement and participation are central to the form, reception and meaning of interactive art, collaborative modes of production also contribute to the critical and experimental project of art and its contemporary significance.

Collaborative Framings

Four collaborative registers of interactive art production and reception were identified in this study. These included collaborations between institutions supporting the production and presentation of interactive art; collaborations between artists and technologists designing and realising new interactive art works; collaborations between artists and the technological media being employed; and collaborations between the work of art and the audience through the participatory nature of interactive art. These findings were then considered in relation to other literature and research into co-creativity and collaboration [3].

Institutional collaboration includes cross and inter-organisational partnerships that can support trans-disciplinary activities such as the development and display of interactive art. While larger national economies are able to support specialised centres of electronic art production and presentation spaces, this opportunity is not available in New Zealand. *Digital Art Live* is currently New Zealand's only permanent venue for presenting interactive art. The institutional collaboration between THE EDGE and *Colab* allows a pooling of resources and provision of different types of expertise and support. While from an institutional perspective, DAL is primarily a curatorial and capability-building project, there is also an important critical dimension to this partnership. The requirement for cross-disciplinary expertise challenges traditional academic structures and institutional practices. Institutional collaboration can help create a more exploratory, trans-disciplinary space for experimentation and creative production.

The second framing identified in the study is collaboration between artists and technical specialists, in the production of interactive art. Creative collaborations developed during the *Digital Art Live* project corroborate the findings of earlier research into interactive art production [2]. They also introduced some new collaborative models, such as artist's co-operatives, that present longer-term opportunities for both conceptual and technical development, and make it possible to build more extensive critical and artistic explorations over a number of projects.

The third form of collaboration with which I am concerned pertains to the engagement between the artist and their materials. This notion of materiality is inclusive of digital technologies. Interactive technologies can be regarded as expressive materials that show themselves in use [4]. Collaboration is normally thought of as being between human beings, but there is also a collaborative aspect to materials, because the artist doesn't simply impose a vision upon those materials, "but rather discovers it there" [5]. While distinctions - between artist and technologist, and between the physical and the virtual, characterised the early discourse of interactive art, such polarities have been challenged as practices, technologies and theories have evolved over the past twenty years. In the context of expressive, interactive e-textiles, the polarity between virtual and physical is further eroded through the digital materiality of fibretronics.

The fourth framing addresses collabo-

ration and affect as audience interaction with or through the work of art. Considering the audience as collaborator shifts the focus away from notions of interaction as a functional relationship between the user and the machine to "the act presentation of temporal behavior" [6] that acknowledges human interaction with technology as meaningful. This position recognizes the unfinished nature of the interactive work of art that requires embodied engagement and the influence of human behavior to be complete

Digital Art Live

The *Digital Art Live (DAL)* project was initiated in March 2011, to develop a programme for *THE EDGE's* new interactive screen, located in the foyer of the Aotea Centre in downtown Auckland. While this appeared to be a relatively straightforward curatorial process, it proved to be a complex proposition. This was because there are very few New Zealand artists working in the field of interactive art, and these artists have different levels of experience, conceptual understanding and technical ability. The audience for this work is also small. The *DAL* project has become a focus for the development, exhibition and research into interactive art in Auckland and has helped establish a community of interest.

THE EDGE management, prior to the partnership with Colab, determined the format and position of the interactive screen. Located on a wall in the foyer beside the main theatre, the screen consists of twelve flat screens organized into a large composite unit. While the multiple-screen set up presents certain challenges for artists, it has other advantages, including the clarity and definition of image and the ability to support single or multiple screen works. A variety of interactive technologies have been employed, although a majority of the new works produced to date have used motion detection and camera-based tracking systems. All the works have been documented on the *DAL* website [7].

The two institutional partners support the employment of a part-time programme coordinator, are represented on the project committee which oversees the conceptual direction and sustainability of the project, and provide technical staff and facilities to support development and testing (at *Colab*) and physical installation (at *THE EDGE*) of new interactive artworks. *THE EDGE* provides a budget for the development of a new works, while *Colab* works with the coordinator to secure additional external funding for special projects and related events. In 2013 these have included projects extending beyond the screen space, such as Kim Newell's *Wandering Creatures,* an augmented reality based installation at the Auckland Zoo. *Colab* is responsible for project documentation and both organisations contribute to marketing and associated project events. For *THE EDGE, Digital Art Live* is a programme of interactive art exhibitions, for *Colab* it is a research project. However these different perspectives on the project are compatible and the institutional collaboration is productive and valued by both organisations. While the technical and organizational aspects of the commissioning process were a major focus during the first two years of DAL development, more recently the project focus has concentrated on ways it can help develop a sustainable community of practice and deeper critical and aesthetic engagement.

DAL has involved a number of experienced practitioners who have both technical and conceptual understanding of the medium and a track record of independently producing interactive art, including Stewart Foster (2011) Kim Newall (2011, 2012), James Charlton, (2011), Jeff Nusz (2012) and Luke Munn (2013). However the development of new works created by pairings of artists and technology experts, organized through *DAL* and supported by the wider *DAL* team, has been an important strategy in further developing the programme. Candy has identified two types of artist/technologist collaboration [8]. They include the "partnership type" where the artist and technologist work closely together on the development of a work and the "support or assistant type" which is a more discreet, problem-solving role. While each *DAL* project has been unique, collaborations have tended to be of the partnership type, where a high level of engagement by both collaborators is required. For example, this was the case with the work *Typeface* (2012) by Vaimaila Urale in association with Johann Nortje, where audience movement activated an association between traditional Polynesian mark making and ASCII art.

Another mode of collaborative practice evident in *DAL* has been with creative collectives such as *The Interrupt Collective* (2011, 2012) and *Unguarded Intersection* (2012). These self-formed groups are made up of individuals who bring different areas of expertise to the interactive projects, which they create together. These established collectives have developed considerable experience and understanding of the medium, and of working together, over a number of projects. Both collectives evolved from professional connections in creative industries that are based on teamwork rather than individual artistic production - through the music/VJ scene, games and film industries. The technical and conceptual resolution of *DAL* projects like *Acute Self* (Interrupt Collective, 2012) and *Rollercoaster* (Unguarded Intersection, 2012*)* confirm the value of such long-term collaborative practice.

Dynamic Textiles

Collaborative registers of inter-institutional partnerships and creative teamwork were also evident in the *Dynamic Textiles* project. However in this project the notion of collaboration as material engagement was of particular interest. Initiated in March 2012, the *Dynamic Textiles* project set out to develop interactive costumes for dance. The area of e-textile design is recognised as a multidisciplinary domain [9], and this project exemplified this interdisciplinarity. The project was initiated through the *Textile and Design Lab* (*TDL*) a research and development center that is one of a group of specialist laboratories managed by *Colab*. The project also involved postgraduate students and staff from the School of Art and Design's *Department of Fashion and Textiles* and from *Colab's* Creative Technologies programme. This inter-institutional collaboration brought together textile, technology, garment construction and performance design experts to form a trans-disciplinary team, where specialisations were extended into a new medium.

The *TDL* has been involved in a number of innovative costume design projects using technologies of digital textile printing and seamless (3D) knit, undertaken in conjunction with New Zealand film, television and theatre production companies [10]. Previous e-textile research at the *TD*L had focused on the development of knitted e-textiles for health and sportswear with commercial partners [11]. These projects were concerned with developing textiles for bio monitoring through the precise measurement of breathing rate, heartbeat and other biological information, and were technical and functionally oriented design projects. The *Dynamic Textiles* project provided an opportunity to explore

more expressive applications within an artistic rather than scientific and commercial R&D environment. This allowed a more experimental approach that, free from commercial IP restrictions, supported reflection and theorization of the practice.

The materiality and wearability of e-textiles brings distinctive perspectives to the discourse of interactivity and to the consideration of collaboration. Interactive, expressive e-textiles engage and open up new, tangible dimensions and possibilities for making meaning. As Kuchler states "What is really at stake is a new kind of surface ontology which replaces the opposition of inside and outside, invisible and visible, immaterial and material, with a complementary relation that thrives on transformation rather than distinction" [12]. In their consideration of aesthetics, materials and interaction design, Wiberg and Robles introduced the notion of "texture" to address such compositions [13]. They propose this as a way of re-thinking the division between the material (atoms) and the computational (bits) that underpinned earlier conceptualizations and technologies of interactivity.

In a collaborative project, prototyping can be an important form of communication that helps articulate and integrate different perspectives within a multidisciplinary team. In the *Dynamic Textiles* project, prototyping was an important collaborative making process, involving the exploration of material, constructive and expressive possibilities across different stages of the project, the testing of specific features as well as supporting communication within the team and with different project stakeholders. The collaborative process was manifest through making. It was open and highly productive, resulting in a number of experimental works and a more resolved prototype sleeve, with opportunities for future development.

Audience Participation

Interactive art is a broad genre of artistic practice, distinguished by a form of audience engagement that goes beyond traditional aesthetic appreciation, which was defined by distanciation between the audience and the work of art. Non-digital forms such as installation and performance art led the initial challenge to these aesthetic boundaries, engaging the audience in an aesthetic encounter perceived through the body and affective experience. Interactive art has introduced a new aesthetic, experienced and understood through embodied action. In the media arts domain the term "interactive art" serves as a genre specific designation for computer-supported works, in which an interaction takes place between a computer system and audience. Despite the technical advances and commercialization of interactive media, the theorization and aesthetics of interaction remains an emergent and contested field.

Across the *DAL* project a number of different interactive strategies have been developed. For a number of less experienced artists the main concern has been with making the work interactive, rather than on the ways interactivity can draw people into more self-reflexive understanding through participation. The need for a deeper level of critical and theoretical engagement has been recognized as an important area of focus in the next phase of the DAL project. This is being supported through the formation of a monthly meet-up for interactive artists at Colab; the establishment of a residency programme for visiting international theorist and practitioners to present seminars, workshops and creative works (initiated with the residency by Florent Aziosmanoff from Le Cube, Paris, in May 2013) and by engaging postgraduate students in research in this field.

The *Dynamic Textiles* project was concerned with interaction between performer and artifact, a distinctive partnership that relates both to material collaboration and to the embodied activation, resolution and reception of the work of art as a form of aesthesis. The research into sound responsive textiles undertaken in this project is now being extended through a number of postgraduate research projects involving interactive textile artifacts and environments rather than garments. These sonic textiles are engaging the audience as participant and co-creator, rather than spectator. The tactile and tangible nature of textile interfaces brings new affective dimensions and theoretical perspectives to the discourse of interactive art.

Conclusion

Collaboration recognizes mutual benefit through engagement. It extends from relationships between humans to those between humans and computer systems and to relationships between entities in human systems, such as institutions. The articulation of these different registers of collaboration in the DAL and Dynamic Textiles projects has assisted our understanding the ways these projects have developed and evolved. More importantly the study has highlighted the need for deeper levels of critical engagement with forms of participation or co-creation, where the work of art requires human engagement and activation, both for its resolution or completion as a work of art and for its reception and affective understanding by the audience. Exploration across these two different forms of interactive art – screen and textile based – opens up two distinct and productive arenas for creation and ongoing research. Collaborative creation and reception through participation are recognized as being common to both areas, bridging what may otherwise be seen as independent fields of inquiry and helping to build a broader community of interactive art practice.

References and Notes

1. Linda Candy and Ernest Edmonds. "Collaborative Expertise for Creative Technology Design," in Massod Masoodian, Steve Jones and Bill Rodgers Eds. *Human Computer Interaction Lecture Notes in Computer Science.* (Berlin, Heidelberg: Springer, 2004)

2. L Muller, E. Edmonds and M. Connell. "Living Laboratories for Interactive Art." *CoDesign: International Journal of Co Creation in Design and the Arts, 2* No.4 (2006), pp. 195-207.

3. Linda Candy. "Co-Creativity in Interactive Digital Art." In *Consciousness Reframed, Fourth International CAiiA-STAR Research Conference*. (2002). <http://lindacandy.com/COSTART/pdfFiles/ConsReFramed.pdf> accessed 15 April 2013.

3. Linda Candy and Ernest Edmonds [1]

4. Anna Persson, *Knitted Circuits for Visual and Tactile Interactive Expressions.* (Sweden; University of Borås, 2009).

5. Paul.Kaiser "On the Design of Creative Collaboration". In Richard J.Boland and Fred Collopy Eds. *Managing as Designing*, (California: Stanford University Press 200) pp. 203-207. <http://openendedgroup.com/writings/creativeCollaboration.html>

6. Lars Hallnäs and John Redström, *Interaction Design Foundations, Experiments.* (Sweden: University of Boräs.2006) p.23

7. Digital Art Live <www.dal.colab.org.nz>.

8. Candy [3] unpaged

9. Susan Küchler. "Technological Materiality: Beyond the Dualist Paradigm." *Theory Culture Society. 25* No.1 (2008) pp.*101*-120.

10. Case Study 3/2010: The Lovely Bones - New Line Cinema, <http://www.tdl.aut.ac.nz/case-studies>.

11. Case Study 2/2008: Integrated Bio-harness Development. <http://www.tdl.aut.ac.nz/case-studies>.

12.Küchler [9] p.116

13. Mikael Wiberg and Erica. Robles, "Computational Compositions: Aesthetics, materials, and interaction design". *International Journal of Design, 4* No.2 (2010). pp. 65-76.

THE CONNECTIVE TISSUE OF PHYSICAL COMPUTING

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Abstract

This paper investigates the role of performativity, intersubjectivity and empathy in relational, participatory or computational art. Through the creation of sensorial, kinesthetic and immersive interfaces for the public to "perform" the work, participants can expand their somatic experiences to include looking, moving, touching, listening and other forms of sensing. They can enter into a sensuous continuum with the artwork, oscillating between the representation of another's experience and reflection on their own, so as to reconstitute new subjectivities.

Keywords: interactive, empathy, performance, somatic, touch, intersubjectivity, physical computing, sensorial, trauma, relational.

Shock trauma is that event that intervenes in our whole life narrative, erasing memory and preventing the forward movement that is immanent in our life history. Without a coherent life narrative, we are immobilized at the moment of its incision into our lives. In order to move beyond its facticity and fixity, to incorporate it into our life narrative, we need to enact it into new narrative forms that allow for re-inscription of the traumatic event into other psychic, social or personal narratives. Rewriting the narrative allows for one's movement through the event [1].

Somatic therapies such as EMDR, (Eye Movement Desensitization and Reprocessing), a therapeutic technique that seeks to fill gaps in the narrative language and retelling, strive to heal trauma. Through a series of sessions, the traumatic event is retold and pieced together to desensitize the person and decrease symptoms of stress. Through the telling and retelling, which is accompanied by somatic stimulation (such as tactile tapping or creating back and forth eye movement), the brain reprograms ruptured experience. The goal is to locate the traumatic moment as one of many experiences situated in a whole life narrative. The severance of one's life is then integrated into, or united with, one's life timeline [2].

Somatic techniques of reconstructing the archive of experience informs in part how I employ experimental narrative and participation in art works and videos that address traumatic events. As an artist, I am concerned with reworking the narrative of trauma through choreography of movement, staged performances and repatterning of recorded interviews. Disturbing the archive, originally provided by the collaborator through interviews or writing, can translate a new understanding of the traumatic experience to the public and give voice and agency to the collaborators in the projects. I acknowledge that translating the experience of others should always be critically evaluated at every stage of a project. The evaluation process is part of the collaboration. Each project commences with discussions between participants and artists to determine guidelines by which stories are shared and represented and timelines for periodic review and revision. Participants determine what can and cannot be shared, and provide expertise in their areas as to which representations are appropriate and sensitive, especially when the possibility of re-traumatization is present.

This paper investigates the role of performativity, intersubjectivity and empathy in relational, participatory or computational art, focusing primarily on three prototypes I constructed in collaboration with designers and a United States Army veteran using physical computing. Physical computing refers to artworks and interfaces that translate the analogue world into digital processes in responsive ways through sensors. Through the creation of sensorial, kinesthetic and immersive interfaces for the public to "perform" the work, participants can expand their somatic and art experiences to include looking, moving, touching, listening and other forms of sensing. They enter into a sensuous continuum with the artwork, oscillating between the representation of another's experience and reflection on their own, so as to reconstitute new subjectivities. Psychologist Robert Stolorow describes the intersubjective exchange as the "experience of being understood that supplies its mutative power" and that does not separate "cognition and affect, thinking and feeling, and interpreting and relating." Within this relational system of the intersubjective exchange, we can expand our capacity for self/world awareness [3].

Affect and Embodiment

We spend a lifetime in our own bodies. We know that our limbs belong to us. Or do we?

In 2008- 2009, I completed a collaborative media installation work entitled, "United and Severed". Based on interviews with three women living with traumatic bodily injuries, the work investigated their somatic experiences and called upon the viewer to reconsider their own. One goal of the work was to create an understanding of "othered" experience at the level of the body.

One of the women who collaborated in the project was paralyzed from the neck down. Counter to the notion that there was no feeling in her body below the neck, she described her bodily sensations differently. When explaining how the paralyzed parts of her body felt she said, "My hand cannot feel my face" and "I am like Mario; I can feel the need to jump and leap, but the cord is cut to the controller" [4].

Many of the statements the women shared point to the following concepts: that the phenomenological body is a site of identity and subjectivity, that sensing is an important determinant in our self/world affective and empathic practices, and that sensing can take many forms.

Studies based on visual and somasensory stimulus, such as watching another body being touched as one's own body is simultaneously touched, have shown that we can fairly quickly take ownership of the other body that is not ours [5]. Participants in a study were so able to manifest

Fig. 1. Petkova VI, Ehrsson HH (2008) If I Were You: Perceptual Illusion of Body Swapping. PLoS ONE 3(12): e3832. doi:10.1371/journal.pone.0003832

themselves in another body that when the other body was threatened with a knife, they felt the threat as much if not more than a threat to their own actual body. This was measured through Skin Conductive Responses or sweating, a somatic fear/flight response. This was especially effective if they experienced this from the first person perspective, such as in a virtual reality configuration where they could "own" another body part, such as an arm, that was not actually theirs (Fig. 1).

The study identifies two important factors, amongst others; one is that emotions or affect are deeply conjoined with the body, and the other is that empathy derives from a multisensory experience that includes the perception of temporal and spatial signals that situate our body in direct relationship to another. In other words, we have an intensified intersubjective experience that is based on multisensory modes.

Relational Art

Relational art can provide a home for the narrator/collaborator's painful emotional states and can unfreeze the severe emotional and somatic symptoms through creating an intersubjective context. Through dialogic practice, artists and collaborators "catalyze understanding, mediate exchange and sustain an ongoing process of empathic identification and critical analysis" [6].

Of the many examples of relational art both within the new and traditional media art worlds, *Home Visit* (2000) by Pepòn Osorio, exemplifies what I consider the three most important aspects of art framed to heal trauma: dialogue, materialization and narrative reworking. For *Home Visit*, which was based on a family's experience of loosing everything in a home fire, he sat with the family in dialogue about their experience of loss, grief and displacement. They recreated a model of their home as a result of this dialogue, and then took the house to other homes to retell their story. In the process of telling and retelling in a relational environment, the family was able to heal their trauma of loss.

Technophenomenology and Intersubjectivity

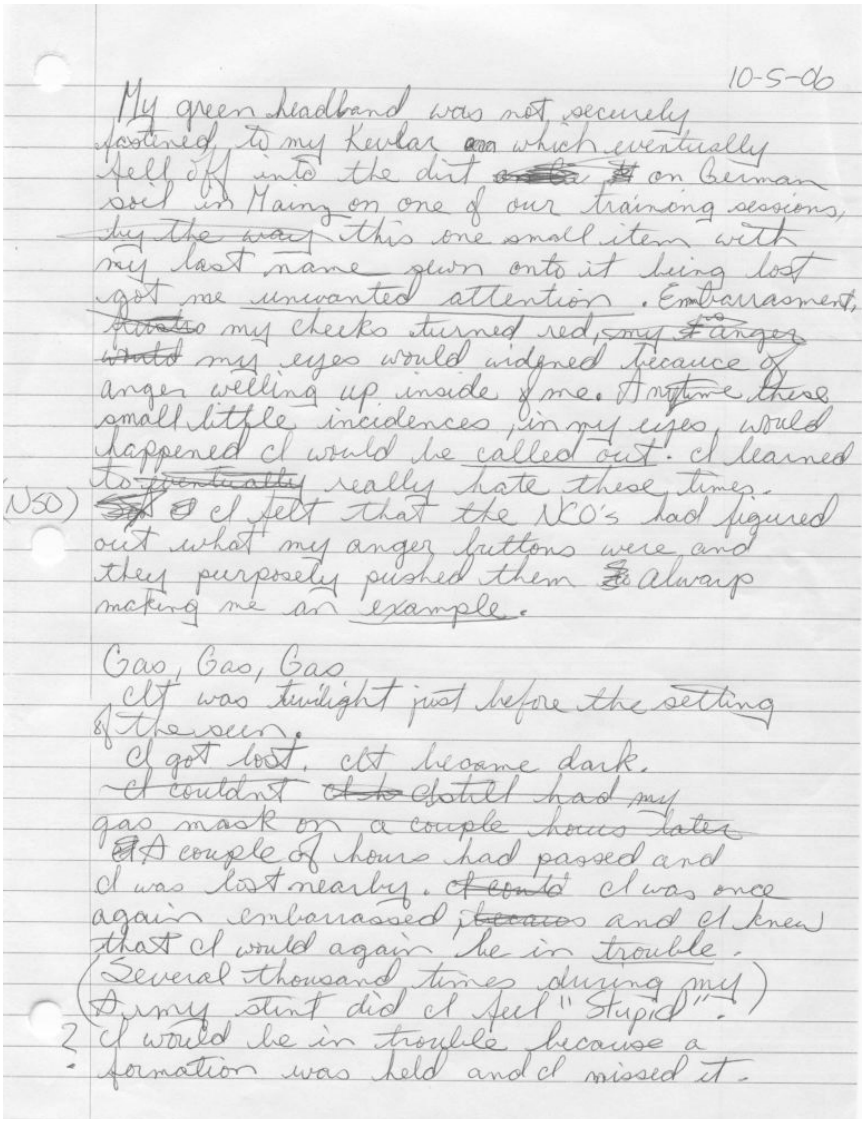
Artworks that are placed in the temporal and spatial world of the audience afford the immersion of looking, listening, and moving through them. They create an "intertwining of the senses" (to borrow a phrase from Merleau-Ponty) [7], and call the public to an awareness of their own embodiment, and by extension, the body of the other. In representing the traumatic experience through physical computing, artists can constitute a relational home, where stories of trauma, and their pain, can be held and narratively reworked. Performing the artwork through appropriate kinesthetic explorations gives the audience the reflexive experience of sensing oneself at close proximity to and within the artwork. This can move the audience through symbolic understanding to an integrated somatic/affective response and ultimately, empathy [8].

The constitutive power of these computational or relational artworks creates an appreciative attunement that brings the audience closer to the story. Feminist art historian Amelia Jones coined the term "technophenomenology" to characterise the ways that performing subjects (collaborators and audiences alike) are politicized and socialized in their embodied relationship through technology to self/other and self/world. She stresses that embodied experience is generative, rather than representative, in its performativity. As techno-subjects performing within computational, interactive art works, our subject/object orientations can be reversed, altered and reconstituted [9].

Called Out

The following are collaboratively created prototypical artworks that utilize sensing by touch or movement that I developed in 2008 – 2011, some through a residency at Banff New Media Institute.

"Called Out" is a series of interactive, touch sensitive artworks that asks the public to embody the solitary experience of writing and reading through touching and listening. The text, sound and sur-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My green headband was not securely fastened to my Kevlar which eventually fell off into the dirt on German soil in Haing on one of our training sessions, by the way this one small item with my last name given onto it being lost got me unwanted attention. Embarrasment, my cheeks turned red, my anger would my eyes would widened because of anger welling up inside of me. At no time these small little incidences, in my eyes, would happened I would be called out. I learned to really hate these times. (NCO) I felt that the NCO's had figured out what my anger buttons were and they purposely pushed them always making me an example.

Gas, Gas, Gas

It was twilight just before the setting of the sun.

I got lost. It became dark. I couldn't I had my gas mask on a couple hours later A couple of hours had passed and I was lost nearby. I was once again embarrassed and I knew that I would again be in trouble. (Several thousand times during my Army stint did I feel "Stupid".)

I would be in trouble because a formation was held and I missed it.

Fig. 2. Journal page written by Private Kristine Wise.

faces are based on the hand-written journal entries and creative writing of a United States Army Veteran, Private Kristine Wise. Private Wise, like many returning soldiers, suffers from Post Traumatic Stress Disorder (PTSD), a neurological dysfunction that is caused by sudden traumatic events that disrupt personal life narratives. Her experience as a female veteran subject to sexual harassment and abuse amplifies her trauma (Fig. 2).

"Called Out" incorporates small gestures and close listening with the intent of creating a sensuous connection between the material, the writer, the reader and the listener. The project seeks to translate her writing into a kinesthetic and affectively resonant experience for the public, situating their direct connection with the script. In her writing, Private Wise expresses fear, discomfort, anger, erasure and embarrassment at the condition of being subjected to a patriarchal military structure and being "called out" or hazed. Her diary is a creative and contemplative act, a communication tool between her experience and the world. Through her writing, she records thoughts and emotions at the moment of inscription, working and reworking her subject formation, pre and post trauma.

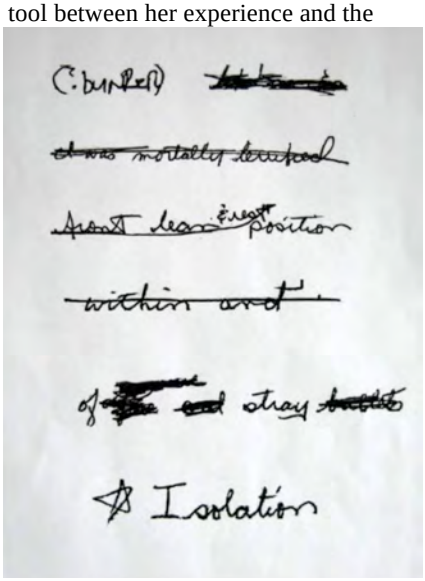

Fig. 3. Selections from Private Kristine Wise's journal pages.

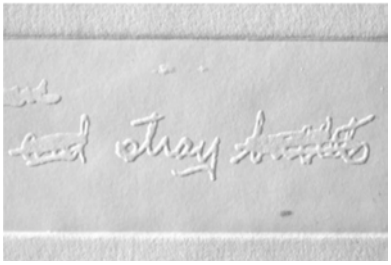

Fig. 4. "Called Out", 2009, Diekman, embossed paper surfaces. (© Kristine Diekman).

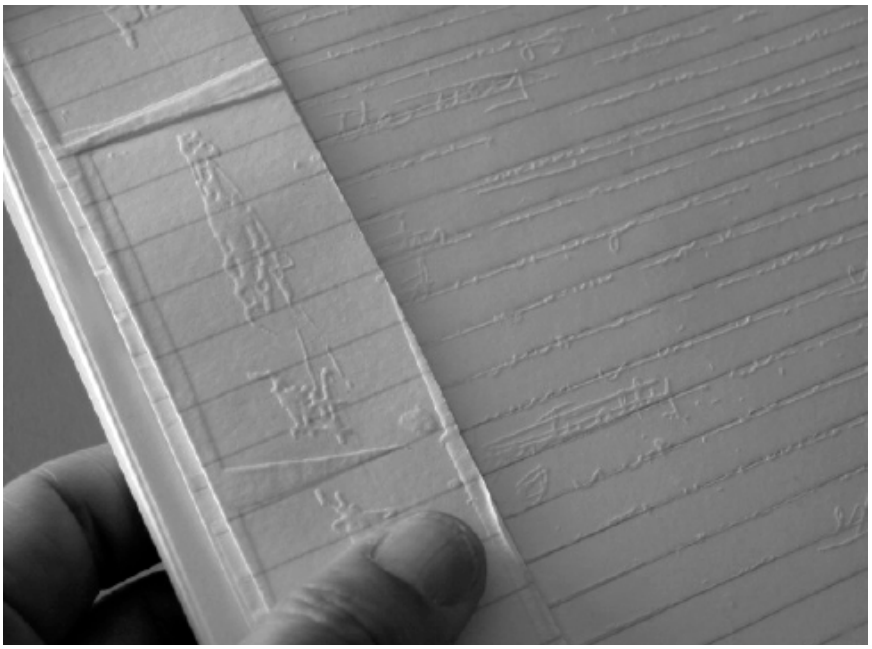

Fig. 5. "Periphery", Kristine Diekman, embossed paper surfaces, sensors, audio. (© Kristine Diekman).

The resulting artwork focuses on fragments of heavily crossed out words and phrases from her journals (Fig. 3). Selecting these inscriptions draws attention to the dual nature of the journals; the organization of private experience and the desire for public communication. The obliteration is the speech act, at once hiding and manifesting the content. Self-censure, non-disclosure, shame, and aggression are physically embodied in the obliterated words. The complexity and integrity of her writing can be accessed, however, in the aural experience of the work. While enunciation is an important assertive act that should be recognized and valued as empowering for artist and collaborator, listening itself is a creative practice for the audience.

I transcribed Private Wise's writing as a trace of her thoughts, feelings and experiences into raised, touch-sensitive surfaces, that when touched, allow us to hear her writing. Like a line of scars, they invite and repel touch. In this way, I hope that "Called Out", as interactive artworks, collapse the distance between the experience of the veteran and the civilian, while maintaining the specificity of her story (Fig. 4).

Periphery

In the series "Called Out", *Periphery*, a sheave of inaccessible papers, can be picked up and held. At the center of *Periphery* are narratives expressing shame, anger and isolation at being "called out" or made an example of. They include seemingly small infractions, consequent punishments such as the "the front, lean, and rest position", and finally demotion.

The quality of touch determines how and what we hear. When squeezed tightly, the narrative at the center is interrupted by descriptions of physical states of PTSD. Like the emphatic scars of crossed out words embossed around the edges, the symptoms of PTSD surround and interrupt the process of storytelling. We quiet the trauma through releasing pressure, providing a space for telling and listening (Fig. 5).

Tent City

Private Wise drew a map of the barracks where she was stationed in Iraq. *Tent City* is both a spatial map, including the clothesline, the showers, the rocks and sand, and a psychological map of traumatic experience, where she learned of her grandfather's death, where she was counseled for suicide prevention, where she experienced sexual abuse (Fig. 6).

When we first encounter the interface, her audio narrative is overwhelmed by the cacophony of the crowded, noisy space of the barracks, mostly the sound of generators. As we place our hand gently on the map, we quiet the noise. Slowly the liminal space of Camp Dogwood, where she was living, is drawn. The

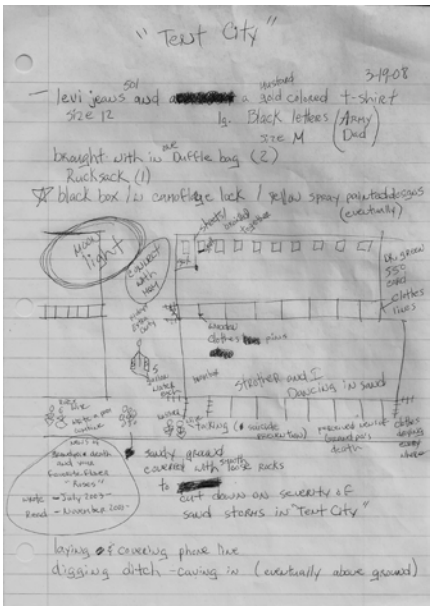

Fig. 6. Page from Private Kristine Wise's journals mapping her barracks

sound returned is not informational, but consists of emotional fragments.

Because *Tent City* looks like it should be activated through pushing on or poking at specific markers on the map, the audience/participant is sometimes confounded by the lack of specific feedback expected of interactive interfaces. This initial response foregrounds the important role of interactive interfaces as opportunities to build skills, in this case, of listening and touching. The touch required for this piece is one of condolence, a simple and thoughtful pressure of laying one's hand on the shoulder or arm of the sufferer. Seeking and giving touch of this type can create a bonding effect, and can be instrumental in such affect responses as integrity, honesty, helpfulness, recognition and empathy (Fig. 7).

Although neither of these works include "being touched back" in the sense of pure haptic feedback, as there is no touch back in the strictest sense, they still access our body's holdings. Being called to specific touch and movement, we empathically invest in the experience of the other. We come to know what matters through mattering itself [10].

Line of Duty

Line of Duty, also based on Private Wise' military experience, explores contractual mimicry, and investigates the ways in which we are co-created by and contingent upon one another. When we enter the installation, we see the projected figure of a female soldier standing at attention. In her world there is a footlocker that is mirrored on the floor in the physical space. Next to it is a straight backed chair. As we approach the soldier, we see her reach for her flak jacket in the footlocker, and repeat gestures of putting it on, calling us to do the same.

By putting on her jacket, we enter into her world, and are further called to stand at attention until she sinks against the wall in a sitting position. This position, the "sit-out", is a painful hazing or disciplinary position that Private Wise endured. In front of us is the chair, and when we sit to mirror her, we are in the same position as the soldier, but physically comfortable where as the soldier struggles to maintain the painful wall-sit. Our sitting down causes the video to proceed forward. As we shift on the chair, we learn that our position controls the narrative flow of her struggle. Leaning back creates a continuity of narrative flow, while leaning forward slows and disrupts it. Yet leaning back drives the virtual figure further along the path of suffering, while we relax. Even so, her image at times jumps forward and backward in micro jolts that accentuate and materialize the discontinuity of her traumatic experience. We are in a mimetic relationship with the figure, sometimes controlling the figure and sometimes being controlled by it (Fig. 8).

The conditions of watching and moving are enmeshed in *Line of Duty*. We experience something like an embodied spectatorship. We watch, we move, yet are unable to physically feel her struggle. People describe being discomforted by what they see, coupled with a sense of vulnerability as performers in the space. After experiencing the installation, some people try out what they witnessed, and gain more intimate understanding of her struggle through their own physical experiments with the "sit-out".

Conclusion

In "Touch: Sensuous Theory and Multisensory Media", Laura Marks describes her own approach to writing about media as "haptic criticism," which is mimetic: "It presses up to the object and takes its shape. Mimesis is a form of representation based on getting close enough to the other thing to become it. Again, the point is not to utterly replace symbolization...Rather it is to maintain a robust flow between sensuous closeness and symbolic distance." She suggests that we need to "warm up" our cultural tendency to keep at a distance while maintaining the material specificity of the body represented [11].

Artworks that foreground the material and tangible existence of space and time can create what Marks calls "empathic non-understanding", which allows for the recognition of difference while maintaining a material understanding in our connection to others and their stories. Although I argue for the intersubjective connection that physical computing can create between the artwork, audience and narrative, difference or distance or interobjectivity, as Amelia Jones suggests, is equally important. Connective tissue works to hold things together in cohesion and to be kept apart through boundaries. The "flesh" operates, either theoretically

Fig. 7. "Tent City", 2009, Kristine Diekman, paper, audio, sensors. The interface encourages the touch of condolence and close listening. (© Kristine Diekman).

or practically, in both ways, as membrane and boundary. We rework and reclaim the space and relation between our body and the world, self and other, through these artistic practices.

References and Notes

1. Patricia Zimmerman, "Processing Trauma: The Art of Dan Reeves", *Afterimage* 26. No.2 (September/October 1998).

2. Kristine Diekman and Karen Schaffman, "*United & Severed: Collaborative Research and Cognitive Authority*", College Art Association, 2009.

3. Stolorow, Robert D. *Trauma and Human Existence* (The Analytic Press, 2007).

4. Kim Anderson, "United and Severed: What Happens in that Moment of Time", media installation, 2008-2009.

5. Petkova VI, Ehrsson HH (2008) If I Were You: Perceptual Illusion of Body Swapping. PLOS ONE 3(12): e3832. doi:10.1371/journal.pone.0003832

6. Kester, Grant. *Conversation Pieces: Community+Communication in Modern Art* (University of California Press, 2004).

7. Merleau-Ponty, Maurice. *Phenomenology of Perception*. Colin Smith, trans. (New York: Humanities Press, 1962 and London: Routledge & Kegan Paul, 1962). Trans. revised by Forrest Williams, 1981; reprinted, 2002.

8. In an adjacent gallery to our exhibition, *United & Severed: What Happens in that Window of Time*, we created a space for reading, writing and discussing. We determined this to be especially important as the artwork required wearing wireless headphones to navigate the installation space; effectively isolating the public from each other while in the installation space. After leaving the installation, the public wrote about their experience within the art work as one in which they became more sensitive to the subject of disability, more aware of their own kinesthetic experience of the world and more able to understand the experiences of their own bodies and the bodies of others.

9. Jones, Amelia. *Body Art/Performing the Subject* (Minneapolis: Minnesota University Press, 1998).

10. Holler, Linda. *Erotic Morality, The Role of Touch in Moral Agency* (Rutgers University Press, 2002). Linda Holler writes about "mattering"; how materialization through touch or mattering (giving something a material presence) elevates importance.

11. Marks, Laura. *Touch: Sensuous Theory and Multisensory Media (*University of Minnesota Press, 2002).

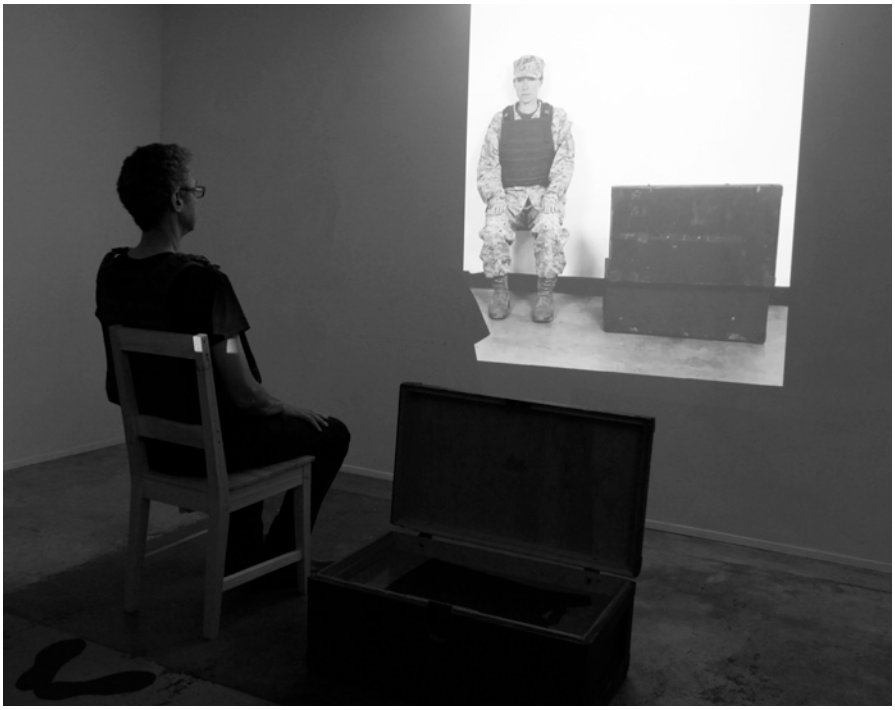

Fig. 8. "Line of Duty", 2011, Kristine Diekman, video objects and sensors. "Line of Duty" utilizes light, motion and proximity sensors, RFID tags, military clothing and gear, and audience performance to create an interactive system. (© Kristine Diekman).

CREATING #CITIZENCURATORS: PUTTING TWITTER INTO MUSEUM SHOWCASES

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Abstract

This article is a case study of a Twitter project #citizencurators, which was jointly developed by the University of Westminster and the Museum of London to 'collect' Londoners' experience of the 2012 Olympic Games. The cross-disciplinary research explored how cultural institutions can use social media to extend and diversify their collecting methos. As such this project demonstrates how the use of social networking can empower the Museum.

Keywords: Social media; Twitter; crowdsourcing; museums; curating; Olympics; participation

The writer Gertrude Stein stated memorably "I like museums. I like to look out their windows."[1] Stein's cryptic quote can be read in many ways, but on one level she is describing the museum as being 'a window onto the world'. But to expand on Stein's metaphor, windows do not only offer transparency between spaces but also create ancillary spaces, or spaces of transition and connection. The metaphoric window presents the possibility that the museum can devise situations that augment the visitor's experience.

Museum discourse in recent decades has extended from emphasising collections, expertise and presentation to embracing public experience, engagement and interpretation [2]. A frequent point of discussion has been the change that has taken place in ways museums construct narratives. Rather than being authored and authorial, they are increasingly subjective and open to multiple readings and can allow the public voice into the museum [3].

Social media and museums

Social media in the museum has made an important contribution to visitor participation, by creating relationships that extend beyond the museum environment and by facilitating dialogues between the museum and its remote users[4]. It is also seen as an opportunity for curators and public to have a dialogue on the way that objects and collections are interpreted, and to debate how the meaning is constructed, through crowd sourcing and the use of user generated tags such as folksonomies [5].

These approaches to the use of social media in the museum can be described as building upon, and diversifying, existing museum displays, collections and activities. But an alternative approach could be to use social media to generate completely new material for the museum – to facilitate a "front-end" engagement. With this approach, social media could be used to enhance museum collecting by offering a new way to access material, to supplement traditional media. Furthermore, such an approach points to a new form of object that museums might focus upon: collectable, born digital, material produced by the public.

Within new media discourse there has been considerable coverage of the approach that art museums take to collecting and display concerning born digital material [6]. However the debate in non-art museums, such as social history museums, has had a different focus when the artefact is not seen in an arts context but as a unique evidence of social, scientific or ethnographic knowledge [7].

Research partners

The research partnership between the Museum of London and the University of Westminster had the following strategy/objective in mind: to collect the experience of social media users through the means of social media itself as the method of acquisition. The Museum of London is a leading international city museum and "tells the story of the world's greatest city and its people" [8]. Its collection contains over 2 million objects including the largest archaeological archive in Europe and the museum has a strong emphasis on social history and a commitment to contemporary collecting.

The project was developed as a joint research initiative between Dr Hilary Young, Digital Curator at the Museum of London, who had established a research plan to investigate collecting digital material and Peter Ride, Senior Research Fellow at the University of Westminster, who had an extensive background in curating digital arts projects [9].

The objective: collecting the Olympic experience

The Citizen curators project came out of a straightforward research provocation. How could the Museum record the experience of Londoners living in an Olympic city during the games? As a museum with a commitment to contemporary collecting there were many precedents to collecting material that was associated with public events. However, recent events, such as the Occupy movement of 2011-12 and the London riots of 2011 raised issues about the difficulties associated with gathering material when events happened at speed and there were dramatic shifts in public mood. Indeed, in both these events, social networking had played an important role in mobilising participants and enabling members of the public to share up-to-date information.

The hosting of the Olympic Games in London was itself a contentious subject. The run-up to the Games had generated very mixed opinions among Londoners, with highly vocal opposition to government decisions about budgeting, resourcing, commercial interests and security, as well as public enthusiasm for the sporting events and the activities of the supporting Cultural Olympiad, all of which were debated on social media platforms.

Hilary Young, Digital Curator Museum Of London summed up the possibilities as: "It was expected that athletes, media and the public would Tweet voraciously about the Games. Of particular interest to our project team was the way Twitter would be used by some Londoners to communicate and gather immediate information, feelings and views around the Olympics instantaneously. But at the same time my internal museum curator voice was screaming 'can we collect this? 'what do we do with it?' and 'what is the object?'" [10].

Collecting through a small scale project

The opportunity to collect the Olympic experience of Londoners through social media presented both complications and possibilities. As far as the museum curators were aware, there were no obvious precedents of museums collecting social history content generated through social networks. However, the Museum of London had a substantial practice of collecting through oral histories and audio recordings of public events and worked on social history collection projects where community participants shared curatorial control with museum professionals.

What social media offered the Museum was not the content analysis available through studies of 'big data' [11]. Instead, the value of the project was that it could provide a small set of data with an emphasis on personal content, that spoke of people's lives and attitudes. It could be used to gather stories about the

'lived history' of London and how it was communicated between individuals and groups.

Project development and choice of Twitter

The way that the project progressed demonstrated how practicalities and pragmatics can shape research, as well as the curatorial and theoretical interests of the museum and the university partners. The initial proposition had been to use a variety of different platforms to give a sense of the breadth of social network activity, however it became obvious that Twitter was the only platform that could easily be employed for museum collecting. Because the museum would be collecting material to be held in perpetuity, complications around ownership or intellectual property would impede the acquisition processes. The IP issues associated with Facebook, Instagram, Pinterest and other platforms meant that it would not be possible to collect material disseminated through these. However the Library of Congress had established a precedent through its agreement with Twitter to archive all tweets generated between 2006 and 2010, and the outcome of US legal actions against the Occupy Wall Street movement had asserted that tweets were in the public domain and were not private property.

Using Twitter also had limitations. Early on in the project it was realised that it would not be possible to collect tweeted photographs despite the important role that images had in networked culture, and that this would be an important part of the way the games were experienced and information shared. Images presented IP issues because once an image was tweeted or presented through a platform such as Instagram or Twipic it carried coding that meant it was no longer the exclusive IP of its creator. As a result the project could only collect the text of tweets and metadada. However, since this information contained the URL of any associated content the images could be seen online at a later point.

Working Methods

An important research objective as to define a method by which social networking could be collected. These questions were made complex by the fact that the material generated could be potentially boundless. Tweets would be created in the millions that used terms relating to the Olympics and any tweets produced by Londoners could be said to reflect their experience at some level.

The researchers addressed these problems by choosing to examine and adapt other successful models of social media projects: community projects, marketing and brand awareness campaigns. As a result it was decided to develop the participation in the project one two levels. Firstly by recruiting a group of volunteers who could function as a core, dependable group of content providers and advocates. This enabled the research team to have a reliable relationship with a group of participants who could be briefed on the purpose of the project and its long-term outcomes and who could give feedback on the project as it progressed as well as generate content. The second level of participants would be the unrestricted and therefore open to any social media users who wished to engage with the project and the level of content from this group would be unpredictable and variable. Participation was encouraged through regular call-outs: "Anyone can take part by tweeting using the hashtag #citizencurators. All tweets will be collected by our software" [12]

Models of curating

Fundamentally, the participants operating at both levels would be taking on a curatorial function in determining what was collected into the archive, and they were doing so as citizens of London. Consequently the term 'citizen curators' was also coined to refer to them. In doing so the researchers were addressing the vogue in terming the organisation of online material as curating, as well as addressing museum collecting practices. This approach which was not without dissent from other curators within the museum and other members of the curatorial community. However, the researchers recognised that the way in which social media was being gathered required an open framework in which responsibilities were shared between different parties and that a desirable outcome of the project might also be further debate around the concept of digital curating.

Role of the core participants

After a social media and promotion twenty people were recruited as the core group of participants and asked to commit to making at least ten tweets a day. The advantages and limitations of this group-based approach were complex. Selecting a small number of people gave the project focus but also meant that its breadth was reduced. The criteria for selection was that the individuals could demonstrate a commitment or interest in the project. This was advantageous in ensuring that they would generate content, however it also meant that a limited number of personal points of view would be emphasised. It also meant that although this approach could produce detailed conversations, it could mean that the manner in which 'trending' operated on social networking sites might not be reflected. But an additional benefit was that a small, defined group enabled the Museum to confirm that it had rights to reproduce any of the content produced by the participants.

Defining the hashtag

The key element to enable and encourage unrestricted public participation lay in the promotion of hashtag #citizencurators, which was done through social media and websites.The use of an easily recognisible term meant that it could be widely promoted and that the museum could collect from anyone who tweeted.

"Use the hashtag #citizencurators to tweet your point of view. A moment, an observation, an annoyance, something that made you laugh, something that speaks of what its like to be in London while the Olympics are on"[13].

It became obvious from early on in the project that although people would be tweeting using a wide range of tags and terms, it was best if participants had a tag which was unique and furthermore, that using it would signify that they intended a tweet to be included within the project. Using London2012 related terms, such as 'games' or 'Olympic', were not permitted under the regulations of the organising body of the Games established by UK legislation. #Citizencurators was a self-explanatory term, and one which was not being used elsewhere within Twitter.

However, the use of #citizencurators as a hashtag was not without problems as it contained fifteen characters –taking up nearly ten percent of a tweet's one hundred and forty characters. It also meant that participants wishing to use other trending hashtags needed to use multiple terms, otherwise their tweets would not be gathered.

Tweet Archiving

Tweets were gathered using an open source archiving software, 'Twitter Archiving Google Spreadsheets' (TAGS), which allowed for the automatic collection of tweets around specific terms and

their compilation into a database [14]. This database contained the following data and meta-data: the user ID number; the user's name; text of the tweet; date stamp time; language; reply to (if relevant) user name and ID; URL of profile image; URL Tweet. The search terms were set exclusively to harvest tweets using the hashtag #citizencurators, or the incidence of the word citizencurators within the tweet's text.

Outcomes

The nature and the spread of the outcomes revealed a range of results. A a base level of what would have given adequate material for the collection was set conservatively at 2,000, because it was recognised that there would be considerable competition for the attention of social media users. However, over the 2 weeks of the games, approximately 7000 tweets were gathered using the #citizencurator hashtag. Of these, approximately 4000 were unique tweets and the remainder were re-tweets. Tweets came from approximately 600 unique Twitter accounts. As a result the project reached its objectives of having both a broad spread of public contribution and a dedicated and focused body of content. Because the tweets came from a relatively small sample of users compared to the population of London that regularly tweeted they provided highly individualized voices. Nevertheless, the threads that developed and the shifts in subject reflected interestingly upon the mood of Londoners.

The tweets provided diverse content and points of view on a range of issues and phenomena (or something like this), such as the resistance from communities that had been disrupted by the games support industries and security companies; the perspectives of people who enthusiastically followed the games; the protests against the government spending on the games in the face of massive cuts to welfare and education budgets; the experiences of people who participated in a wide range of games related activities who took two weeks off work to assist as volunteers; and the fact that people reported on their lives as normal, doing domestic chores, jobs and raising their families. The tweets demonstrated how social networking enabled simultaneous social connections, with pivotal moments during the sporting events, and how they linked people in the stadiums with those watching live tv or in the streets.

The tweets that were gathered also showed how Twitter topics developed and had their own trends even within such a small group. These trends indicated that (or something like this) support for athletes built across the two weeks; that there were constant reflections of the socially acceptable display of the British flag (often associated with the right wing); that people were concerned about sexism within the media coverage of sports; and that people were aware of the contributions made by the huge numbers of volunteers. Importantly it was evidence of the way that networked exchanges reflect changes in the mood of the city.

Tweets also demonstrated how Twitter could become a space for critique and subversion. A contentious issue in London was that goods producers or shopkeepers who used the Olympic rings in their designs could be prosecuted for breach of copyright. Social networks became a means to circulate images that playfully and resourcefully resisted or poked fun at this level of control.

Realising the goals of the project

The project also raised questions aout the way that social networking can be archived and how an archive can operate. A core aim of the project had been to investigate how the museum could collect tweets and to define how they could be included in the museum collection. The single obvious item that resulted from the project was a database containing the tweets and metadata; a concise, duplicatable, set of data on a hard-drive. However, this did not present the tweets as they had been experienced, but were a partial record. But it was also enabled the tweets to also be viewed online so they could be placed within their context, not just treated as lines of text. Additionally this led to issues about the way that it could be shown in future – whether the tweets could be 'recreated' as a Twitter stream or if they should be abstracted from their context and shown as text [15].

Display

The question of display was approached in different ways. Over the period of the Games the project was displayed in the museum as a foyer display of a Twitter stream that represented a live environment. In addition the project team ran a blog15 and published daily edited highlights, using 'Storify' software, which offered a 'curated' selection managed by the students working on the project [16]. A year after the Games, in 2013, the Museum presented a exhibition ' Opening The Olympics' featuring objects that it had collected during the Games. The tweets were presented as overlying text on a video installation [17]. Even in a small display, the tweets provides evidence of a shared experience, and a direct sense of the way that people engage with materials and spaces in real time. This placed them in 'the now' rather than encouraging people to see them as things of the past.

As an additional project outcome, a selection of photographs and tweets created during the #citizencurators project was exhibited at The Photographers' Gallery London, August 2013, curated by Peter Ride. This display created the original tweets by extracting the URLs from the database and posting them to dedicated webserver that ran a simulating programme designed by Gordon Joly.

Ultimately, the project demonstrated the ways in which a Twitter archive can illustrate how social media changes the way people experience public events and how they relate to material culture. To return to Gertrude Stein's quote, the #citizencurators collection can provide a 'museum window' to look out of. It offers a bridge between the materiality of the museum object or display and the intangibility of social and personal knowledge. It adds to objects as a source of information by giving space for individual voices to provide additional meanings and to contest orthodoxies. Therefore, this project can be seen as exemplifying the way that social media can serve to augment the museum experience.

Notes

1. Gertrude Stein quoted in Sam Wright, Koviashuvik (San Francisco: Sierra Club Books, 1988).

2 . Hilde S. Hein, The Museum in Transition (Washington: Smithsonian Institute Press, 2000); Michelle Henning, Museums, Media and Cultural Theory (New York: Open University Press, 2005); Graham Black The Engaging Museum: Developing Museums for Visitor Involvement (London: Routledge, 2005).

3. Nina Simon, The Participatory Museum (Santa Cruz: Museum 2.0, 2010)

4. Elizabeth P Stewart, Dana Allen-Greil and Beck Tench, Conversations with Visitors: Social Media and Museums, (New York: Museumsetc, 2012).

5. John Stack, in Andrew Dewdney and Peter Ride, The Digital Technologies Handbook (London: Routledge 2013)

6. Beryl Graham and Sarah Cook, Rethinking Curating: Art After New Media (Cambridge, Mass.: MIT Press., 2009); Christiane Paul, ed. (New Media in the White Cube and Beyond: Curatorial Modes

for Digital Art (Berkley: University of California Press, 2008).

7. Ross Parry, Museums in a Digital Age (London: Routledge, 2009)

8.http://www.museumoflondon.org.uk/Corporate/About-us/Who <accessed 20 June 2013>

9. The project team also included students working on the MA Museums, Galleries and Contemporary Culture: Eleni Tziourtzia, Xiao Song Liu, Jayacintha Danaswamy and Fliss Hooten.

10. http://citizencurators.com/2012/09/11/can-the-museum-collect-tweets <accessed 20 June 2013>

11. A significant example of big data analysis of social networking during the 2012 Olympic and Paralympic Games was the Emoto project by Future Everything,

http://futureeverything.org/ongoing-projects/emoto-2 <accessed 20 June 2013>

12. Public call for participants posted at http://citizencurators.com/2012/07/26/so-whats-it-like-for-you <accessed 20 June 2013>

13. Public call for participants

14. TAGS was developed by Martin Hawksey http://mashe.hawksey.info/2012/01/Twitter-archive-tagsv3 <accessed 20 June 2013>

15. The project blog was posted to by the project team, students and other curators at the Museum of London http://citizencurators.com <accessed 20 June 2013>

16. http://storify.com/citizencurators <accessed 20 June 2013>

17. Opening the Olympics 2013 http://www.museumoflondon.org.uk/london-wall/Whats-on/Exhibitions-Displays/OpeningtheOlympics.htm <accessed 20 June 2013>

STATIC AS A TROPE IN ELECTRONIC ART: DAVID HALL'S *1001 TV SETS (END PIECE)* AND OTHER WORKS

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Abstract

Static is often used in electronic art to symbolise a metaphysical outside that is only perceivable with technology. A significant recent example is David Hall's 1001 TV Sets (End Piece). In this paper I will explore the static as outside trope using numerous examples, with a focus on Hall's work. I will show that the trope demonstrates how static can be meaningful and so functions as more than merely interference.

Keywords: static, sonic, outside, electronic art, trope, David Hall, metaphysical.

Static, the white noise seen and heard on analogue television sets, does not just signal the lack of signal. It is often used in electronic art to symbolise a metaphysical *outside* that is only perceivable with technology and from which the meaningful, including sometimes the supernatural, comes. Despite the emphasis on static, electromagnetic interference, as visible, its presence is unstable and destabilising, as is indicated by its sonic dimensions. It acts, interfering with signals and overflowing boundaries, and is spatial, filling space and transforming it.

Examples of popular culture where the static as outside trope, as I call it, appears include the *HBO* ident, and the films *Poltergeist*, *White Noise*, and *Static*. A recent example of electronic art that employs the trope is *David Hall's 1001 TV Sets (End Piece)*, which was presented at Ambika P3 gallery in London in March-April 2012.

Here I will explore the static as outside trope using examples such as those listed above, with a focus on Hall's work. I will draw on Michael Taussig's writing about the magic of technology, Jacques Derrida's work regarding ghosts, and Michel Serres' metaphysics of noise to explain the way the trope presents noise as outside, as well as the significance of this. Moreover, based on this I will show that the trope demonstrates how static can be meaningful and so functions as more than merely interference. Analogue televisions signals around Australia are gradually being switched off as part of a shift to digital broadcasting, a process that will be complete by the end of 2013 and indeed has already been completed in a number of countries. The significance of this shift is directly addressed in Hall's work, demonstrating the timeliness of this investigation.

Static as a Trope

Apart from the increasingly ubiquitous *HBO* ident, in which the station's logo emerges from static to an angelic chorus of *ahhh*, the static as outside trope is predominantly recognizable due to its use in films. The film *Poltergeist*, in which ghosts escape from the static emanating from a TV set, is probably the most well known example, however there are a number of others [1]. For instance in *White Noise* TV static is used to help the central character make recordings of electronic voice phenomena (EVP), and in *Static* a man claims he has invented a device that makes it possible to see heaven while others find the device only shows static [2, 3]. Notably, Greg Hainge has explored the use of noise in horror films, including *Poltergeist*, *White Noise* and *The Ring*, in his book *Noise Matters: Towards an Ontology of Noise*, but while there are a number of parallels between his arguments and mine he, I find, primarily focuses on the way in which noise is figured as disruptive in horror films and communication systems [4]. As I have stated, I am interested in the way in which the static as outside trope more broadly demonstrates noise as meaningful. The trope is also present in other forms of electronic art, in particular in audio-visual installations such as David Hall's *1001 TV Sets (End Piece)*, which I will explore later.

The Magic of Technology

The use of TVs and communication technologies more generally in the static as outside trope is significant because it can be considered a specific example of a broader trope, that of technologies as magical and mysterious in their function and power. This is a trope that is common in horror films – examples include *The Ghost in the Machine*, the *Ringu* films and their Hollywood remakes, *Kairo*, and *Insidious* [5]. Moreover, the trope has a rich history, both in the arts and more generally.

Michael Taussig writes of the "mimetic faculty" of technologies of reproduction in his book *Mimesis & Alterity: A Particular History of the Senses*, offering an explanation, at least to some extent, of the way in which communication technologies are frequently treated as if they are actually able to summon those whose words or likeness they reproduce [6]. Particularly crucial to Taussig's argument is the duality of mimesis as both a "copying or imitation" and a more direct "palpable, sensuous, connection" between bodies, such that "seeing something or hearing something is to be in contact with that something" [7].

Taussig writes about the significance of the large amount of "colonial phonography" that exists, that is, the use of early sound recording and playback technologies at so called frontiers. This is exemplified in Robert Flaherty's documentary film *Nanook of the North*, which features the Inuit man Nanook, on whose family the film is focused, expressing amazement at hearing and seeing a gramophone being used [8]. Rather than being interested in the effect of phonography on "the natives," Taussig is interested, in his own words, in "the white man's fascination with their fascination with these mimetically capacious machines" [9]. He argues that what is crucial is "the magic of mechanical reproduction itself," explaining:

> In the West this magic is inarticulable and is understood as the technological substance of civilized identity-formation…Yet these shocks rightly live on in the mysterious underbelly of the technology – to be eviscerated as "magic" in frontier rituals of technological supremacy [10].

Basically, his argument is that colonial photography and film of 'natives' being shocked by phonography is an example of a drama Westerners play out to enjoy the power of their society's machines, a power they themselves, that is we ourselves, generally do not fully understand. The static as outside trope is an example of the same playing out of the power and mystery of technology, a dramatization of the hold of technology over those who use it. It is a spectacle to be enjoyed as fiction that nevertheless demonstrates the relationship many have to technology, in which the function and power of the technologies they use is considered magical.

Interestingly, Taussig notes that it is "curious" that this drama has been played out with sound reproducing technology rather than photography or cinema [11]. This, I find, is because of sound's mysterious quality. Photographs, as Susan Sontag has argued, furnish evidence but sound is thought of as ephemeral, a mere effect [12]. Sound, as I have

indicated, overflows boundaries, creating ambiguous spaces.

The Ghost in the Machine

In all of the films I have mentioned what emerges from static is the supernatural. *Poltergeist* and *White Noise* both feature ghosts that manifest in various ways from static – in particular that played from TVs – while in *Static* the central character is able to see heaven using a device he makes from a TV, while whenever someone else uses the device they see only static. This reflects the way in which it is common to speak of seeing *ghosts* on an analogue television broadcast if there is shadowing of the picture due to interference (an effect itself called *ghosting*). In Ken McMullen's film *Ghost Dance*, when asked if he believes in ghosts, Jacques Derrida responds "here, the ghost is me…so ghosts do exist…the modern technology of images…enhances the power of ghosts and their ability to haunt us" [13]. Derrida considers his appearance in the film to be that of a ghost. Subsequently, when asked about his appearance in the film during an interview with Bernard Stiegler in their book *Echographies of Television*, Derrida argues:

> At this moment, in this room, night is falling over us. Even if it weren't falling, we are already in night, as soon as we are captured by optical instruments which don't even need the light of day. We are already specters of a "televised." In the nocturnal space in which this image of us, this picture we are in the process of having "taken," is described, it is already night. Furthermore, because we know that, once it has been taken, captured, this image will be reproducible in our absence, because we know this *already*, we are already haunted by this future, which brings our death [14].

Here Derrida builds from a similar point to Taussig. He argues that because our image and our voice can be reproduced and we know this will be possible following our death, we are pierced through by a disappearance we experience that "promises and conceals" a "magic" or "ghostly" apparition or reapparition [15]. This, he suggests, and it is here that his argument crosses with that of Taussig, is only possible because of a "faith" that stems from our lack of understanding of how the technology functions [16]. He explains that even if we know how a technology works we don't see how it works and so "our knowledge is incommensurable with the immediate perception that attunes us to technical efficacy" [17]. Applied to the ghosts that emerge from static in some of the films I've mentioned, Derrida's theory suggests that the static as outside trope serves, at least in part, to play out a dramatization not only of the perceived magic of technology, but the way that magic acts on each of us, the way it influences our sense of identity, our life and our death.

Derrida, I find, does not address sufficiently the sonic aspects of the *ghosts* of which he writes. He argues that *specters* and *phantoms*, as distinct from ghosts (*revenants* in his native French), are specifically visible – referencing "the spectacle" and "*phainesthai*" or "appearing to vision" respectively [18]. However, he argues in both cases it is a "night visibility" for they are never fully present and so both remain to some extent effects, like sound [19]. This is even more the case for ghosts, which he suggests are concerned with "coming-back [*revenance*]" and so are not necessarily visible, instead having a presence like that of an echo [20].

Despite our tendency to treat technologies as things on display, or which we might use, he argues that "wherever there are these specters, we are being watched, we sense or think we are being watched" [21]. Here he is referring specifically to when people use technologies that involve a screen, such as is the case in all the examples I have been discussing. He argues that "this flow of light which captures or possesses me, invests me, invades me, or envelops me is not a ray of light, but the source of a possible view: from the point of view of the other" [22]. We can sense that what he describes occurs in *Poltergeist*, *White Noise* and *Static*, as well as *1001 TV Sets (End Piece)*. However, it is static that represents the other and in each example in which the ghostly emerges from the static, the static is heard as much, if not more, than seen. It reaches into the spaces in which it broadcasts, filling them with the other, and yet like the ghosts never becomes fully present.

Noise as Outside

The static as outside trope, as I have argued, presents noise, in the form of static, as not only unintended, loud or interfering but as representing the outside. In his book *Genesis*, Michel Serres presents a metaphysics of noise that supports my claim [23]. He theorizes *noise* as a metaphysical outside that is distinct from but represented by the noises of different kinds that are heard. He argues "noise cannot be a phenomenon; every phenomenon is separated from it, a silhouette on a backdrop, like a beacon against the fog" [24]. *Noise* precedes and underlies everything, he claims. He writes:

> The *noise* is incapable of differentiation, everything in it is indistinguishable. It is laminar and white; each lamina takes the place of any lamina, white noise, continuous aquarian outpouring, sustained noise of waterfall, a null signal, formless background [25].

Static, approached using Serres' metaphysics of noise, is representative of a metaphysical outside, *noise*. However, this does not mean that static itself constitutes that outside. Serres is clear in his argument that such an outside is inaccessible. He describes it as a "saturation of differences," pointing out that "no difference or complete difference both produce the undifferentiated" such that *noise* can at best be represented, not apprehended in full [26]. Static, in such a way, when heard coming from a television set late at night, signals a lack of signal and in doing so represents the outside that is *noise*. If static blankets a signal without completely covering it, it may be referred to as *snow* but even then it is reduced to something identifiable. The static as outside trope, meanwhile, uses it to signify a metaphysical outside from which meaning emerges, and which therefore, despite being inaccessible, is productive.

David Hall's *1001 TV Sets (End Piece)*

David Hall's installation piece *1001 TV Sets (End Piece)* is, when compared to the films I've mentioned, particularly interesting. It is based on his previous work *101 TV Sets*, which was first shown at *The Video Show*, Serpentine Gallery, London in 1975 and is itself in turn based on a work known as *60 TV Sets* that was premiered at the exhibition *A Survey of the Avant-Garde in Britain* at Gallery House, London in 1972 [27, 28]. Both of these works were produced in collaboration with Tony Sinden and featured a number of TV sets – sixty and

one hundred and one respectively – tuned or mistuned to various broadcast signals [29].

Timed to coincide with the shut off of analogue television signals in London, *1001 TV Sets (End Piece)* featured, as the title suggests, one thousand and one TV sets tuned to a variety of stations. Gradually, as the various stations were switched off, each of the sets flicked to static until all of the televisions were left playing and showing nothing but white noise.

In the work, static is all that is left after all the analogue television signals are gone and this can be read in a number of ways, all of which emphasize the conception of static as representing an outside. Although the work does not overtly present technology as magical or present the supernatural as emerging from static, it nonetheless positions static in a similar way to the films I've mentioned. Clearly the work can be considered to critique, or at least provide a visceral experience of, the cacophony of contemporary media – this seems the most obvious reading of both *60 TV Sets* and *101 TV Sets* – and in addition, depending on your point of view, the peace or anxiety of being immersed in static, which in the work is juxtaposed with the TV signals as an outside. However, the timing of the work with the shut down of analogue television signals in London in 2012 suggests more. Hall's work, with this in mind, can be thought of as a mournful tribute to static that calls into question the assumption that it is desirable to eliminate noise, to deny that which is outside the bounds of what is considered meaningful, wherever possible. Serres describes how the grey of a studio floor where "all hues have fallen" is noise, not of possibility but of culmination [30]. He writes "here, the noise is no longer possibility, it is its opposite, it is no longer the font of time, but its culmination" [31]. The static in Hall's work can be considered an example of this, explaining its nostalgic qualities. Yet, it nonetheless is produced from and represents *noise*, the outside. Moreover, the sonic dimensions of the work are not completely "laminar and white" [32]. Instead, though the static on the TV screens is flattened and contained, the white noise that gradually dominates as the stations are shut down fills the space, echoing off the walls. The *noise* remains inaccessible but nonetheless spills into the known as static. Witnessing Hall's work, I mourn the disappearance of static but I do so inspired by the magic of technology, thinking of the ghosts in *Poltergeist* and imagining the outside.

Conclusion

The static as outside trope is significant for its role in a variety of electronic arts, particularly in film and most recently and poignantly in David Hall's *1001 TV Sets (End Piece)*. Not only does it explain the role of static in these works, it shows how noise is often positioned as outside and explains how this is involved in the development, production and marketing of new telecommunications technologies. Digital television is frequently presented as superior to its analogue predecessors not only because of its high quality pictures and sound but because it eliminates the threat of static, supposedly ensuring audiences see and hear broadcasts free of interference and noise. However, that is a definition of quality dependent on the assumption that interference and noise are always disruptive, not productive, and, as I have shown, this is not necessarily the case.

Digital broadcasting does not allow us to apprehend the outside that static represents. Instead, all that is available to us is signal. Supported by a rhetoric of immediacy, digital technology presents broadcast signals as situated in a striated space in which they are surrounded only by other, regulated, signals, seemingly somehow outside of nature. Digital television broadcasts are either received seemingly intact or break up. If there isn't a signal, or isn't enough signal, for a digital television to receive, the television itself presents one, such as the increasingly familiar message *No Signal*. Paradoxically, this is perhaps not so different from the way static functions – despite being the result of a lack of signal, signalling that there is no signal, a site in which "all hues have fallen" [33]. However, there is one crucial difference: the message *No Signal* is a deliberate function of the technology while static, despite its familiarity, is considered noise. Beyond the simple message that there is no signal, therefore, static represents a metaphysical outside that is indecipherable and yet full of possibilities.

Static is not just electromagnetic interference. As the static as outside trope shows, it is itself meaningful. Static represents not only an absence or loss of signal, in fact itself containing many signals, but a metaphysical outside that is denied by the digital television technology now being adopted in Australia and elsewhere.

References and Notes

1. Steven Spielberg, *Poltergeist*, (1982), film.

2. Geoffrey Sax, *White Noise*, (2005), film.

3. Mark Romanek, *Static*, (1986), film.

4. Greg Hainge, *Noise Matters: Towards an Ontology of Noise* (New York, NY: Bloomsbury, 2013) p.87.

5. John Bailey, "The spectral network," *The Age* (May 8 2011) <http://www.theage.com.au/entertainment/movies/the-spectral-network-20110507-1ed80.html>.

6. Michael Taussig, *Mimesis & Alterity: A Particular History of the Senses* (New York, NY: Routledge, 1993) p.21.

7. Taussig [6] p.21&43.

8. Taussig [6] p.200.

9. Taussig [6] p.198.

10. Taussig [6] pp.207-208.

11. Taussig [6] p.201.

12. Susan Sontag, *On Photography* (Harmondsworth, London: Penguin, 1979) p.5.

13. Ken McMullen, *Ghost Dance*, (2006), film.

14. Jacques Derrida and Bernard Stiegler, *Echographies of Television* (Cambridge, UK: Polity Press, 2002) pp.115-117.

15. Derrida and Stiegler [14] p.117.

16. Derrida and Stiegler [14] p.117.

17. Derrida and Stiegler [14] p.117.

18. Derrida and Stiegler [14] p.115.

19. Derrida and Stiegler [14] p.115.

20. Derrida and Stiegler [14] p.115.

21. Derrida and Stiegler [14] p.122.

22. Derrida and Stiegler [14] pp.122-123.

23. Michel Serres, *Genesis* (Ann Arbor, USA: The University of Michigan Press, 2009).

24. Serres [23] p.13.

25. Serres [23] p.118.

26. Serres [23] p.118-119.

27. *David Hall – Gallery 2* (Date Unknown), <http://www.davidhallart.com/id2.html>, accessed 12 May 2013.

28. *David Hall – Information* (Date Unknown), <http://www.davidhallart.com/bio.html>, accessed 12 May 2013.

29. Hall [27].

30. Serres [23] p.33.

31. Serres [23] p.33.

32. Serres [23] p.118.

33. Serres [23] p.33.

TEACHING DIGITAL MEDIA TO DIGITAL NATIVES

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Abstract
The majority of today's undergraduate students are 'digital natives'; a generation born into a world shaped by digital technologies. It is important to understand the significance of this when considering how to teach Digital Media to digital natives. This paper examines the analogies to literacy that recur in digital native debates. It argues that if the concept of digital literacy is to be useful, educators must attend to the multiple layers and proficiencies that comprise literacy. Rather than completely dispose of old teaching methods, updated pedagogical practices should integrate analysis and critique with exploratory and creative modes of learning.

Keywords: digital natives, digital media, literacy, art, pedagogy, teaching practices

This paper draws on my experiences teaching and researching an undergraduate subject called Digital Media. The primary aim of Digital Media is to provide first year Visual Arts students with the skills to employ moving images in their studio art practice. This paper examines a set of assumptions attributed to the generation that currently comprise the majority of my students, and indeed the majority of incoming undergraduate students [1]. This generation, often called 'digital natives', has grown up in a world shaped by digital technologies [2]. Because of this, they are supposed to learn very differently from the generations before them. This logic is currently filtering through the higher education sector, sometimes leading to calls for extensive reform to accommodate the needs of these new learners [3]. This paper focuses specifically on the rhetoric surrounding this generation of learners, and its relationship to older pedagogic ideas, namely the concept of 'literacy'. I argue that, if they are to be useful when teaching digital media to digital natives, analogies between digital technologies and literacy require educators to comprehend all aspects of literacy as a learnt and multi-layered set of skills.

In his influential article "Digital Natives, Digital Immigrants", Marc Prensky describes digital natives as "'native speakers' of the digital language of computers, video games and the Internet" [4]. Born anywhere between 1980 and 2002 [5], Prensky argues that this generation are utterly techno-philic, and that they move seamlessly across the emerging digital interfaces, hardware and software that shape our contemporary realities [6]. As students, they are supposed to be radically different from their teachers, 'digital immigrants' who began using digital technologies later in life [7]. Unlike digital natives, digital immigrants are trying to learn digital technology as a 'second language', and are supposedly stubbornly and nostalgically inclined towards the 'good old days' of heritage skills and traditional teaching practices [8]. For digital immigrant educators to keep up with (let alone teach) their already-fluent students, Prensky calls for the radical renovation of teaching methods, chiefly to integrate new technologies into classroom environments and learning tasks.

On the surface, Prensky's argument makes sense. In my classrooms, students often open multiple applications, multiple browser windows, log in to social networking sites, place smart phones next to computer mice and compulsively click and flick between learning and social activities. Illuminated by glowing screens and tethered to devices with headphones, these students appear consigned to what Sherry Turkle calls modes of "copresence" and "partial attention" [9]; they keep their options open to tune in and out of multiple real and virtual environments. And yet, despite this distracting modus operandi, the vast majority of these students successfully pass their assessment items, sometimes with high distinction. In doing so, they demonstrate that they are learning.

My Digital Media classrooms are also already full of integrated technologies. Digital Media students sit at computers in order to watch, debate and create moving images. Industry-standard hardware and software, as well as popular screen culture interfaces like YouTube, are already blended into learning activities and assessment tasks. Prensky advocates using contemporary technologies and interfaces to help students learn in other disciplines, however his approach does not fit neatly with the teaching of digital media to digital natives.

Part of the problem with Prensky's argument is that it oversimplifies a generation. As Jason Sternberg points out, the hyperbolic tone of these arguments seems to characterise students conversely as technology-addicted zombies mindlessly wandering through their degrees, or as revolutionising how we think about information, knowledge and pedagogy [10]. Sternberg suggests that these debates risk homogenising student diversity and ignore students' ambivalence towards technology. More balanced understandings of the implications of the widespread 'socialisation' of digital technologies are clearly needed. In the realm of higher education, these conditions also require more measured and thorough understandings of pedagogical approaches that use analogies to literacy.

The allusions to traditional concepts of literacy throughout digital native discourse are perhaps so obvious that they remain largely unqualified and unexamined. The logic is that digital natives are 'native speakers' of digital technologies, and can therefore already read and write digital languages across all aspects of their lives. This gives them an advantage over digital immigrants who are struggling to adapt to a world suddenly speaking a new language. In reality however, this broad account does not acknowledge the diversity of experiences and competencies both within and across generational lines [11]. This is partly because Prensky's formulation also proposes that new digital media initiate completely new ways of communicating that entirely usurp old ones.

Contrary to this view, media theorist Lev Manovich has written extensively on the correlations between old and new media [12]. While he argues that digital media are indeed transforming contemporary cultural languages, he emphasises lines of continuity that connect related audio-visual forms:

> A hundred years after cinema's birth, cinematic ways of seeing the world, of structuring time, of narrating a story, of linking one experience to the next, have become the basic means by which computer users access and interact with all cultural data. [13]

For Manovich, new digital formats can be understood as extensions and adaptations of old analogue ones, rather than radical breaks with the past. In the context of higher education today, acknowledging this slower evolution of media languages allows for more complex and nuanced understandings of diverse digital competencies and literacies.

However, there is another more basic proposition underlying Prensky's and Manovich's assertions that must also be understood: that analogies between language and the audio-visual

paradigms of new screen technologies are indeed appropriate and valuable. It seems commonplace now to refer to people as visual literates, native speakers of audio-visual languages, and so on. However, to fully understand the pedagogical potential of these analogies, the operations of literacy require close consideration [14].

In discussing the application of literacy to the field of visual culture, W.J.T. Mitchell argues that while useful and insightful, the analogy runs the risk of perpetuating an unwanted dichotomy between the apparently natural and automatic functions of vision on the one hand, and the constructed, *enculturated*, language-like operations of representation on the other [15]. In other words, if blindly applied, linguistic metaphors and analogies to literacy risk flattening the entire field of visual culture. The danger is that they ignore the differences between vision as a 'naturalised' human sense, and representation as a process of mediation and communication.

The same risk applies to the digital native debate, and this is precisely the shortcoming of Prensky's argument. He establishes a view of 'digital natives' as naturalised users of digital media, and therefore as being always already cognizant of their engagement with various aspects of technology and visual culture. However, by naturalising the audio-visual languages of digital media, Prensky fails to accommodate the discipline- and medium-specific aspects of this new mode of literacy. In effect, he simplifies digital literacy to the ability to perform digital tasks. In doing so, he ignores potentially higher-level forms and applications of literacy, what Sonia Livingstone identifies as "the ability to access, analyze, evaluate, and create" [16].

The real issue here is that many digital native debates gloss over the differences between literacy as an intuitive capacity and a learned set of skills. As linguist James Gee argues, *acquiring* a language is very different to *learning* one [17]. There are degrees of proficiency. In his terms:

> Acquisition is a process of acquiring something subconsciously by exposure to models and a process of trial and error, without a process of formal teaching. It happens in natural settings which are meaningful and functional in the sense that the acquirer knows that he needs to acquire the thing he is exposed to in order to function and the acquirer in fact wants to so function. [18]

Unlike acquisition, processes of learning require meta-level skills, competencies and capacities.

> Learning is a process that involves conscious knowledge gained through teaching […]. This teaching involves explanation and analysis, that is, breaking down the thing to be learned into its analytic parts. It inherently involves attaining, along with the matter being taught, some degree of meta-knowledge about the matter. [19]

Prensky assumes that digital natives acquire digital literacy through 'natural' exposure and absorption. If this is so, they may be adept at performing tasks through their interfaces, but they may not yet have learnt to analyse and explain their complex layers of mediation and meaning. Many Digital Media students can quickly navigate, follow and apply digital information. However, demonstrating increased mastery demands more than simply re-performing an attained language. It means developing the skills to analyse, dissect, discern, evaluate, critique and re-imagine [20]. If these students are to become the informed, critically engaged cultural professionals of the near future, these meta-level skills and competencies must be the pedagogical focus when teaching digital media to digital natives.

Some teaching practices that actively address these concerns are emerging. Contrary to Prensky's call for the widespread digitization of teaching methods, some of these practices look decidedly 'old school'. For example, Mitchell's learning activity "Showing Seeing" is an adaptation of one of the simplest and perhaps oldest pedagogical activities: show-and-tell [21]. For this task, Mitchell asks students to assume the role of an alien anthropologist who is unfamiliar with the fundamental physical, optical and cultural characteristics of vision. Their task is to explain the nature of vision to an audience that is unfamiliar with this basic human sense. The objective is to fundamentally divorce, if only for a moment, the instinctive qualities of seeing from more sophisticated modes of interpreting cultural artifacts. The activity encourages students to attentively interpret naturalised vision: to do a 'double take' on their own instinctual ways of navigating their visual environments.

Bevin Yeatman's and Sean Cubitt's teaching practices in the field of Media Studies are also worthy of consideration. Like Mitchell, their goal is to enable students to engage knowingly with their cultural environments now and into the future. Against the institutionalised binary of theory and practice, Yeatman and Cubitt seek to reorient their teaching practices around new terms: the creative and the critical [22]. Their strategy has been to introduce creativity into theory courses that were previously dominated by textual exposition and essay writing. By integrating audio-visual technologies and communicative modes into their teaching they have sought to intersect creative learning activities with more traditional text-based forms of analysis and critique. Yeatman and Cubitt argue that the long-lasting and transferrable benefits of current higher education will neither involve proficiency in one media, nor expertise in cocooned theory departments. Instead, the most important skills for this generation of graduates will be the abilities to move thoughtfully, knowingly and critically through the plethora of new technologies that will inevitably continue to emerge into the future. Any principled educator surely holds this motivation in high regard.

My teaching practices in Digital Media take their cues from these examples. The subject is based on the contention that if learning digital media is to be useful to students beyond the lifespan of specific software and hardware, and beyond the limits of medium-specific practices, this learning must focus on much more than technical skills. Like Yeatman and Cubitt, my teaching focuses on actively and explicitly coupling critical and creative modes of engagement. And like Mitchell, it seeks ways to defamiliarise instinctual patterns of spectatorship. Digital Media lectures and tutorials introduce students to methods of close analysis. Through the shot-by-shot dissection of a broad range of audio-visual examples drawn from throughout the history of the moving image, students learn to slow down their spectatorship and to pay attention to the formal construction of audio-visual artifacts. Diverse examples are used to demonstrate the varying communicative roles of continuity editing, montage, shot type, camera movement, composition, diegetic and non-diegetic sound, and other important formal elements. These

are strategies to develop meta-level literacy skills.

The culminating points of these learning activities are two assessment items: an Oral Critique task where students analyse the formal construction of a moving image example, and a Creative Work task where students translate these analytical skills by creating their own three to four minute video. The goal of this task is to encourage students to experiment with the audio-visual conventions of moving images to explore how meaning is constructed.

In their work for this second assessment item, varying degrees of visual literacy become evident. Students are openly encouraged to use the brief to explore their own specific interests in visual culture. The works submitted therefore often adopt the presentation formats and languages of popular screen culture. This is one of the intentions of the task: to encourage students to actively and knowingly engage with moving images as a way to demystify how they work. The music video genre is by far the most common format that students adopt, but travel-log, cooking demonstration, dream sequence and mockumentary are also popular. Competent students readily appropriate the shot types, aural structures and editing patterns of these formats. However, they do not always do so in ways that transform, manipulate or significantly alter the original templates. These students therefore demonstrate levels of literacy that mime and re-perform the languages of popular culture. In these ways, they are incrementally adding to their *acquired* language skills.

Other students, however, demonstrate *learned* meta-level literacies. The common traits among these higher-achieving students are that they risk using ambiguity, confusion and non-sense as ways to actively engage with an array of contemporary mediated representations. These videos use a variety of formal techniques, but prominent features are abstraction, distortion, montage, manipulated sound, repetition and forms of spatial and temporal discontinuity. For example, in one student's video, a series of static camera shots detail twilight scenes of suburbia. The sequence cuts between interiors and exteriors, long shots and close ups, all set to a slowly building creepy soundtrack. As night sets in, a train rockets by and the intensity of the soundtrack increases. The first sign of a human figure is a hand opening some blinds and a silhouette approaching a screen door from the dark interior of a suburban home. A young female figure looks out through the screen before the video cuts to black. A second later, the video concludes with the sound of birds chirping and an image of trees at sunrise.

This video borrows cinematic conventions from sources such as Stanley Kubick's *The Shining* [23] and David Lynch's *Blue Velvet* [24], both of which feature as teaching resources during the semester. Like those films, this video is an effective study of the dark potential lying dormant in seemingly innocuous suburban ambience and architecture. Through its considered compositions, tight editing and evocative sound it creates a compelling and anxious portrait of commonplace settings and experiences.

In another student's work, found footage of young people playing videogames is combined with game-play screen captures, music videos and advertisements. The different sources are montaged in a way that alludes to a narrative relationship between real and gaming environments. However, it becomes increasingly difficult to follow which characters are playing the game and which are being played. This disorienting effect is further enhanced by visual effects that pixelate and flatten the different kinds of footage. Error messages begin flashing on screen and the sound becomes further distorted. The video is edited quickly and the overall effect is to deliberately confuse the real and digital worlds. It is willfully incomprehensible.

Through these formal techniques, these and other students demonstrate the critical mindset that Yeatman and Cubitt describe as "the basic refusal to accept" [25]. By experimenting with formal and symbolic audio-visual codes, they deconstruct and re-imagine the languages of digital media. Such critical-creative outcomes represent advanced literacy skills through their thoughtful, knowing and speculative modes of engagement. They are at their most evocative when breaking the *acquired* rules of language, thereby enabling unplanned and unpredictable symbolic possibilities. These examples are evidence of what can emerge when creative and critical approaches are combined. They demonstrate the potential for *learned* visual literacies to provide students with the skills, knowledge and tools to challenge and critique *acquired* languages.

There is much more to be done in in the development of teaching practices that encourage more students to adopt these exploratory and critical strategies in their studies. One obvious goal is to create learning environments that encourage more students to experiment with and break the audio-visual languages of popular visual culture. As digital technologies and interfaces continue to develop, further work can also be done to more fully understand the literacy metaphor in terms of networked and interactive media and their potential roles in an evolving digital grammar. Against calls for scrapping 'old school' teaching practices, I believe this requires an even greater emphasis on embedding long-established skills of analysis, interpretation and critique. Traditional concepts of literacy are highly valuable in this context, but only when they are applied in their fullest sense: as an interrelated and multi-layered set of skills that allow students to knowingly 'mess' with the rules of their acquired digital languages.

As increasing access to new technologies continues to reduce the gap between the technical proficiencies of professional and amateur creative practitioners, meta-level literacy skills will be the prized attribute of those wishing to excel, lead, critique and create. It is up to educators to challenge students to develop and apply analytical skills and critical thinking across the diversity of their experiences and activities, including (perhaps especially) creative ones. Defamiliarising patterns of spectatorship, and closely integrating modes of critique and creativity can enable digital natives to make informed and challenging contributions to the evolving social, cultural and technological conditions of the future.

References

1. Rickes, Persis C., "Make Way for Millennials! How Today's Students are Shaping Higher Education Space," *Planning for Higher Education* **37**, No.1 (October-December 2008) pp.7-17.

2. Prensky, Marc, "Digital Natives, Digital Immigrants," *On the Horizon* **9**, No.5 (October 2001) pp.1-6.

3. Prensky [2].

4. Prensky [2] p.1.

5. Bennett, Sue, Maton, Karl and Kervin, Lisa, "The 'digital natives' debate: A critical review of the evidence," *British Journal of Educational Technology* **39**, No.5 (2008) p.776; Rickes [1] p.7.

6. Prensky [2]

7. Prensky [2]

8. Prensky [2]; Tapscott, Don, *Growing Up Digital: How the Net Generation is Changing Your World* (McGraw-Hill, Books24x7, 2009) <http://common.books24x7.com.ezp01.library.qut.edu.au/toc.aspx?bookid=14311> accessed 19 December 2012.

9. Turkle, Sherry, *Alone Together: Why We Expect More From Technology and Less From*

Each Other (New York: Basic Books, 2011) p.161.

10. Sternberg, Jason, "'It's the end of the university as we know it (and I feel fine)': the Generation Y student in higher education discourse," in *Higher Education Research and Development* (London, England: Routledge, 2012, pp.1-13) p.1.

11. Bennett, Maton & Kervin [5], pp.778-779.

12. Manovich, Lev, *The Language of New Media* (Cambridge Massachusetts, London, England: The MIT Press, 2011).

13. Manovich [12] pp.78-79.

14. Livingstone, Sonia, "Media Literacy and the Challenge of New Information and Communication Technologies," *The Communication Review* **7**, No.1 (2004, pp.3-14) p.4.

15. Mitchell, W. J. T. "Visual Literacy or Literal Visualcy," in James Elkins, ed., *Visual Literacy* (New York, USA and Oxon, England: Routledge, 2008) pp.11-14.

16. Livingstone [14] p.5.

17. Gee, James Paul, "What is Literacy?" in Vivian Zamel and Ruth Spack, eds., *Negotiating Academic Literacies: Teaching and Learning Across Languages and Cultures* (London and New Jersey: Lawrence Erlbaum Associates, 1998) pp.51-59.

18. Gee [17] p.53.

19. Gee [17] p.54.

20. Livingstone [14] pp.5-7.

21. Mitchell, W.J.T. "Showing Seeing – A critique of visual culture," in Joanne Morra and Marquard Smith, eds., *Visual Culture: Critical Concepts in Media and Cultural Studies, Volume 1* (London and New York: Routledge. 2005), pp.147-164.

22. Yeatman, Bevin and Cubitt, Sean, "Critical and Creative Media Studies and the Embedded Learning Environment," *New Review of Film and Television Studies* **3,** No.1 (May 2005) pp.1-14.

23. Stanley Kubrick, *The Shining* (1980), film.

24. David Lynch, *Blue Velvet* (1986), film.

25. Yeatman and Cubitt [22] p.12

READING, WRITING, RESISTING: LITERARY APPROPRIATION IN *THE READERS PROJECT*

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Abstract
The *Readers Project* is an aesthetically-oriented system of software entities designed to explore the culture of human reading. These entities, or 'readers', enact specific reading strategies and function as autonomous text generators, networked writing machines visible beyond the texts they 'read'. As the structures on which they operate are culturally implicated, the project's readers shed light on a range of institutional practices surrounding the digital literary and the aggregation of the linguistic commons by corporate interests. In this paper, we present the practical and theoretical considerations guiding the project's development, and consider various strategies to resist the commodification and enclosure of literary culture within the corporate 'cloud'.

Keywords: linguistic commons, networked language systems, critical algorithmics, copyright and intellectual property, network services, aesthetic computation, natural language processing, conceptual writing/literature, digital language art, writing digital media, literary visualization, computational writing, (human) reading.

Introduction

The *Readers Project* deploys algorithmic readers onto inscribed surfaces that model and explore the multidimensional culture of human reading. For a description of the design and behaviors of selected 'readers', please see our earlier article '*The Readers Project*: procedural agents and literary vectors'. (*Leonardo* 44.4)

We concluded this essay by positioning the project as both a celebration and a critique of the institutions of reading and writing. In today's world, so much of our symbolic, language-driven engagements are now transacted with algorithmic agents that what we think of as reading and writing, those practices heretofore considered as proper to human 'authors', have been fundamentally altered. The 'cloud'-based services provided by networked aggregators such as Google and Facebook give us instant and convenient access to all the linked references that we need, habitually and professionally, as we write or read. By default, these sources have superseded previous reference works and fact-checking tools. Few human authors, however, acknowledge the fact that they have become prosthetically 'enhanced' by algorithm. By way of example, the text we are now composing 'lives' on 'Google Drive', allowing its authors to collaborate more or less effectively. As we write hundreds, if not thousands, of algorithmic agents work for us in various capacities: saving, transferring, attributing and time-stamping our edits; bringing up windows of 'research'; framing our writing with indicative paratext. (Linked advertisements, for the moment, are just off screen) [1].

Some portion of this computational compositional work is displayed on screen 'in plain sight', but much more takes place 'in the cloud', as a function of the proprietary indexing and analysis of Google. It feeds the 'big data' that we hand over with each keystroke to massive corporations behind proprietary firewalls, with whom we have—tacitly, all but by default—agreed to terms: terms of use, terms of service, statements of rights and responsibilities, etc. The primary function of these terms is to grant such companies the right to pass the 'data' we are generating on to the algorithms they own, for the derivation of hugely profitable, tangentially related sales [2]. When we make a thing—this sentence, its phrases—in 'private', do we expect it to be instantly and automatically appropriated for purposes that are distinct from our own—and of which, perhaps, we disapprove? Too late. We have already agreed that this should be the case. However, this agreement is quite clearly not reciprocated. Perhaps strangely, the appropriation of what we create does not seem to occur in other domains of our lived experience, and might well be found to be illegal or immoral if it did. It is precisely here that the dimensionalities of language, of reading and of writing have already changed, radically and by default, without our comprehensive agreement or understanding; and this vectoralization, this appropriation of symbolic practice by 'big data' and 'big software', threatens to coerce, by statistical force majeure, the totality of culture, including material culture and exchange, into those channels of activity and attention that it considers 'best', 'not evil', or most profitable; but for whom, exactly?

Which brings us to the question of how the *Readers Project* relates to, and engages with, these massive and ubiquitous networked agendas? To start, the project recognizes these circumstances as a profound reconfiguration of the predominant modes of reading and writing. The algorithmic, compositional, and configurative agents of big software's network services have changed the very nature of these activities far more deeply than even the development of hypertext in the 1990s [3]. The project consciously strives to articulate the relationships between these software agents and the new dimensionalities of reading; configuring and setting out, for example, 'motivations'—specific vectors—for its readers. This perspective requires that any critical understanding of the project takes adequate account of its readers' motivations, and provides a model for the understanding and critique of other reading agents on the net, as they are silently or pointedly deployed, both by big software and by the even less benevolently motivated engineers of the Dark Net [4].

Reading

The process of designing variously motivated software 'readers' for the *Readers Project* has transformed our understanding of reading, both as an institution and as a set of cultural practices. Reading only ever takes place, only ever brings language into existence as readable, in a culturally predetermined and located context, predominantly what we have called the 'typographic dimension'. This fact necessitates the precise specification of a textual field or 'neighborhood' which defines the possible foci of attention for each reader. Further, the neighborhood is determined by typography per se, and not, in the first instance, as might be expected, by linguistic or stylistic considerations. For graphically inscribed language, it is the visual form of the text that determines its interpretative context, rather than only its linguistic features or formal structure.

This realization highlights the fact that typical reading practices in all of human culture are as unnatural as they are highly developed [5]. When we read we do something that is unusual, even for animals that have evolved as we have. The requisite reading-attuned visual facility and acuity is remarkable. The way our eyes move as we read is extraordinary, not to say bizarre. In particular, for western readers, there is the hyperspeed movement from right margin to left that, literally, collapses the typographic dimension of prose and makes relatively distant words 'neighbors', both in the terms of our project and in the culture of reading itself. In other words, it is just

such strange, embodied, human, cultivated practices that 'make reading possible'; that constitute 'what reading is'.

Thinking further, it becomes clear that, from the perspective of a phenomenologically engaged philosophy of language, the practical art and science of reading that our project delineates is, substantially, a privileged metaphor or allegory, in so far as it is constrained to the particular support media associated with 'graphically embodied' language. The symbolic practices of language may be inscribed in, literally, anything [6]. Their (typo)graphical instantiations are, ultimately, pure convention, however elaborate, powerful, or ancient. While the ways in which we read are not necessarily, or even predominantly, determined by the 'typographic', our exploration of this dimension in the project shows that reading *has* dimensionalities that may be overlooked or undervalued, and that these are, and will always be, constituted by institutional histories and conventions.

Writing

Since Christopher Strachey's coding of a love letter generator in 1952, the institutions of writing and reading have been challenged by novel programmable media [7]. Until recently, the efforts of those devising and proposing new aesthetic or expositional practices of reading and writing have been transfixed by the novelty of what before seemed impossible: that the graphic word might move, for example, or that text might otherwise change over time [8]. Clearly it may, and it does. However, work focusing on innovation may do so without a sufficient regard for those dimensionalities of reading which, precisely, make reading possible. To explore and critique exactly those dimensions of practice that *maintain* readability during the processes of transformation, requires a degree of artistic and material-cultural care that can be missing in much digital literary work.

We make both stronger and more specific claims. We argue that text generation—as demonstrated by the project's Perigram, Lookahead, or Mesostic Readers [9]—is more 'readable', both literally and in terms of significance and affect, when it takes systematic account of the dimensionalities of reading practice, typography as one example, that continue to determine what is readable for contemporary humans. We hypothesize, for instance, that a Markov model without orientation in the typographic dimension is less readable, and less likely to generate significance or affect, than one that is projected into some appropriately designed and configured space-time for reading [10]. The consequences are not only literary. As ephemeral screen fodder, a Markov model may continuously spew its syntax without disturbing any institution other than idleness; however, when such a model writes websites and link farms, it populates the 'Dark Net' with post-human language, working a textual terraformation of the very world in which so many of us now symbolically exist.

Moreover, the project's readers themselves reach out and 'use' network services. Explicitly non- or post-human, but programmed with aesthetic or cultural-critical motivation on behalf of human readers, the project's agents query and transgress the access points provided by big software, attempting to negotiate and interact with the software architectures and algorithmic agencies they discover [11]. The service we have used most consistently and with significant results is, simply, search. For exact-match phrases, the counts of search results provide, effectively, real-time probability models across a huge corpus. Constructing searches that allow us, for example, to filter out those results associated with a specific author have enabled us to develop works—distributable and performable outcomes of the project—that engage with conceptual literature, rigorously problematizing contemporary conceptions of authorship, of copyright, of moral rights. These works explore just those characteristics of language that make it common. Language, inscribed or freely performed, is an inalienable commons which is nonetheless under threat precisely due to network services' intrusions and enclosures. The project's readers read, but as they do so, they test and transgress the algorithmic agencies of reading's new dimensionalities. They resist. They resist the enclosure of language, its vectoralization, the automation and algorization of symbolic practice. They seek out strategies of resistance in aesthetic vehicles.

Resisting

The *Readers Project* is inherently long-term, and in continual development. Rather than a work in itself, it is more a framework [12] for the development of aestheticized outcomes. In a note from our previous brief introduction to the Project, we wrote that:

> *the existence of "services" (or pretended cultural vectors) such as those provided by Google, combined with a burgeoning, aesthetically motivated "use" of these services, has profound implications for contemporary artistic practice. Such use also allows artists to engage critically and productively with important socio-economic and political developments in an unprecedented manner.* [13]

To address these implications, and elucidate those aspects of the project that critically engage with and resist the aggregation and enclosure of culture by big software, we turn to recent installations and publications revolving around the rubric *Common Tongues* [14].

In one recent installation, visitors enter the space opposite a projection displaying a 'perceptual reading interface' [15]. This interface maintains a focus of proposed reading attention at the center of the screen, while continually reassembling a typographic neighborhood around it [16].

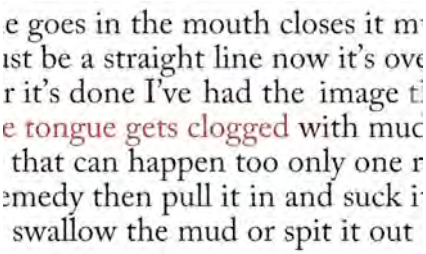

Figure 1

Figure 1 shows a Phrase-Finding Reader navigating a short text by Samuel Beckett, entitled 'The Image', later incorporated into his last longer prose work *How It Is* [17]. Unlike Readers described previously, the Phrase-Finding Reader follows a strict left-to-right linear progression through a text, as would a typical western reader. Rather than moving word-by-word, however, it reads the text in short phrases according to what we have called the 'Longest Common Phrase' algorithm. The procedure for the selection of phrases follows.

A 'Longest-Common Phrase' (or LCP) is the longest sequence of words, beginning from a specific point in a text, that can be found on the web, *not* written by the author or about the text in question. The *LCP algorithm* is the procedure, generally employed by Phrase-Finding Readers, to locate such phrases, via queries to public search engines like Google and Bing. The algorithm begins

by doing a search for the first K words [18] of a text, as an exact match (i.e. as a double-quoted string), with the addition of the author's name and title words of the text excluded. If the search returns no results, one word is trimmed from the end of the string and the search is retried (so that if a K value of 10 was initially selected, then we search next for an exact match on the first K minus 1, or 9, words). If once again there are no results, the phrase is shortened again by one (to 8 in our example), and the search is repeated. When finally there is a match, the number of results and the list of matching URLs are stored. If, for example, the search returns one or more matches for the first 6 words of the text, the next iteration of the algorithm will begin on the seventh word and proceed similarly. The algorithm terminates when the end of the text is reached, and all words have thus been included in a matching phrase [19].

```
LCPDriver(text, 10)     # start the driver

LCPDriver(text, max) :: Phrase[]

        var cursor = 0, phrases = Array
        while:
                var p = LCP(theText, cursor, max)
                if (p):
                        phrases.add(p)
                        cursor += p.words.length
                else
                        exit('no phrase')
                end if
        end while

        return phrases
end

LCP(text, cursor, max) :: Phrase

        var found = false, offset = max
        var words = text.substring(cursor,  cursor+offset)

        while (!found):
                var matches = doSearch(words + "-beckett")
                if (matches > 0):
                        return Phrase(cursor, words, matches)
                end if
                words  = text.substring(cursor, cursor + --offset)
        end while

end

type Phrase:
    var textindex       # the phrase's position in the text
        var words       # list of words in phrase
        var matches     # list of matching URLs
end
```

Figure 2 Pseudo-code for finding a longest common phrase

In a *Common Tongues* installation, the Phrase-Finding Reader may employ the LCP algorithm to read through the Beckett text via the perceptual interface; at the same time, on a screen recessed into a lectern, we may present the text in an animated codex-like opening, onto which the Project's readers—Perigram, Mesostic, Lookahead—have also been released. Here, viewers can experience the readers moving through the text as originally set in type, rather than via the perceptual reading interface. Additionally, on a set of smaller, iPad-like screens, visitors may view the generated output of each reader as described above. Networked clients, through which visitors may 'subscribe' to one or more readers, distribute their outputs to personal networked and mobile devices.

Figure 3

For Perigram and Mesostic Readers, such clients manifest primarily as text generators (see figures 3 and 4).

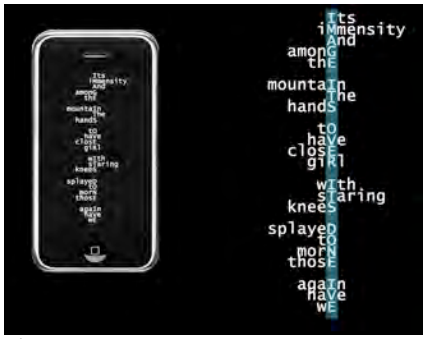

Figure 4

For the Phrase-Finding Reader, however, we have developed a series of textual visualizations that reveal when a phrase is or is not 'common', when it is unique to an 'authored' text, and when it has been commonly or uncommonly inscribed by one (or many) others.

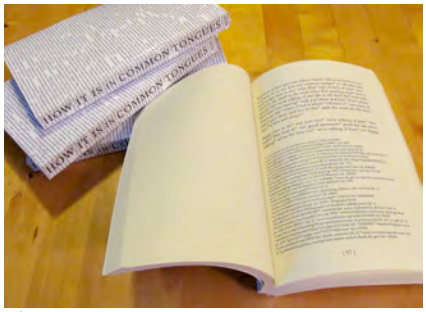

Figure 5

An additional 'client' deserves special attention here: specifically the printed, full-length book, *How It Is in Common Tongues*. We refer to this book as the 'client' of its processes of manufacture; while it is not a client in the usual sense, animated in real or networked time, it is nonetheless a client in that it bears the programmatic traces of its generation. It is also, arguably, the artifact of the *Readers Project* that most persistently resists and transgresses both contemporary and traditional practices of reading and writing. *How It Is in Common Tongues* was composed by searching, successively, for the entire text of Beckett's *How It Is* using a universally accessible search engine. We found, in sequence, the LCPs from *How It Is* that were composed by writers (or writing machines) other than Beckett. For each phrase we inserted and printed a footnote. The actual notes at the bottom of each page of the book give the shortest URL that we were able to retrieve for the phrases cited. The first in a sequence of citations provides, in parentheses, the date when we found the phrase on a given web page. The number following the date is the total number of occurrences found for the phrase.


past[b] moments old dreams[c] back again or fresh like those[d] that pass or[e] things things always and[f] memories I say them as I[10] hear them murmur[11] them in the mud

in[12] me that were without[13] when the panting stops[14] scraps of an ancient voice in[15] me not mine

my[16] life last state last version[17] ill-said ill-heard ill-recaptured[18] ill-murmured in the[19] mud brief[1a] movements of the lower face losses[1b] everywhere

recorded[1c] none the less it's[1d] preferable somehow[1e] somewhere

[b]www.nytimes.com/books/first/w/wiesel-sea.html (Aug 14, 2012. 1)
[c]www.cameracellularphone.org/tag/device (id. 1)
[d]www.kwarnmmeud.com/darknesslakorns/?p=1501 (id. 4)
[e]www.youtube.lu/watch?v=MAsddbn_2LM (id. 2) [f]cucurbite.wordpress.com/ (id. 2620000)
[g]gorwathswarband.guildlaunch.com/forums/viewtopic.php?t=85632376 (id. 2)
[h]pplsorce.com/people/Jim_Quaqua/ (id. 3) [i]celebrityzap.com/AJ_Langer.html (id. 5)
[j]www.parrothouse.com/hlthcare.html (id. 4290)
[k]kindle.amazon.com/work/sample?asin=B0021HHLW4M&pw=1&publisher=A3SWXVW6XL4CG8 (id. 1) [l]sonicliving.com/artist/182670/past (id. 3200) [m]www.blurb.ca/tags/design (id. 25) [n]www.iraised.it/s/web/index.php?page=7&q=come-back-quotes (id. 3)
[o]www.sqlsaturday.com/158/privacypolicy.aspx (id. 7070)
[p]www.ilovephilosophy.com/viewtopic.php?f=5&t=142604&start=75 (id. 1)
[q]pulsinemeter.com/military/Past-of-Hear.html (id. 2) [r]www.bartleby.com/84/31.html (id. 29900) [s]www.facebook.com/dectowing (id. 7860) [t]flpoa.com/headlines/resignation.htm

Figure 6

As a 'book', *How It Is in Common Tongues* resists interpretive assimilation in terms of copyright or the related moral rights of association and integrity; as a client of the *Readers Project* it is a critical aesthetic artifact.

How It Is in Common Tongues also resists conventional reading. As a process that rediscovers common language in an authored text, the book represents a conceptual interruption in the reading of a modernist classic; one that directs our attention toward the words that 'belong' both to all of us and to none of us. Less obviously, perhaps, the book and its making also resist the control of the search interfaces and indexes that were employed to enact and prove its principles of generation. These processes reclaim information about our language from services that have been built from the appropriation of our collective linguistic practice. Our literary aesthetic agents ignore and transgress network services' unilaterally-asserted 'terms of use', and build from this resistance a conceptual literary artifact intended as both commentary upon, and critique of,

the vectoralization of search; especially of search understood as linguistic practice and as practice-based research [20].

In Conclusion

We are far from having exhausted descriptions, analyses, or elaborations of the implications that might be derived from the Project's readers and their readings. When we say that the *Readers Project* is aesthetically oriented, we are aware that we may be constraining its practices and outcomes within certain specific institutions through which critical gestures are unlikely to be translated into action or event as such. Nonetheless, it is an important aspect of digital, networked practices that they act in, and upon, exactly those networks of which they are nodal parts. When the readers execute, they act on the networked world of big software and big data — the same world that is reconfiguring the ways in which humans read and write; and while the project's readers are denied and rejected by the unilateral terms set out by proprietary, global, transgovernmental, historically and contingently predominant, vectoralist 'services', the project's resistant appropriative algorithms are coded by, and for, those humans who are invested in the exploration of the contemporary literary, and in the cultures of reading and writing. These quiet readers, by demonstrating how they read, and by generating new readings, perform aesthetically and also 'act'. In doing so, perhaps, they can help us to do the same.

References and Notes

1. John Cayley writes from within Google Apps for Education as commissioned by Brown University, relatively protected from commercially motivated software agencies. Daniel Howe shares this document through his 'private' Gmail account, the terms of which may be more open to such agents' intrusions, though browser plugins like Ghostery and Adblock Plus mitigate their effects. As Howe works, his network monitoring software tells him that 3 servers (internet addressable computers) for Google Drive and 13 servers for Google Chrome are managing the transactions concerned with this 'writing'. For several of these servers, imagine hundreds of agents handling specific tasks and queries, many of these quite unrelated to the task of composition that Cayley (the human) pretends to undertake.

2. See Cayley, John. 'Terms of Reference & Vectoralist Transgressions: Situating Certain Literary Transactions over Networked Services', *Amodern* 2 (2013): <http://amodern.net>.

3. Once the hype had settled—as was often pointed out in the literature—it became clear to both scholars and practitioners that most of the formal characteristics of hypertext (linking through cross-reference or indexing, intertextuality, non-linearity) already existed in print culture, both materially and conceptually.

4. The Dark Net generally refers to those portions of the web not indexed by commercial search engines, and thus invisible to most users. In this essay we refer as much to the textual content of the net that is visible but not authored by humans, as to the invisible and or sequestered regions.

5. Dehaene, Stanislaus. *Reading in the Brain: The Science and Evolution of a Human Invention*, New York: Viking, 2009 provides a good, popular overview of cognitive science approaches to reading with, in chapter one, some indication of the unusual perceptual and cognitive facilities that reading requires.

6. Writing as language-in-the-graphic clearly dominates this and many other related discussions, but humans are all-but-universally familiar with the most common support media for language, namely orality. Moreover, there is the real-world culture of signing: a kind of 'visual orality'. In the project and in this essay, we practise and write after Jacques Derrida's *Of Grammatology*, and intend what we say about reading (and writing) to be applicable to linguistic practice in general.

7. Wardrip-Fruin, Noah. 'Digital Media Archaeology: Interpreting Computational Processes', *Media Archaeology: Approaches, Applications, and Implications*, eds. Huhtamo, Erkki and Parikka, Jussy. Berkeley: University of California Press, 2011, 302-22 —describes and analyzes Christopher Strachey's love letter generator, developed in 1952.

8. Two books by Christopher Funkhouser provide numerous examples: Funkhouser, Christopher T. *Prehistoric Digital Poetry: An Archaeology of Forms, 1959-1995*, Tuscaloosa: University of Alabama Press, 2007; and *New Directions in Digital Poetry*. New York: Continuum, 2012. A well-argued celebration of the openness of potential digital literary form can be found in: Eskelinen, Markku. *Cybertext Poetics: The Critical Landscape of New Media Literary Theory*. London and New York: Continuum, 2012.

9. Descriptions of these readers can be found on the project website at http://thereadersproject.org and also in Howe, Daniel C., and Cayley. John. '*The Readers Project:* Procedural Agents and Literary Vectors', *Leonardo* 44.4 (August 2011): 317-24.

10. Markov models or chains, based on the relative frequencies of collocations for arbitrary-length sequences of symbolic or linguistic tokens, are commonly used engines for text generation.

11. Deliberately avoiding official APIs and pointedly transgressing terms of service. See Daniel C. Howe's Processing and Javascript libraries for natural language processing and generative literature, *RiTa*, at http://www.rednoise.org/rita; and Howe, Daniel C. and Nissenbaum, Helen. 'Trackmenot', 2008, http://trackmenot.org.

12. The *Readers Project* framework is, in turn, built upon the RiTa toolkit, described in Howe, Daniel C. 'RiTa: creativity support for computational literature', in *Proceedings of the seventh ACM conference on Creativity and cognition (C&C '09)*. ACM, New York, NY, USA, 205-10.

13. Howe, Daniel C., and Cayley, John. '*The Readers Project:* Procedural Agents and Literary Vectors'. *Leonardo* 44.4 (August 2011): 317-24, note 18.

14. First installed for the exhibition associated with the ELMCIP organized conference 'Remediating the Social', at Inspace Gallery, University of Edinburgh, Nov 1-17, 2012. See http://thereadersproject.org/index.php?p=installation/rts2012/commontongues.html. *Common Tongues* is also documented in the ELMCIP Knowledge Base with permanent URL http://elmcip.net/node/4677. *How It Is in Common Tongues* is at http://elmcip.net/node/5194.

15. We have sometimes referred to this as a 'Perceptual Reader', but this is to use 'reader' in a different sense from that where we write about, for example, a Perigram Reader. A perceptual reading interface is capable of tracking the reading strategy of any of the Project's readers, always maintaining its neighborhood as the 'focal point' of the interface.

16. Our perceptual reading interface is derived from research on the cognitive science of reading—as centered on the visible field around the point of foveal vision/focus while reading—but it is also inspired by Bob Brown's 'readies', see: Brown, Bob. *The Readies* (originally Bad Ems: Roving Eye Press, 1930), with an afterword by Saper, Craig (ed.), Houston: Rice University Press, 2009.

17. Both 'The Image' and *How It Is* were originally composed by Beckett in French. See Cayley, John. 'Writing to Be Found and Writing Readers', *Digital Humanities Quarterly* 5.3 (2011): <http://digitalhumanities.org/dhq/>, for further bibliographic details and closely related discussion.

18. The initial K-value for a text is selected via a trial-and-error process that attempts to balance efficiency (the number of real-time searches required) and accuracy (the possibility that too low a value will miss longer common phrases). One optimization of the algorithm involves the selection of a high K-value and a binary search strategy where K is halved (rather than decremented) after each miss.

19. In the 'worst' case, for a totally unique text, the number of phrases will equal the number of words; each word only being found separately. Thus far in the project, no single word has returned a zero count.

20. Some time after completion of this work we learned, via our colleague Clement Valla, of a similar, if visually distinct web-based project, by Stéphanie Vilayphiou (2013), engaged with Michel Hoellebecq's 'La carte et le territoire' http://bcc.stdin.fr/LaCarteOuLeTerritoire/

SPATIO-TEMPORAL ANOMALIES WORKSHOP: DETRITUS AND MEANING

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Abstract

Spatio-Temporal Anomalies is an ongoing collaborative interactive hybrid media installation project between installation and sound artist Nick Wishart (Toydeath) and video/installation artist FMGrande. A workshop based on the project and its conceptual framework was held as part of ISEA2013 at the University of Technology Sydney, supported by the MediaLab in the Faculty of Arts and Social Sciences. This workshop attempted to explore the juncture between object, sound and modes of visual representation where humans interact with objects in a given time and space. It provided a hands-on approach to media art practices, utilizing modified objects, projections and soundscape. Participants were guided through ways of converting objects within a space into elements of an interactive milieu of triggered sounds, live feedback video loops and interactive experiences which could be used and incorporated into their own art practice.

Keywords: experimental, abstract, media art, spatio, temporal, anomalies, circuit bending

The *Spatio-Temporal Anomalies* project began in 2011 as a collaborative work between installation and sound artist Nick Wishart of the cult circuit-bending band Toydeath and video/media artist FMGrande, as part of The Underbelly Arts Festival on Cockatoo Island in 2011. The *Spatio Temporal Anomalies* workshop (hitherto referred to as the STA Workshop) was originally developed for the *Lab* process at Underbelly Arts 2011, where members of the public were invited to experience the collaborative process undertaken by the artists to produce the work. The artists spoke candidly about the artistic process, their methodologies, and the theoretical, logistical, technological and practical aspects of their work.

For FMGrande the Underbelly process signified a shift in practice from a more traditional video art based practice to hybrid media installation work with a focus on performance. The Underbelly Arts Festival 2011 version of *Spatio-Temporal Anomalies* took the form of a site-specific installation in the Convict Workshops on Cockatoo Island in Sydney Harbour. The large halls with World War I and World War II era machinery fixed to the cement floors, three storey high ceilings and large windows dating back to the 1840s created a challenging environment for the work.

The installation addresses the relationship between ideology, beliefs and hermeneutic paradigms that influence or determine the way we relate to objects and how our perceptions of space underscore an affective aspect to our understanding of this relationship. It is an *exploration* of the ways in which humans relate to and interact with objects and each other, and how this may be predicated on a fundamental linkage to functionalism, within a structuralist discourse, disseminated and propagated through social conditioning, mainstream media and social institutions. This self-referential critique of modernity and the way we relate to everyday objects is central to the development of all incarnations of the project for FMGrande and Nick Wishart.

The 2011 Underbelly Arts installation involved four found objects: a jug, an old television, a vacuum cleaner and a lamp, each painted white. Projected onto each object were representations of contexts in which we usually see each object, animated representations of each object and distorted views of spectators interacting with the objects.

The objects themselves were fitted with electronic sensors, which in turn fed data to a number of laptops at an operating desk where FMGrande and Nick Wishart created electronic soundscapes, which in turn responded to user interactivity with the objects. A proximity sensor interacted with a live video feed from a camera, which projected an image of the user interacting with the object on to a large three-meter by four-meter screen behind each object.

Approximately every hour FMGrande and Nick Wishart would perform a sound piece which interacted live with audience members entering the hall, the effect of which created an immersive space allowing for spectators to contemplate the form and function of each object on display, and *possibly* question the notion of space itself. Was it a performance, an installation or more sculptural in form? How was one to behave in the space, interact with others, or relate to the surroundings or the artists?

Whether or not patrons left with these questions in mind was not a concern of the collaboration. Both artists' primary concern was the creation of a unique work of art. They aimed to utilize any confusion and anxiety the work created to develop a methodological approach to understanding the myriad of ways in which media art can intersect with the spectator or general public.

The work is an ongoing collaborative project and is currently being developed as a new performance piece to be exhibited later in 2013 and beyond. In its current incarnation the artists are developing new modes of interactivity utilizing found objects or electronic detritus. The main thematic impulses meditating on notions of object, space, and our relation to and within them remain at the fore for FMGrande.

Fig. 1. Nick Wishart at the Lab, Underbelly Arts Festival 2011. (© FMGrande, Catherine McElhone Photographer)

ISEA 2013 Workshop

The *STA* Workshop for ISEA 2013 was held in Studios 1 and 2 of the Bon Marche Building, in the Faculty of Arts and Social Sciences, University of Technology, Sydney on the 8th of June, 2013.

To commence the workshop, video and installation artist FMGrande gave a short lecture on the conceptual framework which informed the initial *Spatio-Temporal Anomalies* installation at the Underbelly Arts Festival in 2011 and its future development as an installation and mode of art practice. He introduced the underlying theoretical concepts informing the work, including the notion of 'social-space' and the contextualisation of modes of space in Henri Lefebvre's work *The Production of Space* (1974), particularly in regards to the ways in which the installation attempted to intersect with many of the themes polemicized by Lefebvre [1].

For FMGrande, the notions of space and object were central to the project and the wider implications of the artistic enterprise. The ways in which we interact with objects within space informs our interaction with other humans and our relationships. For Grande the implicit objectification of the human form is a direct extension of the primacy of functionalist thought in relation to space and object in western society. He argues that we have become slaves to functionalism and begin to treat each other (humans) in the same way we treat spaces and ob-

jects. This is where human relations begin to disintegrate and become a trivial extension of a business, an enterprise, an interaction, a transaction. We are no longer communal beings whose primary purpose is to form part of a stable coherent society, where humanist moral codes and the centrality of positive loving behaviour dominate, but mere objects, as a piece of furniture or a television, to be traded like commodities, whose use value is determined by whatever market we find ourselves in. The irony being of course, that in early twenty-first century capitalism, most art will eventually become some form of commodity [2].

For FMGrande, artists' whose work have influenced and inspired the direction of the *Spatio-Temporal Anomalies* project emanate from a variety of disciplines and practices. They include media artists such as Alex Davies, Shona Kitchen, Nam June Paik, and Rodrigo Derteano, traditional influences from the dadaist and surrealist movements to fluxus artists and contemporary graffiti and mural art.

Alex Davies' installation work *Dislocation* (2004) is inspiring for the artists because it elucidates the possibilities within media art practice itself, particularly the use and choice of suitable technologies, but also the very practical use of illusion and trickery to create an other-worldly sense of space and our relation to it. As Mueller explains:
"4 small mounted monitors are set back in one wall of an enclosed installation space. You need to approach them closely to see what they are showing. It takes a moment to realise that what you can see is your own back, and those of your neighbours peering at the adjacent monitors. The screen flickers slightly, as if there is a minor disruption in transmission, and someone else enters the gallery, nearer to the camera, talking on a mobile phone. The sense of their presence behind you is spine-tinglingly palpable, as is the illicit feeling that you are eavesdropping on their conversation. But glance over your shoulder and you find the room is empty. The other presence was a phantom, a ghost in the machine"[3].

In many regards the sense of bewilderment, amazement, confusion and possible disappointment a spectator feels being fooled by the illusion created by *Dislocation* ignites in them a sense of cautious self-reflection for future engagement with contemporary art. This comes very close to what FMGrande terms a *Spatio-Temporal Anomaly*, where space and time are distorted to create an other-worldly feeling or sensation, the distortion being an intentional projection of the artists' will. Although for FMGrande this occurs at the point of inspiration, where the affect and resonance of a work of art inspires moments of conceptual lucidity, breakthroughs in cognitive association or sparks a moment of brilliance regardless of the contextual framing of the work.

Another influential artist is Shona Kitchen. Her work *High…Low* (2011) is a solar powered interactive illuminated installation in Deptford, United Kingdom, which is synchronised with the tide of a neglected and run down area of Deptford's tidal creek. It was developed as part of a consultative community regeneration project and is designed specifically for "repeat viewers…to ponder the changing nature of the sign and, with it, the tide which drives Deptford Creek" [4]. FMGrande used Kitchen's work as an example of how consultative processes in contemporary art can produce work that is socially engaging, generate a sense of wonder, and use modern technology to establish new forms of public art: "The art work, an illuminated sign made up of the words HIGH…LOW, spans 21metres/69feet and 1.5metres/ 6.5feet high. A total of 165 LED spotlights create this tidal indicator which sits on the creekside wall in front of the Faircharm Industrial Estate building – each lamp serving as a pixel. As the tide moves in and out twice daily, the letters within the words are illuminated to reflect the current level of the tide with each segment lasting approximately 20 minutes" [5].

Fig. 2. *Spatio-Temporal Anomalies*, Underbelly Arts Festival 2011. (© FMGrande, Catherine McElhone Photographer)

Nick Wishart's presentation at the ISEA 2013 STA Workshop focused on his art practice. His band *Toydeath* have toured internationally, released albums and have a solid cult status and following. The band performs dressed as invented toy characters and create music using modified toys. This is commonly referred to as circuit bending, where a toy is dismantled and a specific element is modified, such as a circuit added to allow the pitch to be modulated, or volume to be adjusted or sounds to be distorted. Utilizing the modified sounds, the band then develops and writes new music, and have performed at venues such as the Museum of Contemporary Art, Sydney, the Australian Museum in 2013, and various music venues and festivals, such as the One True Love Festival in Japan.

Wishart introduced participants to Reed Ghazala, considered to be one of the founders of circuit bending in the 1960s. He went on to describe the different forms of circuit bending, the electronic and philosophical principles based on experimentation and a discordant, chaotic and random sense of creation, where sounds and noises are discovered and formalized into existence though body contact testing and then soldering[6].

The work *CeLL*, a collaboration with artist Miles van Dorssen, formed a major influence which Wishart hoped to inspire possible directions for the Spatio-Temporal Anomalies project. Assembled in a large steel shipping container, "CeLL could be considered the epitome of minimalist visual sculpture. It is the aural elements that make it special. The mechanisms inside and, of course, the massive sound emanating from this banal steel box, make it an exciting and mysterious anomaly" [7].

Wishart then facilitated a practical workshop where participants assembled an electronic trigger kit, which could be used in conjunction with their own work. Participants were instructed in safety, technique and creative modes of experimentation, with regard to the construction of electronic kits and prototypes using soldering irons, wires, solder and appropriate tools. This was followed by a breakout session and discussion with FMGrande covering the possible uses of software and hardware available to artists wanting to experiment in interactive media arts practice. He demonstrated the use of *icubex* sensors with *vdmx* software to manipulate vision and sound, as well as setting up pedals from a dismantled organ to run a basic *arduino makey-makey* interface with *Ableton Live*. The workshop concluded with a broad discussion of the history of media art and the ways in which media artists utilize technology to develop and make new works.

Regardless of how we arrive at a particular space, in the physical sense, we are bound by its material construct once there. Whether one can overcome its history, the way it can shape our emotions, and the influences it has on the way we think, may depend on a person's ability not to experience the space at all, to shut off from all or parts of their surroundings, in a form of physical *selective perception* [8].

Selective perception can be a subconscious process of filtering observations into an order of importance, or a mind self-censoring device that activates when confronted with something anomalous to the expected order of how a space is *meant to be*. Regardless of how it occurs, the point remains that thoughts, however grounded in reality or the fantastical and illusionary, occur in space.

We become aware of the space predominantly through and within a mode and process of self-awareness. We place ourselves in a location in relation to our view of those around us and with an understanding of the context through which we came to be at a particular place at a given time. Our awareness of space can also involve a seemingly random contemplation of form and contact, where *form* is the way we interpret the physicality of a space in two, three or even four dimensions, and *contact* is the level of importance we place on the presence of others in our immediate vicinity.

More often than not, our perception of what others may be thinking about us leads to conclusions about how we fit in to a given space. This could be seen as another dimension of space, albeit a socially constructed one, yet still possibly measurable as a mathematical expression. As confident as we may be as individuals, we wear clothes, a suit and tie, a dress, a uniform, even torn jeans, because we are afraid (subconsciously or not) of what may happen to us if we don't. It is this implicit objectification of space that the *Spatio-Temporal Anomalies* project seeks to intersect with and question [9].

Whether through the accidental development of new works of sound, vision and interactivity, or the creation of new hybrid electro sculptural works through intentional experimentation with electronics, programming and found objects, the project seeks to explore and develop new approaches to media art practice. FM Grande is currently developing a series of sculptural experiments using old and new technology to create electro-sculptural works, which produce hybrid visual forms for print and screen. Some of these new works will be incorporated into upcoming *Spatio Temporal Anomalies* performances [10].

Fig. 3. *Spatio-Temporal Anomalies Workshop*, ISEA 2013, Sydney 2013. (© FMGrande, Shanya Buultjens Photographer)

References and Notes

1. Henri Lefebvre, *The Production of Space* (Blackwell, 1991).

2. Jonathon Freedman, *Professions of Taste; Henry James, British Aestheticism, and Commodity Culture* (Stanford University Press, 1990)

3. Lizzie Muller, *Evocative Objects, Strange Selves* in RealTime issue #70 Dec-Jan 2005 pg. 23

4.http://www.shonakitchen.com/high_low/index.html, accessed 17 July, 2013

5.http://www.shonakitchen.com/high_low/index.html, accessed 17 July, 2013

6.*Soundbuilders: Reed Ghazala*" produced by Liz Cowie and Thobey Campion, 2010 (http://www.vice.com/motherboard/soundbuilders-reed-ghazala—2) accessed 17 July, 2013

7. Bryoni Trezise, *Live Bait: Boxing the monstrous*, RealTime issue #60 April-May 2004 pg. 31

8.Ralph D. Ellis & Natika Newton *Consciousness & Emotion. Agency, conscious choice, and selective perception* (John Benjamins Publishing Company, 2005).

9. Miguel F Valenzuela, http://www.spatio-temporal-anomalies.com, accessed 10 August, 2013

10. Miguel F Valenzuela, http://www.spatio-temporal-anomalies.com/FMGrande, accessed 10 August, 2013

Science Fictional Aesthetics: The Novum & Cognitive Estrangement in Contemporary Art

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Abstract

Science fiction and contemporary art are connected by a set of related conceptual interests and formal expressions. This paper argues that two concepts in the critical study of SF, the novum and cognitive estrangement, are applicable to the practice and interpretation of much contemporary art. Discussing the work of contemporary new media artists whose practice has explicitly dealt with SF themes and tropes in various forms, the paper argues that the use of these two key critical SF concepts help to define a new and under-theorised cultural formation: the science fictional.

Keywords: science fiction, media art, novum, estrangement, video, installation, critical theory.

The space where science fiction and contemporary art meet is growing. From *Awfully Wonderful* at Performance Space in Sydney in mid-2011 and *Star Voyager* at ACMI in Melbourne in 2011-12, to a tribute exhibition to the late JG Ballard held at the Gagosian Gallery in London in 2010, this engagement between SF and contemporary art is made all the more apparent by the forthcoming 2014 Biennale of Sydney, titled *You Imagine What You Desire*, an exhibition that will make "…enquiries into contemporary aesthetic experience, and relate [it] to historical precedents and future opportunities to imagine possible worlds" [1].

This exhibition activity has coincided with a growing critical discourse on the meeting of these formerly separate worlds, such as 2012's Melbourne Art Fair SF-art symposium that included papers by theorists Amelia Barikin and Mark Von Schleggel, and the publication of *Making Worlds: Art & Science Fiction*, edited by Barikin and Helen Hughes. Much of this critical dialogue has taken place in Australia, but significant international conferences and symposia such as *Speculations: The Future Is _____*, 50 nights of lectures, debates and discussions presented by the online journal Triple Canopy and recently staged in New York, indicates a significant international interest.

One of the notable features of this activity has been the inability, or perhaps unwillingness, of artists and art theorists to define what it is they mean when they say "science fiction" or attempt to define its operations. Although science fiction in its cinematic and literary forms has been the subject of a sustained critical inquiry since at least the early 1970s, contemporary art theorists have largely overlooked this discourse in favour of more a general engagement with SF and to focus on selected aspects of the genre for the sake of individual artistic inspiration while applying the critical discourses of art to SF as a kind of errant, uncritical pop cultural subject ripe for exploitation. In this engagement, science fiction is typically defined as a kind of fiction concerned with technology and the future, speculating on the outcomes of the meeting of one with the other. While this definition is reasonable enough, it is also limiting because, as we shall see, science fiction operates in both perceptual and interpretive modes, and the 'futuristic' technology so familiar from culturally dominant SF sub genres such as Space Opera is but one aspect of the interaction between cognition and estrangement.

Von Schleggel, a critic and writer whose work has migrated from art criticism to science fiction proper - albeit SF published by *Semiotext[e]* – argues that while the mix of SF and contemporary art is a trend in the 'super culture' of the international art world, it amounts to a destruction of SF [2]. von Schleggel argues further that while this fusion of SF and art is taking place, a true melding is yet to come, and that it must be respectful of the "better angels of both cultures" [3].

While it may be said that the makers and theorists of contemporary art are increasingly drawn to SF, it cannot be said that the writers and theorists of science fiction are all that interested in contemporary art. Texts by SF theorists tend to concentrate on the relationship between visual media and the technology and techniques of SF illustration, such as studies of the works of illustrators who produce book and magazine covers, and the production designers and concept artists who test-run the imagery of Hollywood genre cinema.

Notable contributions from SF literary scholars - such as those by Gary Westfahl and George Slusser's in *Unearthly Visions: Approaches and Science Fiction and Fantasy Art* [2002] - are often undercut by America-centric views or historical misunderstandings of the production of value in contemporary art. Westfahl for example posits a history of science fiction illustration that ignores developments in the UK and France in the 1970s, a period he dismisses as the decade where nothing happened [4]. Slusser meanwhile claims that the general cultural value of contemporary art is measured by the so-called 'genius' of artists and their adherence to anti-human abstraction [5]. Roger Luckhurst's engagement with SF and contemporary art is more nuanced. His essay *Found-Footage Science Fiction* speculates on collage as a kind of narrative art [6], while *Contemporary Photography and the Technological Sublime, or, Can There Be A Science Fiction Photography?* [7], places the photographic work of a variety of contemporary artists into the tradition of the science fictional sublime. While the US artist John Powers has forged an idiosyncratic discourse between the iconography of Star Wars and Minimalism, in essays such as *Star Wars: A New Heap* [8] and on his blog *Star Wars Modern* [9], very few SF writers profess an interest in art history or design or any visual medium beyond cinema, or are meaningfully engaged with contemporary art. J.G. Ballard, whose life-long interest in art is well documented, and William Gibson's myriad references to media and product design in his fiction, are two rare exceptions.

So what might a 'true melding' of science fiction and contemporary art look like? And on what basis could their shared interests be understood? The definition of science fiction as a genre has been the subject of considerable debate but, broadly speaking, its critical analysis rests on one of two approaches: the first is the tracing and identification of historical antecedents to contemporary SF that in turn reveal an historical constancy of themes and approaches [10, 11], and the second approach is borne of critical theory that postulates and speculates upon generic tendencies and functions of a text [12, 13, 14]. It is in this second approach that two concepts can be applied to contemporary art, and specifically to new media - namely, the *novum* and *cognitive estrangement*.

Before we discuss these concepts, it is worth taking a moment to acknowledge that SF and art already share common ground. Since both are informed by critical theory, there might be a useful application of concepts found on the SF-theory side to contemporary art. More importantly, if the theory of SF literature and cinema might be applied to contemporary art, then what does that theory mean for an understanding of that intersection? It is the proposition of this paper that this

liminal zone is the *science fictional*, a trans-generic tendency of the contemporary cultural object that resonates with shared ideas and themes, but also speaks of a global and anxious aesthetic famously described by Frederic Jameson as a "vast, decentred complexity," where the "impossible totality of the contemporary world system" [15] is manifested.

One of the key theorists of SF is Darko Suvin, the Yugoslavian-born literary theorist whose definition of science fiction is a description of the action of a science-fictional text. According to Suvin, "Science fiction is a literary genre whose necessary and sufficient conditions are the presence and interaction of estrangement and cognition, and whose main formal device is an imaginative framework, alternative to the author's environment" [16]. Suvin's theory of *cognition* suggests, "the seeking of rational understanding" while *estrangement* is something that is "…akin to Bertolt Brecht's *verfremdungseffekt*", that is, a representation that "…allows us to recognise [the] subject but at the same time make it unfamiliar'" [17].

A key aspect of Suvin's theory is the concept of the *novum*. The novum is literally "the new thing" that crystallises the "difference between the world of fiction and … the real world outside" [18]. Frankenstein's monster is one example of a novum, so too spacecraft, time machines or any other fictional reality made strange by the addition of a counter-intuitive yet plausible narrative mechanism that allows the functioning of the story itself. Suvin's conception of science fiction is of a set of inter-related narrative mechanisms that rely on the audience's ability to recognise that mechanism without fully understanding the effect it produces. In this sense, "science" is much as Brian Aldiss defined it — an advanced, if confused, state of knowledge [19]. Suvin's theory also suggests a dialectic between estrangement and cognition. As SF theorist and historian Carl Freedman argues:

> "[Estrangement] refers to the creation of an alternative fictional world that, by refusing to take our mundane environment for granted, implicitly performs an estranging critical interrogation of the latter. But the *critical* character of the interrogation is guaranteed by the operation of cognition, which enables the science-fictional text to account rationally for its imagined world and for the connections as well as the disconnections of the latter to our own empirical world" [20].

According to Freedman, without estrangement this dialectic results in realist fiction but without cognition "the result is fantasy, which estranges, or appears to estrange, but in an irrational … way" [21]. Freedman argues that, beyond straightforward examples of more-or-less pure genre SF or Fantasy, certain ideas, themes and tropes are hard to justify as cognitively valid. For example, can stories contain as their novum, the concept of parallel universes and still be considered plausible? "The crucial issue for generic discrimination is not any epistemological judgment external to the text itself on [the question of] rationality or irrationality … but rather the *attitude of the text itself* to the kind of estrangements being performed" [22]. In other words, the context of the novum is crucial – presented in a rational, realist manner even apparently counter intuitive devices can be considered 'scientific'.

This is the basis of the twinned concepts of the novum and cognitive estrangement. So how might this apply to electronic and new media art? Let's take a look at three examples of recent science fictional artworks.

In 2010 the Mexican-Canadian artist Rafael Lozano-Hemmer installed the work *Solar Equation* in Federation Square, Melbourne, as part of the *Light in Winter Festival*. Featuring "the world's largest spherical balloon" the orb was a scale model of the sun some "100 million times smaller than the real thing" [23]. Projections on to the surface of the balloon were of "live mathematical equations that [simulated] the turbulence, flares and sunspots that can be seen on the surface of the Sun" and used the latest "solar observatory imaging available from NASA, overlaid with live animations derived from Navier-Stokes, reaction diffusion, perlin, particle systems and fractal flame equations" [24]. Although the amassed technology used to simulate the activity on the Sun created a schematic outline, *Solar Equation*, sited in the densely built centre of Melbourne, had an impressive visual impact. Writing on his website, the artist stated that:

> "While pertinent environmental questions of global warming, drought, or UV radiation might arise from the contemplation of this piece, *Solar Equation* intends to likewise evoke romantic environments of ephemerality, mystery and paradox, such as those from Blake or Goethe. Every culture has a unique set of solar mythologies and this project seeks to be a platform for both the expression of traditional symbolism and the emergence of new stories" [25].

Solar Equation allowed viewers with the appropriate iPhone app to remotely control the colour and seasonal variation of sun activity within the simulation. The artist also devised a real time tracking technology that allowed the five projectors beaming images onto the spherical surface to compensate for any movement. The immediate theatricality of the work was undeniable but it was in this process of interactivity and obfuscation of technique that the true nature of the artist's speculative 'new stories' was revealed. In an interview Lozano-Hemmer explained the desired effect of the piece:

> "From the point of view of someone watching it, it just looks like it works. But the engineering behind it enables that uncanny moment of actually having a registration between the real and the virtual [...] What I'm trying to do with my work is emphasise [...] how virtual the material is and how material the virtual is…" [26].

The duo known as The Otolith Group, the collaborative art project of Kodwo Eshun and Anjalika Sagar, and various collaborators, has explored science fiction narratives and themes, either as explicit drivers of individual works, or as a theoretical background. Their exhibition *Westfailure* [2012], for example, consisted of several related individual works which included text, photographs, vinyl album covers, sound, video and performance.

One work *Daughter Products* [2011], featured a suite of archival images in which the viewer witnessed "socialist camaraderie as delegations visit factories, schools, museums, etc" and in which "images act as delegates from the past: they disperse doubt in favor of previous political uncertainties and provide us with the hope of disturbing the temporal autonomy of the markets, myths and more" [27]. The framed prints were exhibited alongside *Anathema* [2011], a video work that imagined the liquid crystals in touch screen technologies as a connected, sentient life form.

The *Westfailure* exhibition sought to revisit "episodes from the archives of

the twentieth century in order to intervene into narratives that aim to capture futurity for market fundamentalism" [28]. The Group's works are typically fragmented and discursive, based or inspired by texts, and purposefully incomplete, like the unfinished or work-in-progress archive. As art critic Nina Power put it: "The past is littered with the debris [of failed] futures, while our present incorporates memory of hopes that have long been abandoned … The Otolith Group doggedly investigates these temporal slips and Utopian dreams of 'the temporality of past potential futurity'" [29].

Where the Otolith Group's work is diverse in form and eclectic in its engagement with SF, the work of Anne Lislegaard is formally more conservative. Lislegaard has explored science fiction narratives in her video, audio and installation pieces, extending and making abstract narratives derived from SF texts. The first work in her trilogy of SF video installations was *Bellona (After Samuel R. Delany)* [2005], in which a single projection of a 3D animation played out across a screen in the gallery space. In Delany's novel, Bellona was a future city in which space and time had become weird and uncertain, made strange by some unnamed event. Lislegaard's installation presented "…a psychological space, in which norms and standards seem to dissolve into chaos of anti-hierarchical conditions, a shifting labyrinth of displaced memories and inexplicable events, where lights switch on and off and doors and windows open and shut without any apparent reason" [30].

Crystal World (After J.G. Ballard) [2006] extended this approach into a two screen work. Side-by-side screens presented a dual projection where a computer generated, black and white animation of the interior of a room played out, broadly schematized but suggestive and eerie, the right hand screen intermittently giving way to text taken from the Ballard story of the title. Along with her later *Left Hand of Darkness (after Ursula K Le Guin)* [2008] Lislegaard's trilogy of video installations extended the room space of the gallery by matching the scale of the CGI room to the gallery's architecture and, by panning across the spaces, and cutting and dissolving, the visual effect was dizzying and disturbingly effective.

How might we apply the concept of the novum and cognitive estrangement to these works? The answer lies in context and placement, or as Freedman suggested, in the attitude of the texts. In both the work of the Otolith Group and Lislegaard, the viewer is required to entertain a state of estrangement. The Otolith Group's collagist approach to narrative requires an active engagement with the content that will allow the audience-viewer to decode their intentions, and counter-intuitively accept that, as in a science fiction story, the past can communicate with the future, or conversely, what is done in the present can change the past.

The metaphor of trans-temporal memory, like the time travel machine, is embodied in the novum of the exhibition. Lislegaard's work is more easily decodable as SF, with its moody soundtracks and audio mixes, yet its poetic engagement with SF shares something of the Otolith Group's discursivity, the novum found in the projection but also the gallery space itself. In Lozano-Hemmer's *Solar Equation*, the disjunction between experience and understanding underscores the mimetic nature of the work while simultaneously highlighting the strangeness of the experience. The viewer knows that the sun cannot float above Federation Square, but for an "uncanny moment" it did. This sort of slippage between the fictional and the real produces the cognitive estrangement effect of science fiction within contemporary art.

The curious aspect of these twinned concepts of the novum and estrangement is the willingness by which we enter the experience. As in the theatre, or at the cinema, on the page, or in the gallery, we entertain the fictional frame of the narrative. Science fiction shares with other genres, indeed with all fiction, the mystery of the withheld; the details of why and how and what for that are artfully suspended, those elements that urge us on to discover answers. Science fiction shares with media art the technological apparatus that allows the cognitive reasoning of fiction to appear rational, possible, and almost real. Lozano-Hemmer's *Solar Equation*, with its highly technical construction and delivery, acknowledges its artificiality while seducing us with the illusion that the sun has come down to Earth. We know that it isn't real, but the possibility is tantalising, and so we happily accept the estrangement. So too Lislegaard's mirrored rooms - even with the artificial outline and the shifting perspectives of her video installations, we entertain the estrangement of their placement, beckoned to walk through walls. In the Otolith Group's multi-part artworks we experience a fragmentary and diffuse narrative united by the frame of the gallery.

What might we deduce from this correlation between the critical theory of SF and contemporary art? In the zone of the *science fictional* we find a meeting of the better angels of SF and art, a comingling that raises intriguing questions about the nature and the affect of contemporary art and the aesthetics of media and electronic technologies. Jameson argued that a single artwork was capable of encapsulating the entire world, including the social, cultural and 'natural — those often antagonistic concepts — within a single object' [31]. Jameson described a fragmented and spatialised postmodern experience: "If experience and expression still seem largely apt in the cultural sphere of the modern, they are altogether out of place and anachronistic in a postmodern age, where if temporality still has its place, it would seem better to speak of the writing of it than of lived experience" [32].

Jameson suggested a reflexive relationship between art and wider culture, and in the specific example of science fictional aesthetics, an acknowledgement of the writing of our experience. Indeed, with the novum of the contemporary art object, and the willing estrangement of our cognitive abilities, we are experiencing a reflection not so much of a possible future, but of the here and now.

References

1. Biennale of Sydney, "Exhibition Overview", Biennale of Sydney, < http://www.biennaleofsydney.com.au/exhibition/exhibition-overview/> Accessed May 28, 2013.

2. Mark von Schlegell, *Dreaming The Mainstream: Science Fiction and* Contemporary *Art*, Melbourne Art Fair Lecture, August 4, 2012. https://vimeo.com/47304860, Accessed May 25, 2013.

3. Mark von Schlegell, *Dreaming The Mainstream: Science Fiction and* Contemporary *Art*, Melbourne Art Fair Lecture, August 4, 2012. https://vimeo.com/47304860, Accessed May 25, 2013.

4. Gary Westfahl, "Artists In Wonderland: Toward A True History of Science Fiction Art" in *Unearthly Visions: Approaches to Science Fiction and Fantasy Art* (Westport CT: Praeger, 2002).

5. George Slusser, "The Iconology of Science Fiction and Fantasy Art" in *Unearthly Visions: Approaches to Science Fiction and Fantasy Art* (Westport CT: Praeger, 2002).

6. Luckhurst, Roger "Contemporary Photography and the Technological Sublime, or, Can There Be a Science Fiction Photography?" *Journal of the*

Fantastic in the Arts. Pocatello: 2008. Vol. 19, Iss. 2.

7. Luckhurst, Roger "Found-footage science fiction", *Science Fiction Film & Television*, 2008, Vol. 1 Iss. 2.

8. Powers, John. "Star Wars: A New Heap, Or: How I Stopped Worrying and Learned to Love the Death Star", Triple Canopy, Iss. 4, November 11, 2008, <http://canopycanopycanopy.com/4/star_wars__a_new_heap> Accessed May 25, 2013

9. Powers, John. "Star Wars Modern." 2013. http://starwarsmodern.blogspot.com.au Accessed May 25, 2013.

10. Aldiss, Brian W. *Billion Year Spree: A History of Science Fiction* (London: Widenfeld & Nicholson, 1973).

11. Thomas. M Disch, *The Dreams Our Stuff Is Made Of* (New York: Simon & Schuster/Touchstone, 2000).

12. Darko Suvin, *Metamorphoses of Science Fiction* (New Haven, CT: Yale University Press, 1979).

13. Istvan Csicsery-Ronay Jr., "The SF of Theory: Baudrillard and Haraway". *Science Fiction Studies*, Vol. 18, No. 3, *Science Fiction and Postmodernism* (Nov, 1991), pp 387-404.

14. Damien Broderick, *Reading by Starlight: Post Modern Science Fiction* (London: Routledge, 1994).

15. Frederic Jameson, *Postmodernism, or, The Cultural Logic of Late Capitalism.* (London: Verso. 1991) p 38.

16. Suvin [12], pp 7-8.

17. John Clute & Peter Nicholls, eds. "Definitions of SF", Clute, J. Nichols, P., Stableford B. et al, *The Encyclopedia of Science Fiction*, (London: 1999 [2nd Ed] p 313.

18. Clute, Nichols, Stableford [17], p 313.

19. Aldiss [10], p 8.

20. Freedman, Carl. *Critical Theory and Science Fiction*. London: Wesleyan University Press, 2000, pp 16-17.

21. Freedman [20], 17.

22. Freedman [20], 18.

23. Lozano-Hemmer, Rafael, "Solar Equation", Lazano-Hemmer.com,. <http://www.lozano-hemmer.com/solar_equation.php> Accessed June 7, 2013.

24. Lozano-Hemmer [23].

25. Lozano-Hemmer [23].

26. Scott McQuire, "Mathematics as Media: An Interview with Rafael Lozano-Hemmer", Spatial//Aesthetics,. <http://spatialaesthetics.unimelb.edu.au/projects/large-screens-and-the-transnational-public-sphere/interviews/mathematics-as-media-an-interview-with-rafael-lozano-hemmer> Accessed June 7, 2013.

27. The Otolith Group, "Program", Australian Cinematheque, QAG/GOMA<https://www.qagoma.qld.gov.au/cinematheque/current/the_otolith_group>, Accessed, June 8, 2013.

28. The Otolith Group, "Westfailure", *The Otolith Group*, 2012. <http://otolithgroup.org/index.php?m=project&id=138 > Accessed June 7, 2013.

29. Power, Nina. "Waiting for the Future" *Frieze*, March, 2010.

30. Lislegaard, Ann. "Bellona". *Anne Lislegaard.com* <http://lislegaard.com/?p=220 > Accessed June 7, 2013.

31. Jameson [15], pp 168-9.

32. Jameson [15], p 154.

Intimate Disavowal: Turning Away from Technological Media Art

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Abstract

This paper describes a personal turn away from technological media art towards modes of practice that involve walking based interaction with the local environment. However, rather than stressing areas of difference, I consider points of unexpected continuity. The key association hinges on a common concern with dimensions of mediation. Within this context, I argue for a broader conception of mediation that is not restricted to technological media, but that can also incorporate our complex relation to aspects of lived immediacy.

Keywords: Media Art, mediation, Land Art

> I spotted a single red car panel poised on the final slope above the creek. I took some initial photographs and considered how I could remove a square section as cleanly as possible. The cutting proved difficult. It was awkward to stand on the steep slope. I wore through an entire grinding disk before eventually freeing the square [1].

Introduction

After many years of producing software art style projects, I recently produced a project that involved making a series of walks up into the escarpment forest behind my home to remove sections of illegally dumped cars with a battery-powered angle grinder. It was entitled, *A Line Made By Walking and Assembling Bits and Pieces of the Bodywork of Illegally Dumped Cars Found at the Edge of Roads and Tracks in the Illawarra Escarpment*, or *ALMBWABPBIDCFERTIE* for short. Apart from taking digital photographs, employing an electrically charged device, and writing blog entries, the project was light on technology. The emphasis instead was on walking and writing. The following essay reflects upon the implications of this turn away from the field of explicitly digital and technologically focused media art practice. I argue that the turn is not as simple as it seems. Rather than representing a nostalgic return to materially grounded, experiential intimacy, it discovers instead, within the texture of lived action, dimensions of mediation.

Turning

Things tend to begin with protestations of exhaustion and disinterest. So, in my case, I felt that I was starting to repeat myself in programming and that I could no longer sustain the monastic effort required to develop elaborate algorithmic systems from scratch.

I was searching for some means of developing a mode of practice linked to other spheres of my life, particularly my out door activities. I wanted to somehow render aspects of my walking, climbing, etc. in terms adequate to art. At the same time, I was not interested in simply representing my leisure activities as art. I was interested in their otherness to art - their distinct context of meaning, their aesthetic distance and reticence.

However committed I was to this turn, and however aesthetically ambiguous, I could still plainly recognize a standard conceptual pattern. I was turning from abstraction to the real material world, from mathematical architecture to embodied action, from technology to nature. In this sense, the turn can all too easily – even inevitably – take shape as a switch, as an alternation between two known states, two legible states. So my notional alternative to the sphere of coded abstraction risked adhering to the latter's most fundamental conditions. In turning, I risked failing to genuinely turn. I changed orientation without actually moving.

Rather than trying to directly avoid this dilemma, the trick was to allow it to play itself out. Instead of imagining a clear path away, it was perhaps better to scrupulously follow the logic of the switch.

So from within the context of my own turn I encountered strange relations. Instead of problems of mediation disappearing, they reappeared in a different guise. Instead of the simplicity of lived action, I discovered the complexity of medial layers, a constant and inextricable play of abstraction, event, thingness and representation.

Disavowal

Turning tends to have an intimate affective weight. It is accompanied by vows and disavowals. To avow is to publicly assert or acknowledge some truth. To disavow is to turn on that truth – to deny and repudiate it. It involves a denial of intimacy.

Disavowal is how art theorist Claire Bishop [2] describes the relationship between contemporary art and digital forms of production. For her it signals less a sudden end to intimacy than an unconvincing distance. Contemporary art, in Bishop's view, insists upon values defined in contradistinction to digital processes – values, for instance, of affect, uniqueness, subjective response, materiality and liveness. Yet at the same time it is integrally affected by new regimes of conceiving, producing and consuming work that are fundamentally enmeshed within digital forms. Bishop projects the sense of a fractured, ambivalent and contradictory space of contemporary art that fashions its dubious autonomy precisely in terms of everything that it wishes it were not. The legacy of Adorno's [3] aesthetic theory is evident here, but also the long tradition of critical discussion considering the relationship between art and the wider social and productive forms characteristic of modern and late capitalism. I am thinking, for instance, of Charles Baudelaire's [4] famous rejection of the artistic aspirations of photography, which simultaneously and inextricably provides the basis for conceiving the proper nature of art, as well as all the various avant-garde modernist traditions that alternatively embrace and reject technology. I am also thinking of Walter Benjamin's [5] harnessing of the apocalyptic character of mechanical reproduction to frame a new, perversely wrought potential for politicization and Clement Greenberg's [6] call for medium specificity, which only makes sense within the context of his perception of a more general and aesthetically disabling space of plural and cacophonous media. These are all examples of how notions of modern and contemporary art emerge through a complex and unresolved dialogue with various 'non-aesthetic' others.

The title of Bishop's essay, "Digital Divide", resonates with this history and immediately recalls Andreas Huyssen's, *After the Great Divide: Modernism, Mass Culture, Postmodernism* [7]. Huyssen traces the ambivalent relationship between modernism and mass culture. He stresses that the identity of high culture is strongly marked by its resistance to mass-mediated popular forms, taking coherent shape in terms of its avowed differences from popular modes of cultural production and consumption.

Fig. 1 ***ALMBWABPBIDCFERTIE @ Brogan Bunt, 2013***

Bishop's sense of the hermetic nature of contemporary art – its fragile distance from everything that surrounds it and lends it meaning - is legible in terms of Nicolas Bourriaud's insistence upon a "Law of Relocation" [8], which requires that art manifest its concerns with wider spheres of modern and postmodern production in displaced, indirect terms. His conception of relational aesthetics takes shape precisely in terms of its opposition to the characteristics of contemporary networked media. It frames contexts for human dialogue that avoid the glib, participatory rhetoric of social media, linking people together in local immediate situations rather than at a virtual and qualitatively impoverished remove.

Surprisingly enough, Bishop's most pertinent point of reference would seem to be Lev Manovich's conception of new media [9], particularly his recognition of a hierarchy of fundamental structural-material principles (numerical representation, modulation, variability, transcoding, etc.), as well as his emphasis on a clear cultural divide between experimental new media ('Turing-land') and contemporary art ('Duchamp-land') [10]. Bishop's sense of a neat split between these two cultural spheres is shaped by this now slightly outdated conception. The notion of new media itself and its associated exclusive focus on the consequences of digitization is no longer constitutive of contemporary media arts practice. Contemporary media art has a much broader range of concerns. Media art has moved beyond conventional media, beyond 'the digital' and into an intimate relation with all manner of other forms of contemporary art.

My point is that this rhetoric of disavowal no longer issues entirely from some rarefied space of alienated contemporary art. It emerges just as much from within the apparently marginal field of media art practice itself. Think of the various notions of the post-digital, or of all the efforts to return to the pre-digital (anachronistic media), or even the renewed emphasis upon media materiality – all of these contemporary tendencies look beyond the standard self-image of old-school new media production. They are no longer future-focused, no longer cutting edge technology, no longer so enmeshed in the virtual. The disavowal gains a more intimate character. The digital appears not as some external bogey, which can be simply embraced or avoided, but rather as the necessary basis for any kind of turn away.

Media Generally

It's funny that despite the sense in which the notion of 'media', in its dangerous plurality, in its resistance to formal reduction, has worked to unsettle the contours of the traditional artistic medium, it nonetheless retains, even within the field of media art practice, a more everyday and very resilient sense. The media are the overall complex of technological forms of representation and communication. They indicate a new ground for social interaction, in which immediate social contact gives way to indirect and distanced systems of exchange. Technological forms of communication, as inhuman prosthetic systems, emerge as emblematic of media – of everything in media that works to defer, displace and then illusorily reconstitute and reintegrate. However, this intense focus on technologically enabled mediation has at least one odd and counter-intuitive implication: it can restrict the scope of mediation. It can suggest that mediation is only ever technologically based. In this manner, it can also produce nostalgia for non-media, for the possibility of the unmediated.

My concern is to conceive media as a field of process that is not restricted to modern, technologically forms of communication. Instead mediation intrinsically affects all aspects of experience and being. It relates not only to cameras, screens, mobile devices, digital networks, etc., but also to skin, voice, particles and all manner of dimensions of the material and immaterial world. I am aware this broader conception of mediation has a perverse and counter-intuitive aspect. No longer exclusively focused solely on relations of distance, it considers modalities of intimate exchange. The advantage, however, is that it enables the experience of immediacy to be rendered in different terms – less as a space of pure simplicity than as a complex relational field.

The activity of walking, for instance, can be regarded as a fundamental lived means of medial engagement and discovery. *ALMBWABPBIDCFERTIE* led me to make repeated walks up into the temperate rainforest behind my home. The process was constitutive of my experience of that space. It shaped it in specific terms. I was aware of the steepness through the effort required to ascend. I was aware of the distance by the sense of how long it took to walk from one place to another. I was aware of the temperature, smells and sounds as I passed between the trees and along the narrow trails. The forest space cohered and gained intimate resolution precisely in terms of walking. In this sense, the activity represented a particular mediation of the forest - one that took form less in terms of absolute and abysmal distance than dimensions of intimate interaction. However, in my experience, this intimacy is never reducible to something fixed and self-present. It is intrinsically complex and layered.

Forest

The forest obtained a sense of autonomous force as I walked within it. Mediation – the complexity of an encounter, of an interaction – provided the basis for realising the alterity of the

forest. It was not as simple external matter that the forest affected me, but rather in terms of a negotiation that drew the material and the immaterial close together, that lent them a generative, emergent capacity.

The project began with a sense of incongruity. I was interested in the relationship between the escarpment rainforest and the abandoned cars. This seemed like a simple relation, but turned out to be complex. The cars were just the most obvious signs of a cultural clash and a field of impurity. Walking within the forest quickly revealed the extent to which the natural environment and the immediately proximate regional city were in close interaction. Of course, this can be regarded as a largely one-sided relation. The forest bears the scars of a century of logging and is infested with all manner of weeds and feral animals. It is crisscrossed with tracks, trails and rotting bits of coal mining and water board infrastructure. Yet at the same time, it somehow retains its sense of lush resilience. It continues to be a place of landslides, leeches and falling tree limbs. It remains a dark, green curtain looming above the city, steel works and suburbs. The illegally dumped cars appear as emblematic of this relation, of its moments of violence, silence and reprieve. I was particularly concerned with the skin of the cars – the surface patina in which the mediation of city and forest gains visible and tangible expression.

> These cars have spilled down the escarpment hills on dark and drunken evenings (or so I imagine, perhaps the truth is less colourful and violent, perhaps the violence only takes proper shape when the cars slip over the edge – when gravity kicks in – perhaps prior to that there is only the dull thought of getting rid of an unwanted thing), but as soon as they halt their slide, as soon as they come to rest, they gradually become something else. They are absorbed within the forest. They become habitat for lizards and possums. Their skin grows mottled and less reflective. That is what I notice the most – the shininess disappearing, passing into something else – something that I cannot quite describe. Abject and desolate perhaps, but also calm and oddly transcendent. Transcendent not of the forest, but of whatever originally shaped their existence. The wrecked cars remain at once very obviously cars, but at the same time, as dumped things, as things slowly decaying in the forest, they manage to transcend their identity as cars. They manage to transcend even the sense of ruin and simple decay. They gain another indeterminable skin [11].

Alongside this primary, thematic space of mediation, there was also my own activity - not only the walking, but also the cutting and collecting of car pieces, the recording of sequential images and the subsequent blogging of my experiences. Each of these involved dimensions of mediation. The cutting was a deliberately crude, but also minor and unobtrusive, mediation of the skin of the cars. But more than this it was also a mediation of art, bush walking and vandalism. It placed each of these in a new strange relation, in which no single one of them attained precedence, in which each could be interrogated in terms of the other. The photography and writing are more obviously forms of mediation, but here, very importantly, they obtained performative dimension. They were not simply modes of documentation. They entered into the tissue of the work as vital procedural features.

The issue of procedure provided the strongest point of association with my earlier algorithmic work. Drawing upon the tradition of Conceptual Art and my experience of programming, the project manifested a strongly procedural aspect. It was characterized by rules and iterative actions. So, for example, I walked to each dumped car site and back again home with a single rectangular piece. I cut seven different pieces from seven different cars on seven different days.

> I am interested in the problem of running embodied procedures, of setting myself a task and then dutifully following my own instructions. And this is really a straightforward process. There is nothing especially inspired or ecstatically phenomenological about it. It just has to be plainly and simply done and then just as plainly and simply described [12].

Whereas programming encourages a neat distinction between the conceptual work of procedural design and the inaccessible, machine-based work of procedural execution, I found that the process of enacting algorithms enabled a more fluid relation. New rules emerged from within the terrain of action itself. My focus shifted easily between abstract procedural architecture and the rich and qualitatively determined field of particular iterative events.

Finally, the issue of mediation affected the structure of the work itself. It emerged less as a coherent single thing – a performance, a piece of sculpture, a set if images or writings - than as an assemblage of medial layers, a juxtaposition of dimensions of event, action, image, memory and reflection.

I wonder whether this shift in perspective, this attentiveness to dimensions of mediation, could possibly have occurred without my having been absorbed for so long in technological media processes? Perhaps it was necessary for media to take pronounced technological shape before I could become sensitive to more general contours of mediation. Perhaps it was necessary that it become reified and clearly identifiable before it could obtain a more elusive and widespread currency - before it could return back down into the apparently unmediated world.

Conclusion

This very personally inflected paper describes a turn away from technological media to a concern with aspects of mediation within lived experience and the always impure, natural world. It suggests that this turn is not simply the prerogative of an alienated contemporary art, but that it occurs within the field of media art itself. Most importantly, this turn can have unexpected consequences. Instead of confirming what we have always thought about abstraction and materiality, mediation and being, it can work to unsettle these terms – enabling the implications of technological media to be thought more generally and beyond the horizon of the technological as such.

> Ultimately, I have the sense that my communication is intransitive. It lacks an object. It cannot adequately produce or imagine one. It is motivated not so much by the thought of reaching another person as by an intimate engagement with the escarpment field. The latter demands efforts of mediation because the field is endlessly elusive. It is never simply itself [13].

References

1. Bunt, Brogan. 2013. *A Line Made By Walking and Assembling Bits and Pieces of the Bodywork of Illegally Dumped Cars Found at the Edge of Roads and Tracks in the Illawarra Escarpment,* artists publication

accompanying “The Situated Line” exhibition, Articulate Gallery, Sydney, NSW, April 2013. (Blog entries also available at www.broganbunt.net).

2. Bishop, Claire. 2012. “Digital Divide”. New York: Art Forum, September 2012

3. Adorno, Theodor. 1997. *Aesthetic Theory* (trans. Robert Hullot-Kentor). London and New York: Continuum. Originally published in 1970.

4. Baudelaire, Charles. “The Salon of 1859” in *Charles Baudelaire, The Mirror of Art* (trans. & ed. Mayne, J.), London: Phaidon Press, 1955

5. Benjamin, Walter. 1973. “The Work of Art in the Age of Mechanical Reproduction” in *Illuminations.* Great Britain: Fontana.

6. Greenberg, Clement. “Towards a Newer Laocoon,” *Partisan Review* 7 (July-August 1940): 296-310

7. Huyssen, Andreas. 1986. *After the Great Divide: Modernism, Mass Culture, Postmodernism,* Indianapolis, Indiana: Indiana University Press

8. Bourriaud, Nicolas. 2002. *Relational Aesthetics,* Paris: *Les Presses Du Reel. P.67*

9. Manovich, Lev. 2001. *The Language of New Media.* Cambridge Massachusetts, MIT Press.

10. Manovich, Lev. 1996. ‘The Death of Computer Art’. http://www.thenetnet.com/schmeb/schemb12.html (accessed 21 December 2006).

11. Bunt, Brogan. Ibid.

12. Bunt, Brogan. Ibid.

13. Bunt, Brogan. Ibid.

Responsive Public Space - Performative Immersive Setting in Public Environments

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Abstract

Responsive Public Space (RPS) is a performative spatial environment integrating audio-visual composition responsive to the engagement of participants among themselves. In an interdisciplinary collaboration architects, artists, composers and computer vision specialists developed an environment in which participants can enter, move around, and - through interaction with each other - experience different fragments of a space-sensitive soundscape and its visual representation (sonification). A high-end tracking system allows multiple participants to be reliably tracked.

Keywords: Trans-disciplinary collaboration, human-human-machine interaction, immersive composition, tracking, responsive environment, public space, LED pixel installation

Responsive Public Space (RPS) is an interactive light- and soundscape installation in a public setting, designed to encourage engagement between participants. *RPS*, which includes a light surface that hangs over participants and a corresponding soundscape, tracks and evaluates participants' behaviour and translates this information into light and sound. In contrast with interactive artworks in which participants interact directly with the work (for example visually [1] or audibly [2]), here participants can only activate an 'active space' if they work closely together. Passers by are invited to react to the light- and soundscape, and so to each other's actions and reactions within the space. The experience becomes more intense as the number of participants increases, and the character of their interaction is represented through a space-sensitive architecturally constructed audio-light surface. Participants' collective behaviour, and the way in which they manage their spatial relationships, influence the quality of experience for each participant by determining the degree to which they transform the active space around themselves.

Instead of focusing on the relationship between human and machine, *RPS* investigates inter-human relationships, encouraging participants to create their own 'performative space' by interacting, and working, with their fellow participants. *RPS* investigates 'connection / disconnection' and 'isolation / togetherness' in urban environments in the information age; the audience enacts social 'nearness' as the main control parameters of the light-audio composition. The aim is to generate an immersive audio-spatial experience of 'nearness' that is enacted by participants' imaginary and novel sense of embodied space.

Concept

RPS responds to the curatorial theme 'Resistance is Fertile' with the proposition that technology has arrived at such cultural and technological maturity that it allows us to go back and explore physical intimacy by exploiting the aesthetic and social potentials of pervasive technologies. Through constant redefinition of the virtual environment, participants are able to develop a novel collective sense of space, and reinvent and expand their everyday perception of public spaces [3]. This work aims to take the virtual reality experience further, by generating an information space in which well known technologies are combined with great consistency to generate intimate human reflections.

The experience intensifies with the number of actors within the space and their collective behavior, and the quality of their relationship is represented by a space-sensitive soundscape and its visual representation on the architectural construction. By attaching new meaning to urban spaces, it fosters human intimacy and collective engagement. As the technology is invisible to the participants, it allows a different sensibility within the performative space and the musical performance itself, as compared with environments in which participants interact overtly with the technology.

RPS is a follow-up project of *Sensitive Space* [4], which processed the results of tracking and visually representing information derived from the relationships between participants (inter)acting within a certain space. In *Sensitive Space*, valuable information based on tracking data could be used for video/audio composition. *RPS* goes one step further and investigates how the space can be responsive to participants' behavior, and how the derived information can be re-applied to transform the space's characteristics and affect participants' experience. The open space is generated by the ever-changing dynamic feedback of the environment in architectural, visual and acoustic transformations. The objective is that a spectacle of simplicity and contradiction, action and reaction is created, in which one learns to find balance in a constantly changing, collectively created, non-haptic environment. Behind the interaction and enjoyment of the music, *RPS* seeks to allow a further, intangible level of psychological experience for the participant.

Fig. 1. Concept Image of the kinetic audio-light surface of *Responsive Public Space*, with participants (© ORTLOS).

The closeness of the participants to one another determines the size of their cognitive-scope. When two individuals meet, both their according light projections and their acoustic tracks melt together into one; when they part, each regains their own visually represented soundscape.

The technical background consists of four components: (1) The tracking system, which uses infrared to exclude distractions from the projections and detect only people in the open space; (2) The 'information cloud' above: a visual surface, made up of light-weight steel construction with LED Pixel elements which serve as projection screens, allowing participants to move freely in the space underneath; (3) the soundscape, generating acoustic 'relational feedback' of the movements in the space; and lastly, (4) the immersive environment, the visual representation itself, i.e. the implementation and integration of all included components.

Interaction and Composition

RPS is driven by a 'metamachine' which uses high-end 3D tracking software to provides a data stream for the evaluation of participants' movement and nearness (according to *RPS*'s interactivity concept), and distribute it between the light and audio systems. This interactivity concept refers to interactions, or 'nearness', in 4 states (Fig. 2). In each state the audio and light (kinetic surface, intensity of lights) has a particular mode of reactivity to the participant. The system also incorporates a rule that regulates the reaction of the light to the soundscape. The system aims to generate the greatest transformation from the greatest relative 'nearness' of people in the given space.

The sound composition is produced by a generative system which aims at providing 'relational feedback' to the participants' movement and activity within the space. Concrete, electronic, instrumental, and even historically referenced sound events are constantly remixed through regenerative combinations, while the activity and passivity of current participants defines the weighting of the composition details at any moment.

The system of the sound scape measures the number of participants, their distances from one another, and their positions and movement patterns. This data is transposed in real-time into a number of musical parameters which influence the density, harmonics, dynamics, style, duration, rhythm, tonality, and so on of different compositional layers. Pre-defined modulation methods and sounds are assigned to each participant, and their interaction is observed by the tracking system. The participants can transform the space through their direct involvement, influencing, for example, interpretation, remix, audio samples,

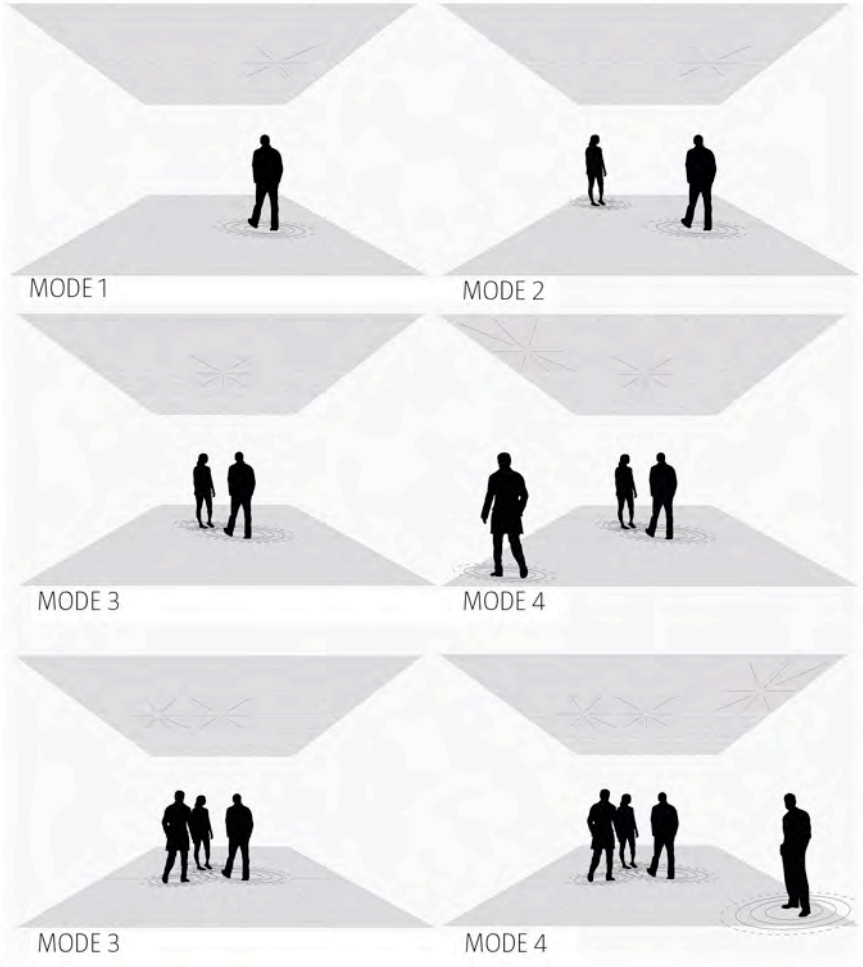

Fig. 2. Interaction rules implemented through the 'meta-machine' showing 3 states of interaction (© ORTLOS)

virtual instruments, groups of instruments, and perspective changes in the composition. The interaction modes are: 0 state = silence, 1 state = noise, 2 or higher state = composition (based the on number of people present).

The major aspects of visual representation are: real-time processing of the participants' positional data, and the visual representations of the physical phenomena of their interactions. The interconnection between sound and visuals investigates the responsiveness of space on both a physical and a virtual level (augmentation). There are several layers of visual information, separated by different surfaces, including tracking data, the intensity of interconnectivity between people, how long they stay close to each other, and so on. The visual representation focuses on the interconnectivity of people, which has to be seen as a feature of participants' immersive experience within the environment.

MAX/Msp/Jitter software is used in combination with the programming language *Processing.* The input data from the tracking device comes in OSC format, and is therefore in sync with the sound; all visuals are triggered live, not pre-recorded; and if a fluid or particle simulation is used, some patches may be prepared as ready-made samples.

The installation explores the social behavior of participants, analyzing relationship patterns; and with a growing number of participants - similar to swarm behavior - also its complexity. Participants can take part by simply walking into the installation space and exploring the audiovisual feedback loop in relation to themselves and to others in the space.

Thus input of behavioral data is processed, analyzed, and made audible as acoustic output, which then interacts again with the participants, through subsequent re-modulations and variations of the music. For each participant there is a range of behavioral possibilities: passive/active, non-conformist/hierarchical, individual/team-oriented, and so on, and and all of these parameters relate to social intelligence.

Participants do not need any previous knowledge of the system, they simply

use their body as an interface. Through the invisibility of its technology, *RPS* aims to produce a distinctively different sensibility in the performative space, a full-body immersion. The anticipated outcome is a multi-sensorial experience in which human movement transforms the soundscape and affects the multi-surfaced visual representations. The open space is generated by ever-changing dynamic feedback from the environment as a form of architectural, visual and acoustic transformation.

Based on the tracking data, the multi-agent simulation defines the following interaction parameters: timescale of movement, timeline of standstill, x/y coordinates of participants, and distances between them. The musical composition supports an impression of private space, and the sense of entering another person's space without permission. Through music-induced movement the private space temporarily expands to a public one. One of the main concerns of *RPS* is the promotion of active communication between participants. Their actions and interactions can dynamically construct and deconstruct the properties of the performative space, take into account their experiences, and dynamically transform the immersive, collective composition.

In *RPS* the tracker assigns an identity to each detected individual, and saves their last positions (x/y coordinates), their distances from one another, and the angles from the middle of the image to each participant). These parameters are sent (as OSC data) for each person and feach frame. Based on the participants' proximity to each other, the 'meta-machine' triggers generative audiovisual compositions which intensify the level of intimacy between participants. The system only produces feedback when at least two participants are interacting with the environment. In the case of overlap, the two tracks are fused; when a track splits - i.e. two participants close together separate again - a new track is generated, and assigned to one of the two.

Fig. 3. Possible implementation of *Responsive Public Space* in a relatively small public square; here the construction is suspended from trees, which define the performative space. All elements, such audio speakers, tracking camera, etc., are incorporated within the primary construction layer – a grid which can be adapted to the site (© ORTLOS)

Hardware

RPS is an outdoor light surface (Fig. 3) consisting of a lightweight architectural structure made up of two layers. The first layer is a rigid grid which has the function of bearing the loads; it is adaptable to different locations, and the second layer, an LED net which is attached to the grid. This LED net incorporates a great number of individually controlled LED lights (pixels). The grid surface is mounted to existing objects found on the specific site (for example light masts, trees and existing walls).

The installation measures approximately 6x4m (planned version), although an 8x6m version is also possible for tracking of 5 to 7 people.

The tracking system uses 3D camera sensing systems for accurate and consistent tracking of multiple participants (e.g. Microsoft Kinect).

The sound component consists of a matrix of 12 speakers, intended to achieve an ambient soundscape. Site-specific tests are crucial for the final set-up, for review of volume, noise level, weather conditions and so on.

The equipment is housed in weather-proof boxes.

The LED net of 2240 RGB Pixels with WS2801 chip on each one, controllable through ArtNet protocol by meta-machine running in Processing, is connected in series, and the light intensity of the LEDs is adjusted to the site specifics.

The installation can only be operated during the evening/night or during the cloudy weather, since the infrared-light tracking device is sensitive to daylight.

Fig 4. Photograph of the RPS installation premiere in Graz, late September 2013. Five people have created a group with a new participant approaching. This is the Mode 4 according to the interaction rules. The advanced version of the meta-machine operates differently depending on whether a group of participants is present in the system or not. This improvement encouraged participants to create groups and come together even more. (© ORTLOS)

Setting up and testing the installation

A workshop at *ISEA2013*, a prominent international symposium on electronic art and ideas which took place in Sydney

[5], provided a platform on which we have been able to realise the first functional prototype of *RPS*. All system components were successfully tested: the Kinect tracking device and tracking software, the meta-machine for control of visual and audio output, and the programmed acoustic composition triggered by predefined interactive rules. It was shown that a covered space with dimensions 6x4m, and a maximum of 5 participants, are suitable limits. However, outdoor conditions, particularly regarding infrared levels in daylight (one of the major issues with this tracking system) couldn't be tested. The participants of the workshop received their own version of control software in *Processing and MAX/MSP*, which they were able to experiment with, modify and even improve.

The final project has be premiered in late September 2013 in Graz, Austria, as a public, outdoor installation over a period of seven days, during which it was monitored and evaluated.[6] Generated data of users' behaviour on the three consecutive days will be visually represented in order to gain knowledge about human behaviour within such an environment, with a focus on social interaction between participants. The results will be published in a follow-up publication.

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Production of RPS:
Conception and Interface Design: ORTLOS, Ivan Redi, Andrea Redi, Brigitta Zics, Gudrun Jöller, AT/UK
Programming: NIRI, Marko Smiljanic, Radica Velinov, Obrad Stajic, SRB
Composition and Audio Programming: Hubert Machnik, D
Hardware Development of Visual Space: Sinisa Hristov, SRB
Tracking: Martin Kampel, Computer Vision Lab, University of Technology Vienna, Austria
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References and Notes

1. A. Camurri and M. Leman, 'Gestalt-based Composition and Performance in Multimodal Environments', in *Music, Gestalt, and Computing, Lecture Notes in Computer Science.* Vol. 1317. Springer Berlin/Heidelberg, 1997, pp. 495-508.

2. F. Aurenhammer., 'Voronoi diagrams – A Survey of a Fundamental Geometric Data Structure', in *ACM Comput. Surv*. 23, 3, 1991,pp. 345-405.

3. C. Stauffer and W.E.L Grimson, 'Adaptive Background Mixture Models for Real-Time Tracking', in *IEEE Conference on Computer Vision and Pattern Recognition*, vol. 2, 1999, pp. 246-252.

4. Web page last accessed July 2013: http://www.ortlos.com/space_engineering/projects/sensitive-space/

5. 19th International Symposium on Electronic Art, Sydney, Australia, 7-16 June 2013. http://www.isea2013.org/events/responsive-public-space/

6. Web page last accessed October 2013: http://www.ortlos.com/space_engineering/news/responsive-public-space/

TREES AS TIME CAPSULES: EXTENDING AIRBORNE MUSEUM HARTENSTEIN TO THE FOREST

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Abstract

Battlefield museum "Airborne Museum Hartenstein" is housed in a villa which served as the headquarters of the Allied Forces during World War II. Since heavy fighting took place in the surrounding forest, many of its trees have bullets hidden inside them. We propose an augmented reality (AR) application which superimposes X-rays of the trees upon their trunk, revealing their hidden content. Our approach suggests that augmented reality, when deployed as a means to visualize what is inaccessible to human vision, can be relevant to cultural heritage applications. We present a working prototype of our application and conclude with reflection and future possibilities.

keywords: augmented reality, cultural heritage, museum, X-ray, bullet, tree, World War II, Battle of Arnhem

Introduction

"Airborne Museum Hartenstein" [1] (Fig.1), located in the Dutch village Oosterbeek, is a battlefield museum about the Battle of Arnhem which took place during World War II. Housed in a monumental nineteenth-century villa, it exhibits the world's largest collection of militaria from the famous battle. The villa served as the headquarters of the British Airborne Division in September 1944, and heavy fighting took place in the forest surrounding the museum.

The AR Lab, a cooperative effort between the Royal Academy of Art in The Hague, Delft University of Technology and Leiden University, was invited by the museum to realize a projection mapping on the villa's exterior. However, during our first brainstorm session with the museum director, we made a serendipitous discovery which changed the course of the project considerably. The director explained that foresters have difficulties cutting down trees in the area around the museum; the trees contain many metal fragments such as bullets and grenade shrapnel, traces of the heavy fighting which took place during the war. The trees were still young when the bullets hit them and, over the course of roughly 70 years, the trunks have completely encapsulated the fragments. When you know what to look for, you can see scars where bullets and other metal fragments pierced a tree in its younger years (Fig.2).

We find it fascinating that these trees have taken on the role of time capsules. The museum itself houses the world's largest collection of militaria from the Battle of Arnhem, but few visitors are aware of the physical remains of the battle in the now peaceful forest just outside the museum. By disclosing the hidden content inside the trees we aim to extend the museum narrative to its surrounding space. We propose an augmented reality application which runs on smartphones and tablets. By pointing the device's camera towards pre-selected trees, its screen will show an X-ray of the tree superimposed on the real tree, giving the illusion that you can look inside it.

Fig. 2. Scar caused by a bullet which once pierced the tree. (Photo © Wim van Eck.)

This article describes the current implementation of our application which we presented at ISEA2013. Section 2 considers museological aspects of battlefields while section 3 describes various outdoor augmented reality systems in the cultural heritage sector. Our prototype is described in section 4. The article concludes with a reflection on our prototype and future possibilities.

Fig. 1. The villa in which Airborne Museum Hartenstein is housed. (Image from Wikimedia Commons.)

Context

Military history events such as battles are often commemorated and interpreted outdoors. Battlefield sites, military cemeteries and memorial monuments are outdoor places for experiencing history, constructing national identities and paying respect to the dead. They are also popular tourist destinations visited by people with diverse interests and motivations [2, 3]. Despite the forceful nature of war, the outdoor traces of conflict are often minute: Brandt has commented on the challenge faced by military museums who wish to incorporate the little that is left after destruction into their narratives [4], while Newman reminds us that battlefields are severely subject to landscape changes [5].

Typically, battlefield sites and military museums are located near or at the original site of events. They are places to experience history where it happened. A wide range of museums are site museums, i.e., museums located at the original site of their subject. Still, what constitutes a site and establishing where

a site begins and ends is a discussion in itself [6]. Regarding battlefields, Carman makes a distinction between a battlefield as a preserved and marked site and a battlefield as a (part of the) landscape [7]. The forest surrounding the Airborne museum is officially a public terrain. While not a clearly marked site, the area is often perceived as part of the museum and used for activities organized by the institute. Yet, it is likely that a stroll in the forest may differ from a visit to a marked battlefield site and may be free from preconceptions about correct visitor behavior. It may also be motivated by emotional motives, for example, a need for relaxation or a desire to enjoy nature. Therefore, we suggest that a technological intervention into this space should be non-intrusive and should allow for an appreciation of nature as much as an appreciation of history.

Interestingly, trees and garden facilities are often utilized as means to commemorate military history events. An overview of the use of trees as means to memorialisation, for example at locations such as war cemeteries or war monuments, is provided by Cloke and Pawson [8]. The authors comment on our desire to use a living and unruly organism as the carrier of a fixed memory. Simply put, nature can and will take over, resulting in landscapes other than the ones originally designed. Furthermore, trees and outdoor spaces afford new meanings, memories and usages to emerge.

Related Work

This section discusses a number of outdoor augmented reality applications from the cultural heritage sector. Our overview is not an exhaustive survey but an attempt to highlight trends in the use of augmented reality for experiencing heritage outdoors. Focus is on the augmented reality end of the virtuality continuum [9] (virtual reality systems are not relevant to our discussion). Audio augmentation, while potentially powerful, is outside of the scope of this article.

Potential applications of augmented reality for cultural heritage are found in early writings about the field. For example, Azuma, in his influential and widely cited survey of augmented reality in 1997, envisioned augmented reality applications that bring archaeological sites and battlegrounds back to life with reconstructions of what it was like. Interestingly, Azuma's vision explicitly drew upon the tradition of living museums, i.e. open-air museums with enacted displays: “A tourist equipped with an outdoor AR system could see a computer-generated version of Living History” [10].

The majority of outdoor augmented reality systems for cultural heritage offer visual reconstructions of the past on location. Visual material is overlaid/superimposed upon ruins, remains or contemporary versions of buildings in an attempt to visualize what once was there. For example, “Archeoguide”, an on-site augmented reality tour guide for the Olympia archaeological site in Greece, delivers 3D reconstructions of monuments that are now in ruins [11]. 3D reconstructions of what is long gone or replaced are provided in the following systems: the MARS system [12], a pioneering system of mobile outdoor augmented reality for the Columbia University campus, USA; the Ename system [13], a kiosk-based system augmenting the foundations of the Benedictine abbey church, Belgium; the Augurscope system [14], a tripod-mounted mobile mixed reality system for the destroyed medieval castle of Nottingham, UK; and situated simulations of Parthenon, Greece and the Temple of Divus Iulius, Italy [15]. In addition to 3D reconstructions, Papagiannakis et al. introduce virtual characters and narrative elements to revive the ancient site of Pompeii, Italy [16]. Note that the above-mentioned projects use a variety of displays from head-mounted displays, to custom hardware, to smartphones.

While many augmented reality systems strive for reconstructions by means of detailed 3D models, a number of projects opt for reconstructions based on 2D imagery. For example, the “Cultural Heritage Layers” system [17] delivers earlier views of buildings on location based on historic media such as drawings, paintings and archival photographs. The approach is proposed as a means to both reduce computational requirements in the client and deal with a lack of (high quality) 3D content. The system was used to deliver earlier architectural views of the Reichstag building, Berlin, Germany and the Reggia Venaria Reale palace, Turin, Italy. The strategy of superimposing 2D archival material on the 3D environment is employed by several smartphone applications for use in urban outdoor environments such as the “London Street Museum” app by the Museum of London, UK [18].

One of the most powerful attributes of augmented reality is its capacity to visualise what is invisible, to make visible what has gone or been replaced. Yet, many aspects of the technology seem to be neglected in the domain of cultural heritage despite their widespread use in other application domains. Consider, as an illustration, several medical augmented reality systems [19]: such systems employ augmented reality to visualize what is inaccessible to human vision rather than what is no longer there. Expanding human vision is core to medical imaging technologies, from X-rays to MRI imaging, and several medical augmented reality systems superimpose views from multiple imaging modalities. The relevance of augmented reality applications that exploit multi-spectral imaging views to cultural heritage applications is nicely exemplified in the “Augmented Painting” project [20]. This project uses augmented reality to visualize “The Bedroom” painting by Vincent van Gogh in different imaging modalities such as X-ray and infrared imaging. Given the particularities of our project,

Fig. 3. Scanning our tree trunk with a portable X-ray scanner. (Photo © Wim van Eck.)

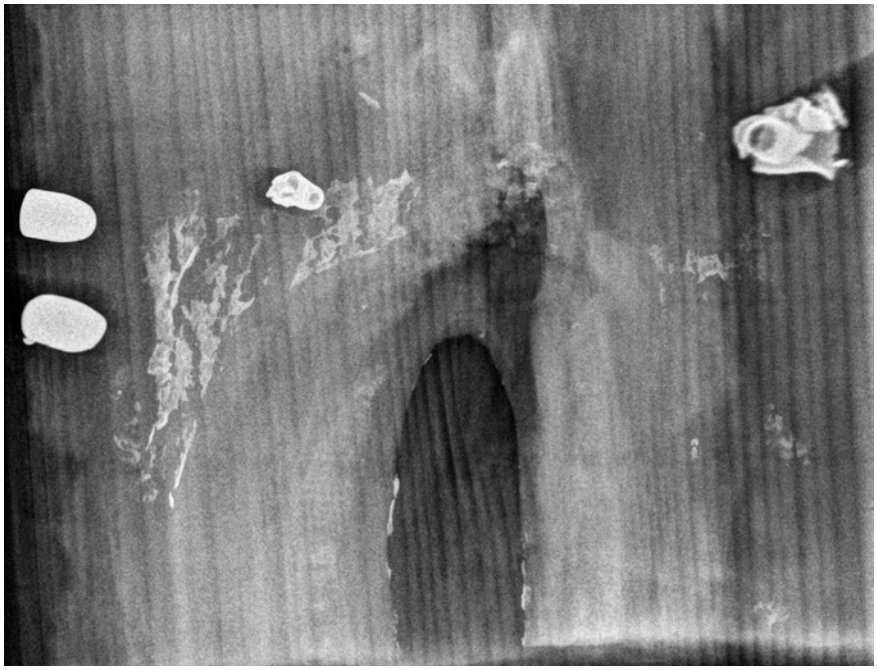

Fig. 4. Actual X-ray of the tree trunk. (© Wim van Eck.)

it is clear that the visualisation of the inaccessible, that is, what is hidden from human vision, is an appropriate direction in which to go.

Current Implementation of the Application

The main goal of our application is to make the museum visitor or passer-by aware of the physical remains of the battle outside the museum. Because of the travelling distance between our institute and the museum, we chose to first develop a prototype at our lab using an ordinary piece of tree trunk. Obtaining a tree trunk was easy but obtaining a tree trunk with bullets inside was somewhat of a challenge. Since no trees around the museum were scheduled to be cut down, we had to find an alternative way to put bullets in our tree trunk. Members of "Defensie Schietvereniging", a rifle club for employees of the Dutch Ministry of Defence, were willing to help us. They arranged genuine World War II weaponry from their depot (a Lee Enfield .303 rifle, M1 .30 carbine and Browning Hi-Power .9mm handgun) and fired multiple rounds at our tree trunk with genuine ammunition.

Scanning the bullets inside the tree trunk is another key element for the realization of our application. There are many stationary X-ray scanners on the market but only portable scanners are of use to us since eventually scanning should take place on location. While searching for a portable X-ray scanner, we came in contact with "Mijn Paardenarts", a Dutch veterinarian who utilizes a portable X-ray scanner to examine horses on location. Fortunately, they were keen on helping us and at our institute we X-rayed our tree trunk from multiple angles (Fig.3). We merely expected the scans to display the bullets as white blobs on a black background but the quality of the scans was much better than expected. The bullets are easily identifiable and the structure of the tree itself is displayed with much detail so that even the tree-rings are clearly recognizable (Fig.4).

With all necessary parts available we commenced building the augmented reality application itself. We chose augaugmented reality software Vuforia [21] for development since it had proved its stability and ease of use during our previous projects and smoothly runs on mobile devices. To position a virtual layer upon a physical object, the augmented reality software must be able to derive real world coordinates. Technically, it is possible to use the scars on the trees as augmented reality markers since they have unique shapes and are positioned at the location of the bullets. Nevertheless, a sign on the trees is needed to inform the public about the project. Using this sign as an augmented reality marker offers better tracking quality since it can be designed with the requirements of the software in mind.

We do not wish to merely overlay the X-rays on the physical tree but aim to give the impression that you can look inside the tree itself. To realize this illusion we created a 3D scan of the tree trunk using the freely available software 123D Catch [22]. Using this geometry we created an occlusion layer, giving the impression that there is a real hole in the physical tree through which you can see the virtual content (Fig.5).

Discussion and Conclusion

We presented our application at the ISEA2013 Symposium on Electronic Art where we received feedback on the project. Among other comments, we were asked if we could create a full 3D reconstruction of the bullets since we had already made X-rays from multiple angles. Although we had considered this option during our design process, we chose to

Fig. 5. Our prototype in action. (© Wim van Eck.)

keep the visuals as pure as possible as the X-rays turned out to be particularly detailed and aesthetically pleasing. Another question challenged the usage of augmented reality for this project. Indeed, we could adopt a low-tech solution and simply attach a print-out of the X-ray onto the tree. However, attaching a print-out on the location of the actual bullets would occlude the scars caused by the bullets which once pierced the tree, hiding an important aspect of the story. Augmented reality also allows an individual to experience the sensation of truly looking at the inside of the tree to discover its content. Another possibility would be to project the X-rays upon the trees, though this would only be an option after sunset when there is less natural light. By that time, the museum would be closed with few people left in its surroundings, so this option would be applicable for special evening events only.

The trees around the museum are currently under the supervision of the local town counsel, not of the museum. Trees are chopped when deemed necessary and there is no agreed conservation policy. A question to consider is whether these trees have a historic value and if they should be treated as museological objects. Or are they war memorabilia such as the "bullet in wood" items, bullets encased in pieces of tree trunk, branches or even fence posts auctioned on Ebay? Similar questions apply to the site itself: Should the forest area be actively managed as a battlefield site? Independently from the terrain's status as a battlefield site, controlling the natural development of the terrain would be a challenge. Our project can be deployed even in informal settings such as a public and unmanaged forest. At the same time, by revealing the traces of war trapped inside the trees, the project makes questions of preservation and management more relevant.

Our prototype demonstrates that it is technically possible to realize this project on the museum's location. The Airborne Museum Hartenstein showed great enthusiasm and is willing to aid us our in our endeavour to realize the final application. As hidden traces of fighting may be waiting to be discovered in other types of objects, in buildings for example, we are confident that our approach can be of relevance to other locations as well.

References and Notes

1. Airborne Museum Hartenstein, <http://www.airbornemuseum.nl/>, accessed 6 July 2013.

2. Ria Dunkley, Nigel Morgan and Sheena Westwood, "Visiting the trenches: Exploring meanings and motivations in battlefield tourism," *Tourism Management* **32**, No. 4 (2011) pp. 860– 868.

3. Caroline Winter, "Battlefield visitor motivations: Explorations in the Great War town of Ieper, Belgium," *International Journal of Tourism Research* **13**, No. 2 (2011) pp. 164–176.

4. Susanne Brandt, "The Historial de la Grande Guerre in Peronne, France: A museum at a former First World War battlefield," *Museum International* **56**, No. 3 (2004) pp. 46–52.

5. Mark Newman, "Why fight for battlefields", *Landscapes* **4**, No. 2 (2003) pp. 34–43.

6. Hermanus Johannes Moolman, "Site museums: Their origins, definition and categorisation," *Museum Management and Curatorship* **15**, No. 4 (1996) pp. 387–400.

7. John Carman, "Battlefields as cultural resources," *Post-Medieval Archaeology* **39**, No. 2 (2005) pp. 215–223.

8. Paul Cloke and Eric Pawson, "Memorial trees and treescape memories," *Environment and planning D: Society and space* **26**, No. 1 (2008) pp. 107–122.

9. Paul Milgram and Fumio Kishino, "A taxonomy of mixed reality visual displays," *IEICE Transactions on Information Systems* **E77-D**, No. 12 (1994) pp. 1321-1329.

10. Ronald T. Azuma, "A survey of augmented reality," *Presence: Teleoperators and Virtual Environments* **6**, No. 4 (1997) pp. 355–385.

11. Vassilios Vlahakis et al., "Archeoguide: An augmented reality guide for archaeological sites," *IEEE Computer Graphics and Applications* **22**, No. 5 (2002) pp. 52–60.

12. Tobias Höllerer et al., "Exploring MARS: Developing indoor and outdoor user interfaces to a mobile augmented reality system," *Computers and Graphics* **23**, No. 6 (1999) pp. 779-785.

13. Daniel Pletinckx et al., "Virtual-reality heritage presentation at Ename," *IEEE MultiMedia* **7**, No. 2 (2000) pp. 45–48.

14. Holger Schnädelbach et al., "The Augurscope: A mixed reality interface for outdoors," *SIGCHI conference on Human factors in computing systems: Changing our world, changing ourselves* (2002) pp. 9–16.

15. Gunnar Liestøl, Terje Rasmussen and Tomas Stenarson, "Mobile innovation: Designing and evaluating situated simulations," *Digital Creativity* **22**, No. 3 (2011) pp. 174–186.

16. George Papagiannakis et al., "Mixing virtual and real scenes in the site of ancient Pompeii," *Computer Animation and Virtual Worlds* **16**, No. 1 (2005) pp. 11–24.

17. Michael Zoellner et al., "Cultural heritage layers: Integrating historic media in augmented reality," 15th International Conference on Virtual Systems and Multimedia 2009 (2009) pp. 193–196.

18. Museum of London, Street Museum, <http://www.museumoflondon.org.uk/streetmuseum.html>, accessed 6 July 2013.

19. Tobias Sielhorst, Marco Feuerstein and Nassir Navab, "Advanced Medical Displays: A Literature Review of Augmented Reality," *Journal of Display Technology* **4**, No. 4 (2008) pp. 451–467.

20. Wim van Eck and Yolande Kolstee, "The augmented painting: Playful interaction with multispectral images," *2012 IEEE International Symposium on Mixed and Augmented Reality* (2012) pp. 65–69.

21. Vuforia, <https://www.vuforia.com/>, accessed 6 July 2013.

22. Autodesk 123D Catch, <http://www.123dapp.com/catch>, accessed 6 July 2013.

OCCUPY THIS: A DIALOGIC DÉRIVE

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Abstract

This dialogue is the text-based component of an evolving performative multi-media lecture. By re-reading Guy Debord's *The Society of the Spectacle* [1], in relation to the global Occupy movement and the rise of social media, we ask: in what ways does the proliferation of digital imagery enable and limit this recent form of political activism? By subjectively responding to selective quotations from Debord's writing, we link the triumvirate of global capitalism, public space and digital technology, producing commentary on the displacement imposed by contemporary 'spectacular' technologies, the networked 'technical image' and the politics of public space.

Keywords: situationism, resistance, Occupy, Super 8, Žižek, digital media

This text takes up Vilém Flusser's call for a historically informed critical unpacking of what he calls the 'technical image' [2], and in doing so we accept Lev Manovich's insight that the 'avant-garde became materialized in a computer' [3]. We enlist avant-garde techniques of sampling, serial and repetitive strategies to execute a technological 'dérive' [4], a performed textual analysis, expressed through its gaps and silences, on the Occupy movement and its effects. We draw on the radical potential of Debord's *The Society of the Spectacle* to frame our journey though public, private, political, aesthetic and academic spaces, in order to make sense of the relationships between global capitalism, digital technologies and political resistance.

'6. In all its specific manifestations - news or propaganda, as advertising or the actual consumption of entertainment, the spectacle epitomizes the prevailing model of social life.' [5]

We've seen this piece of Occupy movement street theatre many times before; it has played worldwide with minor variations. The people occupy the streets, chanting slogans, singing songs, brandishing banners of protest: 'Stop the War', 'Ban the Bomb', 'Free Nelson Mandela', 'Give Peace A Chance', 'We are the 99 per cent!' The police, the national guard, or some other army of uniformed agents of a repressive state apparatus stand in opposition to the people — a grim, thin blue (or black, or brown) line of authority. Sometimes they wield truncheons, sometimes guns, sometimes they just stand stock still, fixing their adversaries with stern, cold stares.

The cameras are always on hand to record history, or make history. On the 17th of April 1965, crowds of young anti-war protesters march on Washington DC. A young white man with a shock of blonde hair places a flower into the barrel of a National Guardsmen's rifle; Click, Click, Click. A camera captures this symbolic moment for posterity. The guardsmen look like storm troopers with their shiny helmets, and they look every bit as young as the protesters. The image becomes iconic, and circulates throughout the world like a virulent virus. A few years later, the National Guard shoot Kent University Student, Alison Krause, dead; on the day before her death, Alison places a flower in the barrel of a gun.

1968 is a very good year for political street theatre. Paris in the month of May comes to a grinding halt; the wheels of capitalism stop turning. Students occupy university buildings, and around eleven million workers go on strike.

In August of the same year, Soviet tanks roll into the streets of Prague to ensure that summer doesn't follow spring. Once again the cameras click, and record the people of Prague bravely standing up to the evil empire. One image is especially arresting - a young man standing defiantly on top of a Soviet tank. A young Milan Kundera is part of the spectacle, and later reflects on Nietzsche's eternal return and something he calls the 'Grand March' in his best-selling novel, *The Unbearable Lightness of Being*. For Kundera "The Grand March is the splendid march on the road to brotherhood, equality, justice, happiness; it goes on and on, obstacles notwithstanding, for obstacles there must be if the march is to be the Grand March." [6] The Grand March is an image repertoire, a mise-en-scène, a vocabulary of protest that eternally recurs: Us against Them, Good against Evil, the People against the State.

1989, Tiananmen Square. Another click, another iconic image - a lone protester plays a dangerous game of chicken with a Red Army tank. He stands in front of the military machine, which is also a potent symbol of state power; the whole world is watching, again.

In 2003 millions of people in cities worldwide take to the streets, protesting against the imminent invasion of Iraq by George Bush's coalition of the willing. And so it goes, back and forth, appearing and disappearing from time to time and place to place: Petrograd, 1921; Soweto, 1976; Berlin, 1989; … . Sometimes regimes fall, and walls come tumbling down, but not today, not in Melbourne, Australia in the year 2011.

On this day, I'm part of the Grand March, along with a few thousand other members of the disenfranchised 99%. We gather around a man with a megaphone earnestly speaking to the crowd. He's old school — he exhorts the workers of the world unite. He recites a long list of battles between capital and labour currently being fought in different parts of the world, and concludes that the thin blue line encircling the crowd are part of the larger struggle against capitalism. They are workers, too, and they, he says, have more in common with the dispossessed than the crowd, who are mostly young, white, and apparently affluent. I notice a young girl with a bunch of single stem flowers, which she offers to the police in riot uniforms. Click. Click. Click.

'167. This society eliminates geographical distance only to reap distance internally in the form of spectacular separation.' [7]

I am in Belgrade for a conference. There is snow. I have just skyped my son who is back from Shanghai with his Chinese partner at my Melbourne home. The MYKI transport system has done them in. I have been pushing a bus out of the snow with my fellow passengers. They'll go to Sandringham beach, I to a dormitory. She is a doctor. He works for Disney, introducing children to an interactive form of pseudo English, an aspirational mix of the Mickey Mouse Club from my own youth and Sesame Street. He wears bright colours. He wants me to finish his Solitary Man video, so he can put it on Youtube. I do not have time anymore. I tell him to go and see his grandmother who has never been back to Europe, which is where I am now, since the '50s. But I could be anywhere, anytime. Click. Click. Click.

I saw Serbian filmmaker Ljubomir Šimunić's 8mm *Retrospective*. I write: "Šimunić tattoos Beograd's city life onto your eye with his mobile double 8mm camera, the soundtrack reminiscent of the transistor radio's newfound mobility,

driving '60s youth culture. These films' double- and triple-layered imagery of street lights, neon signs, B&W TV; the glimpsed everyday, write the kind of eye movement across the frame that the *dérive* elicited in chance walks and city taxi rides. These films document a new way of seeing borne from city life, in which reflections, the car's mobility and the double images offered by both the taxi and shop window are hard-wired into the senses. The layered speed of Šimunić's visual writing predicts the compacted grazing and sampling response to the tidal wave of imagery now colonising the everyday, both on the street and online".

I am presenting a paper on the Melbourne Super 8 film group: *Forgotten Oz Hysteries*. Its pages are like a chat room, a cacophony of contesting opinion. It was the group's strength, if you could call it a group. This is now History. By luck I have brought an old newsletter from May 1998 which has an old article of mine about Situationism, 'In Praise of the Everyday'. I re-read bits to myself; can I recycle any of it?

Maurice Blanchot noted: "Despite massive developments in the means of communication, the everyday escapes. That is its definition" [8]. I re-edit excerpts with a blue pen: "The everyday escapes from culture's Spectacularisation. It doesn't climb an electrified fence with sirens wailing on a rainy night. Though within the Spectacle itself it is where such a breakout is expressed. The spectacle eliminates the everyday every day but cannot exist without it, yet the everyday exists without the Spectacle everyday. The everyday is experienced as boredom and permeates itself with this shame. In this way the everyday takes form. Welcome it in. Welcome in the never-ending leak above our heads. Drip, drip, drip".

Of such conundrums Guy Debord voice-overs in one of his films "Of course we might make a film of it, but even if such a film succeeds in being as fundamentally incoherent and unsatisfying as the reality it deals with, it will never be more than a recreation —poor and false like this botched up travelling shot". [9]

Super 8 is ideally suited to recording the everyday; that is where it exists.

The harder it is to buy a Super 8 camera or stock or splices, the less interest the powers that *be* have in this medium. The more often you hear that Super 8 has been superseded, the more scratches appear on your original irreplaceable film, the more broken sprockets rattle, rattle, rattle through the gate, then ... the more film becomes like the everyday itself: worn out, shunned, ignored, devalued and put in a dark corner somewhere, like a sick bird looking for a place to die, a complete waste of time. This is important at machine's end, at history's end. This is the time of the anti-manifesto. It is important beyond words, ideas, beyond life, beyond history: to waste time. Wasted time is becoming a scarcity. Wasted time functions to make you guilty every time you use it. It is a brave person indeed who is willing to admit to wasting time. I waste time every day, yet I am not very brave at all. Killing yourself is the greatest waste of time of all. That is what Debord did. How brave is that? Bang. (bang, bang)

'107. As a group the bureaucrats may be said to make all the decisions, but the cohesiveness of their class can only be ensured by the concentration of their terrorist power in one person. In this person reposes the only practical truth of the lie *in power*: the power to lay down an unchallengeable boundary that is ever subject to revision. Stalin thus had the power to decide without appeal exactly who was a bureaucrat, and hence an owner; his word alone distinguished "proletarians" in power from 'traitors in the pay of the Mikado and Wall Street."' [10]

The celebrated radical philosopher, Slavoj Žižek, addressed the Occupy Wall Street protesters in New York's Zuccotti Park in September 2011. He reprises one of his best-known anecdotes about living under the repressive yoke of dysfunctional communism: the regime sends a man to Siberia for some unspecified reason. He decides to communicate with a friend via mail, but knows the authorities will monitor his letters for traces of rebellion and dissent. He tells his friend that he will establish a code to circumvent this intrusive surveillance. If he writes in blue ink, it means the information contained in the letter is true. Red ink indicates that the letter contains falsities. The first letter arrives. It's written in blue ink. Everything is great in Siberia, it says. You can buy everything, the shops are full of food, but the only thing you can't get is red ink. Žižek explains that the point of this story lies in the fact that today we lack a language to tell the truth about the world — we know there is something badly wrong, but we don't know how to express this truth. We don't have any red ink. So, where might we find language to express the current situation's truth?

The people in the New York crowd enthusiastically echo Žižek's story. The crowd play Echo to Žižek's Narcissus (or disciples to Žižek's Messiah). But who are these self-proclaimed members of the 99%? They look as though they're enjoying themselves in the midst of the carnival-like atmosphere that pervades the gathering. "Don't fall in love with yourselves" Žižek instructs the crowd, pointing out that the seductive qualities of the carnival can impede political action. What matters, he declares, is what happens after the protests, for revolt without revolution is pointless. Will the crowd find copious quantities of red ink, or will their anger dissipate when they get bored or tired?

In his recent book, *The Year of Dreaming Dangerously*, Žižek argues that the Occupy protests are not "proletarian protests, but protests against the threat of being reduced to a proletarian status". [11] Nevertheless, he reads the demonstrations as a significant political event, because unlike various strains of identity politics based on gender, race and sexual orientation, they unambiguously identify capitalism as the 'name of the beast' — the cause of poverty and injustice. Like Melbourne's megaphone man, Žižek sees transformational potential in resurrecting class struggle, which turns differences (between Wall Street and Main Street, as the Americans like to put it) into antagonisms. In other words, where identity politics seeks to turn antagonism into difference — the peaceful co-existence of identities — class struggle is militant, and revolutionary. It seeks to annihilate the capitalist beast. Moreover, this encounter with the Beast can only result in victory if we jettison the 'democratic illusion'; in other words, it is "the acceptance of democratic procedures as the sole framework for any possible change, that blocks any radical transformation of capitalist relations." [12] This is all well and good, but where do we find the red ink?

'177. Quite obviously, it is precisely because the liberation of history, which must take place in the cities, has not yet occurred,

that the forces of historical absence have set about designing their own exclusive landscape there.' [13]

In the late '50s my welcoming aunt toured my nonplussed newly arrived parents and I proudly around the Olympic Games sites from a few years before, stating in front of the old Olympic Swimming pool (now Collingwood Football Club's Training Centre) that now Melbourne had made it; Australia was now part of the world. Already, as a small boy, I could recognize the folly of her posing. This did not make sense. Clearly, the carnival had already left town.

By the '70s I felt what my aunt felt. I thought that the culture I had now grown up in could participate globally, and film was in the air. A colonial cast could be broken. I had seen packages of experimental works at the Melbourne Filmmaker's Co-op, where I had been working on the front door. There were the meta-texts by Brakhage, Mekas and Thoms, and local work by Michael Lee, Lindsay Martin, Solrun Hoaas and Cantrills Filmnotes.

How do you connect such an initialising time to the present? So much water has passed under the bridge. At the Australian Film Commission the main game constructed, understandably, a national film industry with flagship features, and funding morphed and split through various forms as the experimental was ushered into its own ever-diminishing funding back-water.

With such discounting one had to confront the reality that we were not participating in any official dream, but more of an outsider, self-sufficient, reflexive cottage shadow of the official story. This was no big deal at the time, as it seemed in keeping with my station as a 'Wog' in what was purported to be a classless society, and it promoted a kind of 'Everyday versus Spectacle' take on it all. The spectacle told me we were all one, while the Everyday's small, subtle and repeating humiliations told me we were not. Everything was still possible, as long as you pulled it out of your own garage hat with a good old Oz DIY disposition of making do. I was not alone in this boat and, after all, there was a global scene for this film art stuff that you could identify with.

What also happened, unfortunately, via a changing of the guard at Experimenta in the '90s, was the erasure of any public profile for local experimental film, through a commendable advocacy for New Media. This centrifugal pull from the central embrace of the new to reach the margins seems like a repeating account. It is a particularly Australian tradition, founded in that Terra Nullius moment when, on arriving, those members of the first fleet planted that British Flag on these shores and declared that there was nothing here. Is it our cultural tradition to ignore what is already here?

That is how this script has repeatedly unfolded in Oz, with setbacks and betrayals that have both crippled and strengthened my practice. In this I merely repeat my parents' migrant resolve in passage from the old world to the new, to always run towards a receding horizon of belonging and safety. I seem to elicit a similar, wary response that marks difference as a liability. Like everyone else I have migrated to the new, but not as some erased identity that could be redressed at will. This graceless twisted persona has 'form', is tainted with an old technology's past.

I remain marooned outside any promise that Whitlam's now mythical '70s illuminated. I brace myself for another round of a futile struggle; not that earlier construction of a settler homestead, no dissenting Glenrowan residue, nor a heroic search for an inland sea or even marginal participation in a national film industry. Tricked by a quirk of history and place, I must continue minutely to search, eke out to Occupy a space for my own art to exist in my own country. It is rumoured to be found somewhere between the carnival and its hollow trace, it is pockmarked with denial's ancient damage and it presses me to remember, through some fuzzy local Aussie logic, to Never say Never.

Conclusion

The spectacle asserts itself, not only in our search for a national identity, how we replay the past or where we sit inside Occupy's carnivalesque but also in the ways we migrate in and out of academia.

Institutional protocols determine the tone, structure and style of academic writing. These procedures require scholars to scrupulously cite references, and, more often then not, adopt an 'objective' authoritative tone in their writing. This paper occupies academic space, and observes some of the genre conventions of academic discourse. However, it also enacts a Situationist *détournement* by deliberately employing an anecdotal register that unsettles assumptions about politics and technology.

Online, the old and the new repeat each other in no particular order. For the migrant, dislocation and occupation is not a fashion-click or a Facebook friend, but an act of survival that registers in analog technology as a trace-able trace. Such difference speaks of a disparity between Debord's 1950s and an ephemeral mobile present, and it is Žižek who provides the double negative twist to bridge its gap. Yet Debord can still make visible the way in which spectacular technologies create an illusion of community that alienates people from each other. We post and graze with each accumulative click, to make friends and network in the service of our individually designed profiles. This need not be inherently traumatic, but what kind of community has been borne and what are its connections to the past?

References and Notes

1. Guy Debord, *Society of the Spectacle* (New York: Zone Books, 1994).

2. Vilém Flusser, *Towards A Philosophy of Photography* (London: Reaktion, 2000), p. 16.

3. Lev Manovich, *The Language of New Media* (Cambridge Mass. London: MIT Press, 2001), p. 307.

4. For a detailed account of the dérive — a spontaneous drift through space —and other oppositional political strategies used by the Situationist International see the following texts: Sadie Plant, *The Most Radical Gesture: The Situationist International in a Postmodern Age* (New York: Routledge, 1992); Greil Marcus, *Lipstic Traces: A Secret History of the Twentieth Century*, Twentieth anniversary edition (Boston: Harvard University Press, 2009); Mackenzie Wark, *The Beach Beneath the Street: The Everyday Life and Glorious Times of the Situationist International* (London: Verso, 2011).

5. Debord [1], p. 13.

6. Milan Kundera, *The Unbearable Lightness of Being* (New York: Harper Collins, 1984), p. 257.

7. Debord [1], p. 120.

8. Maurice Blanchot, 'Everyday Speech, 1962', in Stephen Johnston ed., *The Everyday (Whitechapel Documents of Contemporary Art)*, (Cambridge Mass. London: MIT Press, 2008), p. 37.

9. Guy Debord, *On the Passage of a Few Persons Through a Rather Brief Period of Time* (1959), film.

10. Debord [1], p. 75.

11. Slavoj Žižek, *The Year of Dreaming Dangerously* (London: Verso, 2012), p. 12.

12. Žižek [11], p. 87.

13. Debord [1], p. 126.

THRESHOLDS: OBSERVATIONS ON MOTION CAPTURE

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Abstract

This paper theoretically situates research that explores motion capture data visualization using customized software tools such as MxCap.01. The value of software like MxCap.01 lies in its visualization capabilities including the ability to scale the re-presentation of the force, direction and intensity of movement but also do so within a temporal and emotive structuring.

Keywords: Animation, Dramaturgy, Motion Capture, MxCAP.01, Representation, Scale, Visualization.

Introduction

In many ways, the development of motion capture systems for biomechanics research in the first decade of the twenty-first century represents the technical pinnacle of the analysis of human movement begun over a century earlier by the pioneer photographers Étienne-Jules Marey and Eadweard Muybridge. As with these earlier studies, the motion capture suite is a unique framing system that mediates and modifies the way in which bodily movement is understood. The motion capture system approaches the same nexus faced by Marey and Muybridge; experiential and physiological data is graphically represented. This visual mediation cannot capture or represent every complex interaction and the experiential quality of movement. This perhaps explains why the graphic similitude of animated bodies in films and gaming possesses an uncanny disembodied quality. Thus, as with Marey's and Muybridge's two-dimensional studies, these systems have their own unique blind spots that delimit the quality of data 'between the frames'.

The representational accuracy of motion capture systems belies the fact that this data is extracted from its intended 'real world' context. There are two important mediating affects on the data. First, the system itself heavily influences the data one forms into information. This is because movement must accommodate the system. In this respect the requirement for the body to be 'suited up' is only one way in which the system modifies movement data. Together the technical specifications of the tracking devices, the spatial qualities of the suite and the lack of system 'portability' significantly reduce the capacity for this data to be truly situated. The second mediating affect is representational, where the lived, corporeality of embodied knowledge is folded into a visual re-presentation. Ironically, this 'knowledge of the body' is visually constructed to privilege what the eye sees. Accordingly, the technological and representational limits imposed on the body by the system not only affect data quality but also reduces the possibility of contextual feedback.

Decontextualized Data

There is a degree of conceptual equivalency with the decontextualization of the body in motion capture systems and the scientific methodology of inductive generalization. One of the key thinkers in Affect Theory, Brian Massumi, brings into question this use of the particular as evidence of the general because knowledge is based on objects alone and requires them to be extracted from the world [1]. The conceptual problem being that bodies are isolated from the context from which they emerge. This is important because Massumi, whose intellectual lineage reaches back to Spinoza through Bergson to Deleuze, sees the body less as something belonging to a discrete cognizant individual and more as the threshold being, both in the world and part of an individual. This notion is based on proprioception, which is defined as "the perception of the position and movements of the body" [2]. In reference to a range of separate scientific studies, Massumi argues that the independent functioning of the proprioception from conscious thought means objects are simply the residual effect of the condition of being 'situated' in the world [3].

For Massumi, the shortcomings of scientific thought are revealed in the 'control', which operates through "closure and control" [4]. It is important to note that, as revealed in his essay *Too Blue*, Massumi has an aversion to the dominance of scientific thinking. However, the compelling aspect of his argument is that the emphasis on the object comes at the expense of a deeper knowledge of the contextual conditions of formation. The conceptual equivalency of the 'control' to the systemized isolation of the body suggests that this contextual estrangement ensures motion data is more simulated rather than situated. The issue created by the technical and representational mediation of motion capture data is that, like the scientific 'control', knowledge of the body requires the artificial extraction of the body from its context.

Massumi's argument does suggest that the extraction of movement from its context questions the claim that motion data is an authentic mapping of the moving body. The issues surrounding the decontextualization of the body are potentially exacerbated when this data is instrumentalized and used to design specific artifacts that 'solve' very particular design problems. This is not to say that the biomedical application of motion capture data is invalid, or that there are not cases where the data's veracity remains unquestioned. The argument being made is for an alternative mode of practice that appreciates and exploits the mediating aspects of motion capture technologies. In this sense there are many examples where the design of prosthetic objects or mimetic avatars maps data as if it were a natural re-presentation of the body in motion. Many prosthetic or mimetic design applications are obliged to make productive use of this data so that any ensuing mode of research or practice is geared towards ameliorating the mediating affects of the system. In doing so, the extent to which motion data can be claimed as an authentic basis for knowledge of the body must be questioned.

As previously observed, the representational translation of motion capture data in animation possesses an uncanny representational quality. This traces how the use of motion capture data is haunted by its technical and representational mediation. This is an issue with the instrumentalizing mindset, which places a premium on the data's validity by relegating the 'affects' of mediation. The supplementary use of interpolation and extrapolation not only

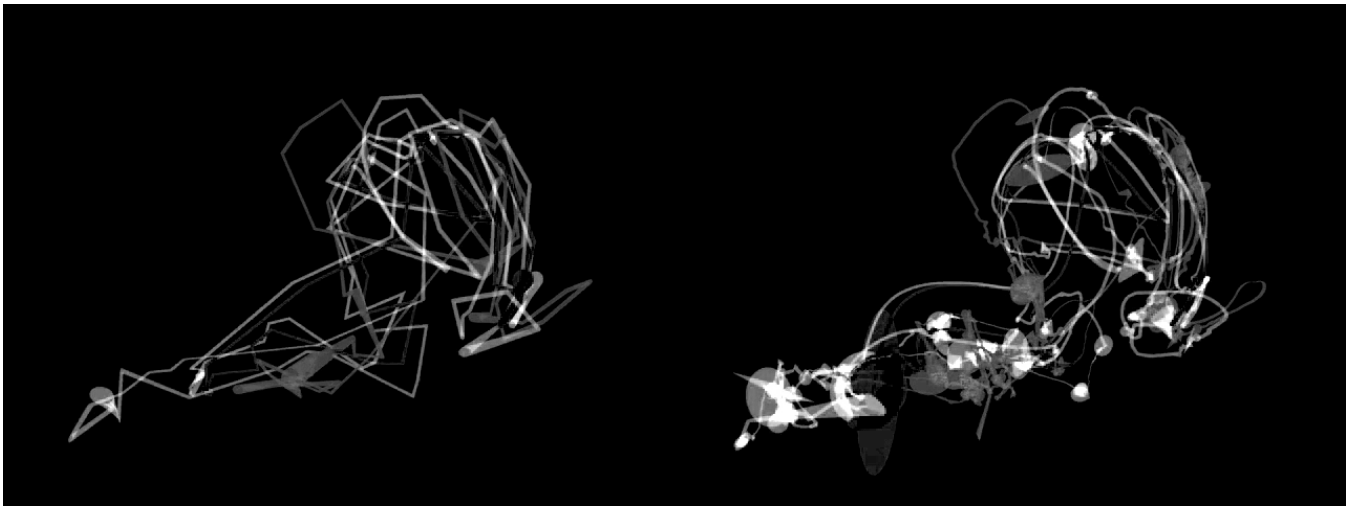


Fig. 1. Alternative Mx.CAP.01 Renderings of Mocap Data (© tranSTURM)

implicitly accepts the data's authenticity, but also deliberately applies these methods to 'overcome' this mediation.

Embracing the representational mediation found in motion visualization offers an alternative approach to the instrumentalization of motion data. This shift in the technology application of the drawn translation of data into information still enables the extraction and quantification of the body's kinesthetic knowledge and a revealing of the hidden aspects of movement. However, it also accepts the optical and graphic mediation of the data and a productive act that exceeds the simple problem-solution design paradigm. This questioning of the veracity of motion capture data exploits how the system re-presents embodied knowledge, and uses mediation to open an iterative mode of data feedback by which to develop new forms of physical expression. Importantly, the basis of this thinking is a conceptual openness to the way the mediation of the raw data can sponsor new modes of artistic practice.

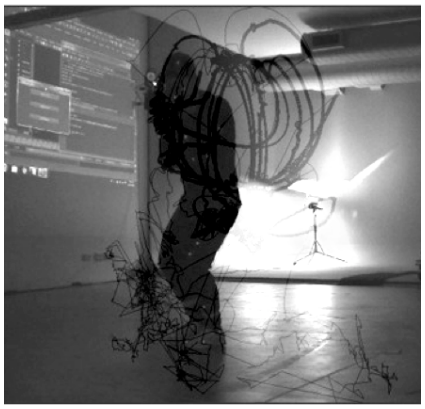
Re-Drawing Movement

The interdisciplinary research group tranSTURM are exploring such non-conventional uses of motion capture data [5]. Central to this work is the development of a new digital software interface, MxCAP.01, which is a plug-in to the three-dimensional software Maya™. Conceived as an interdisciplinary design visualisation tool and working almost in 'real time', the software is able to reconfigure the data from an optical motion capture suite [6]. The significant difference with MxCAP.01 is that it uncouples the data from its spatiotemporal location. This allows a re-visioning of movement data to generate new understandings of movement and forms of physical expression [fig.1]. This differs from most proprietary software interfaces, which effectively conform to the geo-temporal conventions underpinning the logic of the map. A second important difference with Mx.CAP.01 is that its functionality can be extended to incorporate other ways of reconfiguring data on an 'as needs' basis. This allows motion capture data to be easily appropriated within any of the disciplinary understandings existing within any interdisciplinary team. This ability to develop techniques and applications across different design disciplines allows for both the conceptualization and theorising of embodied experience as an immaterial and material spatial condition. These capabilities, plus the power to configure data in an almost spontaneous feedback loop, open an extensive array of modes of extraction and abstraction. Therefore, the value of MxCAP.01 is that it acts as an interdisciplinary design interface that facilitates the abstract rendering of gesture in ways that enable the discovery of new data inter-relationships between gesture, narrative and emotional exploration of body, time, movement, sound and space [fig.2]. The strategic deployment of the representational space of MxCAP.01 can be used to inform how the body might move.

It is the representational openness of MxCAP.01 that allows individuals to author unique movement hierarchies and logics that encompass everything from spatial and temporal constraints to expressive cultural forms. In fact, the ability to collect, collate, manipulate and process emotional and perceptive movement responses can inform performance design and foster better appreciation of three-dimensional spatial logics [7]. The software is neither deterministic nor discipline specific because it allows artists, designers and choreographers to map and reconfigure spatiotemporal data almost in 'real-time'. The ability of the software to enhance the data's malleability means that any resulting taxonomy provides an open interpretative space from which to view these gestural data sets. This not only opens up the research field of 'movement' taxonomies but also allows motion data to feed back and generate new interpretations and models of physical expression within design practices as diverse as sonification, visualization, motion design, animation and dramatization.

In late 2012, the tranSTURM group used MxCAP.01 to assess the gestural dramaturgy or performance language of Australian choreographer and dancer Meryl Tankard [fig.2]. This work, the

Fig. 2. Direct Mocap Mapping (© tranSTURM)



first in a series of studies undertaken with other choreographers, focused on transferring a set of specific moves into a set of abstract notational forms. The narrative framework on which to develop the choreographer's dance gestures was based on the two notions of 'order' and 'chaos'. The prescription of these conditions served several purposes. First, it established a common expressive and representational framework by which to compare the conscious and intuitive dramaturgical responses in different choreographic practices. The aim is to explore how hierarchies of human gesture can be understood in relation to spatial - temporal constraints. Such an approach is valuable because it offers the potential to develop a comparative set of 'expression taxonomies' by which to measure the unique responses of each choreographer. This should provide an opportunity for a more nuanced formal and temporal analysis of individuals' expressive languages. Ultimately, this work will fold into the gesture library currently under construction in the motion laboratory of German artist Holger Deuter. As such, the benefit of the MxCAP.01 interface is its capacity to extract and configure different information sets drawn from an extensive set of diverse forms of performance notation.

The second valuable aspect of the 'order' and 'chaos' narrative is that it creates a contra-point that helps the choreographer to re-imagine their practice. Here, the confine of the motion capture laboratory is integral to the design process, allowing the choreographer to explore expressive emotional and cultural forms of human gesture. MxCAP.01 enables a qualitative research methodology where participant observation, the testing of design interventions and the development of design decisions can be built around the organisation of movement data within new taxonomic scaffolds. The distinguishing aspect of software resides with the ability of the practitioner to reconfigure motion data without resorting to more conventional three-dimensional illustrative visualisations and prescriptive choreographic forms found in much contemporary motion-capture data analysis [8]. This disclosure of embodied knowledge through the representational lens of MxCAP.01 can, in fact, lead to new material outcomes.

Double World: Project Description

Double World is a current installation project that integrates the filtering motion data through MxCAP.01. Authored by the tranSTURM group, the project is a vehicle to use this reconfigured data as a way to generate synergies between the different languages operating within this interdisciplinary design team. The *Double World* project, a site-specific installation work to be exhibited in October 2013, explores motion capture data through a visual, spatial and sonic mediation. Working at the interface of performance, situated media and technology, the project harnesses the creative and experimental ambitions of creative teams operating in Australia and Germany. Using the text of Rainer Maria Rilke's *Sonnets to Orpheus* as the narrative framework, the exploration of 'order' and 'chaos' draws on Orpheus's two opposing god-halves Dionysus and Apollo. The installation pivots around the seminal moment in the Orphic Myth when Orpheus, leading his wife Eurydice out of Hades, breaks the condition not to turn around, thus losing her to the Underworld forever. The installation, to be located in Building 20 at Newington Armory, Sydney Olympic Park, seeks to create a visual and acoustic sensory environment for the audience to explore their own relationship with the narrative of the poem through the emotional and intellectual layers of the experience. This is an expressive and interpretive approach that avoids the reductive and deductive empiricism found in certain kinaesthetic frameworks. Instead, the MxCAP.01 interface ensures that the development of form is contingent on the mode of drawing, rather than something that is predetermined before drawing commences. This integrates all the conditions of representational mediation as a speculative, open and malleable mode of drawing. In this way MxCAP.01 can be used to reveal the latent, or even repressed, experiential aspects of movement.

Representation and Scale

The collaboration of transTURM and Meryl Tankard intended to use MxCAP.01 as an analytical tool to develop a taxonomic library of gesture and movement. This decision reflected the fact that 'intention' in Tankard's dramaturgy functions through the interplay between conscious and intuitive understandings of movement. However, as the work produced in a 2013 UTS master class demonstrated, this is not a straightforward relationship. The disembodiment of the human figure and the ability to reconfigure this data allowed the potential for these movement libraries to be representationally open. The re-presentation of this data exceeded any explicit reading; thus refusing any unequivocal semiotic connection between gesture and meaning.

It is important to remember that MxCAP.01 does not disclose embodied knowledge, but merely re-presents scripted movement. Its ability to manipulate motion data insists that any library should be seen as a mediated visualization of the body in movement. Unlike more instrumental approaches, it requires an appreciation of the conditions of mediation and a willingness to exploit the technological protocols and functional limits of the system. The software opens an important conceptual shift to the issue of decontextualization by altering the representational functioning of the motion capture suite. Representation becomes an embedded mode of drawing in an operative and open way. This is very different to those practices where gesture is scrutinized to develop a semantic representational system linking gesture and meaning.

Clearly, digital technologies both provide unique ways to collect and re-present information and offer a greater facility to embed contingency in the design process. More significantly, as suggested in Walter Benjamin's canonical essay *The Work of Art in the Age of Mechanical Reproduction*, they potentially give rise to new material expressions. The technological discontinuity of the digital necessitates suspending established symbolic and experiential forms of expression. For Benjamin, the material predetermination of any form arsing from a new technology serves the conservative function of ritual and the politics of nostalgia [9].

In this respect, Brian Massumi's epistemology privileges movement precisely because he sees that predetermined form always operates within a representationally semantic structure. In this way 'meaning' prescriptively controls any knowledge of the body so that it can accord to a preordained and universalized set of traits and actions [10]. If the value of the digital is its capacity to represent the

interrelations and contingencies of context, form is something that emerges through the ‘affect’ of forces coming together [11]. In this schema, form is not the symbolic re-presentation of these forces, but simply the trace of action having taken place. The critical issue with this account is that the rejection of signification is premised on meaning always being semantic. The work undertaken with Tankard demonstrates that the MxCAP.01 system is inherently representational. However, the procedural inclusion of representation gives rise to forms that are anything but semantic. MxCAP.01 is an abstract digital ‘mode of drawing’ that suspends any prescribed meaning to movement. In the design disciplines, such representational slippages are unique because designers work directly on the object’s materiality. The mode of mediated representation opened by transTURM’s use of motion capture data has an affinity to Architecture because both practices solicit objects through the mediating affects of their respective modes of codified representation. The sublimated aspect of these representational modes means that they typically influence or ‘affect’, rather than ‘effect’, these objects.

This is, of course, the central thesis of Robin Evans’ canonical essay *Translations from Drawing to Building*. In this essay, Evans calls to attention the unique trait of architecture where objects are affected by the discipline’s representational forms [12]. This is a condition of affect because the codified representational modes are visualized as faithful presentations of the final object. Consequently, the formal effect of the drawing is almost always sublimed in the design act. Accordingly, drawings either fail to capture the quality of the final object or they create alternative conventions that contest existing material and technological expressions and forms. The capacity of these representational forms to infect architectural objects is crucial in creating anterior formal and spatial logics that are essential in reinvigorating the discipline.

Conclusion

The deception of motion capture visualisation is its apparent indexical relationship between image and experience. Yet the corporeality of information returning through the visual realm ensures motion capture data is a disembodied form of embodied knowledge. Accepting Robin Evans’ argument, MxCAP.01 enables a similar mode of visual translation of corporeality that underpins the design of architectural objects. The ability to scale the force, direction and intensity of movement, all within a temporal structure, is significant enough. Yet, as in architecture, it also opens a gap between image and experience that can be negotiated through scale. This enables a representational openness and 'affective' capacity of the drawing itself. In the realm of motion capture, it is this facility that marks the real value of software like MxCAP.01.

Acknowledgements

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References and Notes

1. Brian Massumi, ‘Too Blue’, *Parables for the Virtual: Movement, Affect, Sensation* (Durham, NC.: Duke University Press, 2002), pp 208-256.

2. Oxford English Dictionary Online, *The Oxford English Dictionary Online*, [electronic resource]. vol. 2011, no 27 April, (Oxford U.K.: Oxford University Press), <http://www.lib.uts.edu.au/sso/goto.php?url=http://www.oed.com%3E

3. Brian Massumi, *Parables for the Virtual: Movement, Affect, Sensation* (Durham, NC.: Duke University Press, 2002), pp. 29-31 & 58-61

4. Massumi [1] pp 226.

5. The tranSTURM group develops projects that theorise, hybridise and transcribe the personal and interrelated design ‘languages’ of architecture, performance, dramaturgy, sound, the moving image, and electronic art. It is, as such, an experimental crucible for the inter-disciplinary exchange of processes, data and ideas.

6. This software is presently in a beta version.

7. The authors referred to include William Forsythe, Merce Cunningham, Christian Ziegler, Brian Massumi, Kurt Hentschläger, Stelarc and the partnership of David Quayola and Memo Akten

8. An example is *Synchronous Objects* by William Forsythe found at: http://synchronousobjects.osu.edu/content.html#/TheDance and Piecemaker at: http://motionbank.org/en/piecemaker-2/

9. Walter Benjamin, W. and Hanna Arendt, *Illuminations* (New York ; London: Harcourt, Brace & World; Pimlico., 1999) pp. 217-252

10. Massumi [1] pp. 1-5

11. Brian Massumi (1998), <http://www.brianmassumi.com/english/essays.html>, *Sensing The Virtual, Building the Insensible*. Originally published in Hypersurface Architecture, Architectural Design Profile no.133, ed. Stephen Perrella, 1998.

12. Robin Evans, *Translations from Drawing to Building*, in *Translations from Drawing to Building and Other Essays, AA Documents*. (London, U.K.: Architectural Association, 1997) pp. 153-193.

BITING MACHINE, A PERFORMANCE ART EXPERIMENT IN HUMAN-ROBOT INTERACTION

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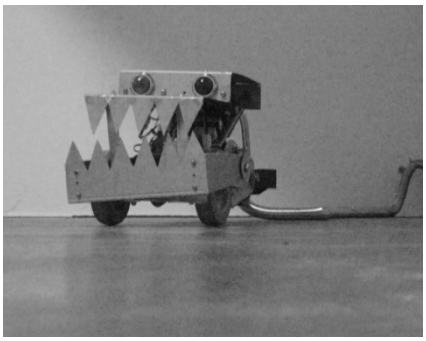
Abstract
The author is a performance and visual artist whose interest lies in the co-evolution of humans and machines, a subject he explores with self-made machines. The paper describes the aims, method, and context of Biting Machine, a performance art experiment in human-robot interaction loosely based on Joseph Beuys' I Like America and America Likes Me (1974) where the artist shared a space for several days with a wild coyote. Biting Machine will be delivered as series of durational performances for an autonomous mobile robot and a human, where the robot will take the role occupied by the coyote in Beuys' piece.

Keywords: Performance, Art, Robot, Artificial Intelligence, Machinic Life, Pickering, Johnston, Beuys

Fig.1. *Biting Machine 1*, Granjon and Horio 2008, (© Paul Granjon, photo Paul Granjon)



Introduction
Since the late 1990s I have defined my artistic research as the co-evolution of humans and machines, based on a strong interest in the way humans create a technological environment of exponential complexity and how the developments of techno-science in turn affect human experience. The subject for future artworks and the selection of technology required to produce them emerges from observing techno-scientific developments and their dissemination. The results of my investigations are presented in the form of performance-lectures and/or exhibitions of machines that aim to provide the audience with material for reflecting on aspects of our ultra-complex techno-scientific lifeworld.

Currently in development, *Biting Machine* is inspired by Joseph Beuys' performance *I Like America and America Likes Me* (1974), where the artist shared a space in a New York gallery with a live coyote for several days. For *Biting Machine* the coyote will be replaced by an advanced autonomous robot which should feature a convincing adaptability and dangerous potential. Beuys' piece was motivated by a critical reading of contemporary western society, particularly how fundamental instinctual values and instinctual relations to nature are being eroded by capitalist society and industrial development. The artist attempted to connect with untainted natural powers by sharing a space-time segment with a wild animal, delivering a comment on industrial society's disconnection from the same powers. The coyote was chosen as a symbol of the primordial force of nature, connected to an ideal, disappearing natural dimension. The *Biting Machine* robot can be seen as a diametrically opposed agent of technique and artificiality, at a time when the complexity of artificial life, artificial intelligence and robotics technologies heralds the emergence of intelligent cybernetic creatures.

One of my first robots was inspired by a tamagotchi, the hand-held virtual pet that was popular with children in the late 1990s. The *Fluffy Tamagotchi* was a reaction against the commodification of the animal companion, bringing back physicality in the toy in a humorous fashion (Fig. 2). Fifteen years later, the *Biting Machine* continues to investigate the possibilities of artificial animals and their relation to humans. If core questions about delegation to machines and about how machines increasingly replace organic functions and creatures are still at the heart of the work, the parodic, tongue in cheek tone of the *Fluffy Tamagotchi* is replaced by an open position. My assumptions about the inherent inadequacy of the artificial animal have made way for questioning a robotic creature's genuine potential for being in the world, sharing presence and territory with humans and animals.

The *Biting Machine* performance is an experiment in human-robot interaction that will generate empirical material for a cross-disciplinary reflection on the ontology of artificial creatures.

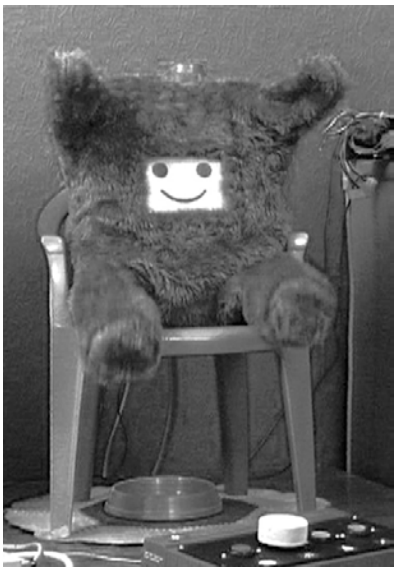


Fig.2. *Fluffy Tamagotchi*, 1998, (© Paul Granjon, photo Paul Granjon)

Simultaneously, the durational unfolding of a performative relation between an intelligent mobile machine and a human aims to create a metaphor for our relation with technology in the age of what John Johnston identifies as 'machinic life'.

I Like America and America Likes Me
Invited to present work in the René Block Gallery, New York, in May 1974, Joseph Beuys' response was a performance artwork called *I Like America and America Likes Me* where he shared the gallery space with a live, wild coyote for seven days and nights. Over that period, Beuys and the coyote developed a form of inter-species relationship. The piece remains one of the most iconic performance artworks of the twentieth century with a wide dissemination of photographic, filmic and written documentation material recorded by Caroline Tisdall [1].

The performance took place behind a floor-to-ceiling fence. Beuys and the coyote occupied one side of the fence while gallery visitors stood on the other side. When Beuys first arrived in the gallery the coyote was already in the space, agitated and exploratory. A constant vigilance is prominent in most parts of the footage. Beuys established a pattern of actions which he repeated during the performance. The coyote responded to the pattern and developed specific behaviours in response, ranging from a playful engagement to plain agressivity. At other times the footage shows the coyote sleeping or lying

down. There is no evidence of conflict over territory. Beuys sometimes throws food to the coyote, an element which probably influenced significantly the dynamics of their relationship. By the end of the performance, coyote and man seem to have established a mutually accepting relationship based on a set of significant interactions.

If the wild vitality, the sophisticated physicality and the complex activities of the animal serve as inspirational guidelines for developing the *Biting Machine* robot, the machine is not designed to be a synthetic version of the coyote. Instead, the coyote's behaviour provides a set of objectives for a design which capitalises on recent scientific and technological developments in an attempt to produce a convincingly life-like, aware, wild non-biological presence.

Tortoises and evolutionary robotics

From the excreting duck automata built by Vaucanson in 1739 to the self-directed, insect-inspired micro-flyers currently developed in the labs of Ecole Polytechnique Fédérale de Lausanne [2] , a wide range of animal species continue to influence the design of machines. In the late 1940s cybernetics pioneer Grey Walter built a set of small autonomous wheeled devices which he called *Machina Speculatrix*, more widely known as 'tortoises'. The machines generated a great deal of scientific and media interest at the time, mostly due to their convincingly animal-like presence. The first model called *Elmer* was described by Walter in 1953 as 'an electro-mechanical creature which behaves so much like an animal that it has been known to drive an otherwise not timid lady upstairs to lock herself in her bedroom' [3]. Based on an ingenious and simple electronics structure, the robots were able to demonstrate autonomous complex patterns of actions based on phototropism and obstacle avoidance. Even though the *Machina Speculatrix* were developed as a tool for understanding the operation of the brain cell, their impact of on the field of robotics and artificial intelligence is significant.

Directly referencing Walter's work, MIT's Rodney Brooks invented the notion of subsumption architecture for robots. Embodied behavioural controllers operating at different levels of complexity interact in such a way that the robot's behaviour emerges from its physical interaction with the environment (bottom up), in opposition to traditional artificial intelligence approaches where the environment had to be fully mapped and appropriate responses pre-programmed into the robot prior to the interaction (top down). Brooks built *Genghis*, an insect-inspired robot based on the principles of subsumption architecture. *Genghis* achieved a human-tracking, obstacle avoiding behaviour through clever connection of sensors and actuators combined with a layered, de-centralised modular digital design. '[*Genghis*] had a wasplike personality: mindless determination. It chased and scrambled according to its will, not to the whim of a human controller. [...] to me and the others who saw it, it felt like a creature. It was an artificial creature' [4].

Evolutionary robotics also takes inspiration from the Darwinian principle of selective reproduction of the fittest. Programming techniques have been developed that allow successive generations of robots to refine their behaviour through artificial genetic evolution. The aptitude of the individuals of a given generation x of robots is assessed automatically with a fitness function. The genotype (artificial chromosomes) of the fittest robots is combined, with the addition of individual-specific variations, in the programming of generation x+1. Repetition of the process gradually leads to machines that fulfill the criteria of the fitness function without human intervention. Experiments conducted in the Laboratory of Intelligent Systems (LIS) in Lausanne, Switzerland, in the late 1990s produced genetically evolved robots capable of battery-charging, maze navigation, garbage collecting and predatory-prey co-evolution [5].

Human interaction with social robots

Research in social and emotionally-responsive machines aims to bring robots into homes to support the elderly, entertain the young, and more generally facilitate interactions with the technological layers of contemporary human existence. 'Social robot' is a term coined by MIT's Personal Robots Group director Cynthia Breazeal who has been working on human-robot interaction since the mid 1990s. Breazeal's research started with the development of 'a socially intelligent machine that can communicate with and learn from people'. *Kismet*, completed in 2000, is an expressive non-human robotic head that engages with its 'caregiver'. Its responses are inspired by studies of infant-caregiver interactions, largely based on non-verbal two-way communication with a strong affective dimension. Breazeal and her team developed a synthetic nervous system (SNS) based on real-time performance, self-motivated interaction and the ability to perform competent behaviours in unplanned situations. The SNS enabled *Kismet* to 'enter into natural and intuitive social interaction with a human caregiver' [6], a relationship facilitated by an anthropomorphic, cartoon-like face able to express easy to interpret emotions.

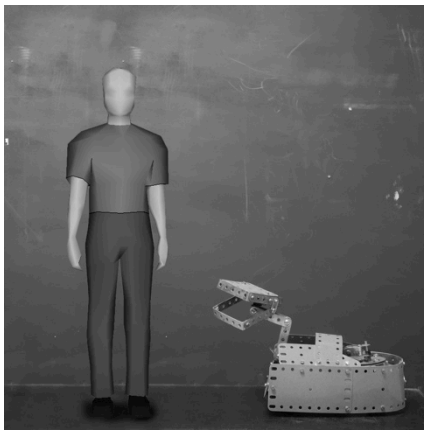
The first commercially available social robot toy was made in Japan. In 1993 Sony's Digital Creatures Laboratory started the development of a convincing robotic pet that could find its place in families. The resulting *Aibo* (**A**rtificial **I**ntelligence ro**BO**t, also translates as "partner" in Japanese) is a cute four-legged, puppy-like plastic machine. The onboard software is inspired by animal behaviour studies and relies on three main layers of operation: sensory input processing, motivation generation, action selection. The motivations of the robot stem from five basic needs and six emotions, an architecture complex enough for some owners of *Aibos* to grow a strong attachment to their robot, similar to a relationship with a biological pet. Yet in 2006 Sony entered financial difficulties and discontinued their non-profitable digital creatures programme.

As well as entering the homes of technology enthusiasts, *Aibo*s have been used in scientific research, for example in Sony Computer Science Laboratory's *Playground Experiment* (2000-2007) led by Frédéric Kaplan, who later wrote about his experiments with robotic pets in his book *Les Machines Apprivoisées* [7]. The project investigated the notion of entertainment robots, machines with no other function than that of being autonomous companions for humans, aiming to 'show how a robot equipped with an intrinsic motivation system can explore its environment autonomously and develop skills which were not pre-specified'. In order to be a worthwhile companion, the robot must be autonomous and able to learn, adapting its behaviour to the non-predictable

socio-physical environment of a human home. One of the key concepts in Kaplan's research is that of intelligent adaptive curiosity, 'an intrinsic motivation system which pushes a robot towards situations in which it maximizes its learning progress' [8]. The integration of a curiosity function is combined with a focus on 'shared attention'. This involves monitoring in real-time the robot's perceptual data when it interacts with the human, for example when being taught a spoken command for fetching its ball. Understanding which parts of a shared experience are prominent in the cognition of each participant informs the design of a machine that can integrate with and contribute to a human social environment.

The concept and design of the *Biting Machine* robot is inspired by the non-representational navigation of Walter's cybernetic turtles, the adaptive capabilities of Brook's behaviour-based robots and the emerging fitness of LIS's evolutionary robots. The curiosity function implemented in Kaplan's Aibos and the associative memory predictors as seen in the motivated reflex agents developed by Rob Saunders [9] provide practical references for the elaboration of a behavioral engine.

Fig.3. *Biting Machine 2*, visualisation with model, 2012, (© Paul Granjon, photo Paul Granjon)



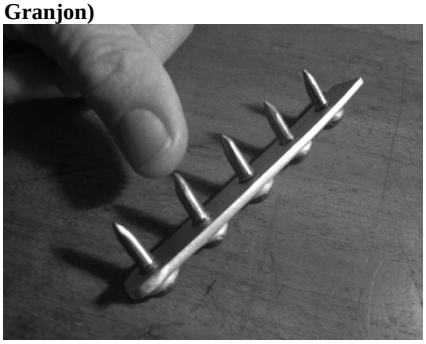
The *Biting Machine* robot

Following *Biting Machine 1* (Fig. 1), a simple automaton that was constructed in collaboration with Japanese artist Kanta Horio, I have built a scaled-down, non-motorised model of a new *Biting Machine* (Fig. 3) and a prototype mobile robot programmed to test the potential of embedded computing and sensing solutions. The prototype robot called *Toothless* features a Microsoft Kinect three-dimensional vision sensor which enables it to differentiate between a human figure and other objects (Fig. 4).

Fig.4.* Alex May and *Toothless* robot, 2012 *(© Paul Granjon, photo Paul Granjon)

The overall volume and weight of the final robot will be similar to those of a coyote, but the design will favor functionality and avoid artificial zoomorphic aspects such as fur, tail, eyes or ears. The body will be based on a wheeled platform mounted with an extending, rotating neck/arm. The robot will be able to move at a top speed of approximately two meters per second, stand on its rear end, and ideally should manage small jumps.Mounted on the neck, the jaws will be fitted with pointed teeth strong enough to pull at things in a way similar to the coyote and to provide an adjustably painful bite (Fig. 5).

Fig.5. Prototype teeth for *Biting Machine* robot, 2012 (© Paul Granjon, photo Paul Granjon)



The machine will extract information from its environment with a comprehensive array of sensors, enabling it to navigate the space, identify the human, and locate objects. Vision will be complemented by acoustic source localisation and touch detection. Additionally the *Biting Machine* robot will be fitted with an olfactory organ and will be able to mark its territory, spraying small concentrated amounts of ethanol on objects or fixtures. In a fashion inspired by the way canines can sense fear or relaxation in a human, the machine will be given the ability to detect some of the human's cerebral activity with a brainwave sensor system.

One of the most prominent aspects of the coyote's behaviour is his determined avoidance of physical touch with the human. The electronic design of the machine will implement this basic avoidance drive at the hardware level with a hard-wired behavioural layer implementing the other important traits which are resting, feeding and constant awareness and monitoring of the environment. These will operate at a very high priority level within the software of the machine. The need for feeding will be based on readings of the battery level. Below a set threshold, feeding will become the most prominent priority. Food will be provided by a charging station installed in the space. Additionally, the human will be able to give electric food pellets to the robot, providing instant gratification after a given behaviour. The resting behaviour will be closely linked to feeding, as the robot has to stay immobile, connected to its charger for at least an hour for the battery to fully charge.

The robot will also possess a memory module, a key part of a dynamic action weighing system where mood and personality traits are constantly adjusted according to present and past stimuli. The memory module will also enable an intelligent adaptive curiosity function driven by a 'pleasure to learn': the robot will explore its environment, programmed so as to prioritise new experiences. The curiosity engine will be most active when, relaxed and charged, the robot will engage in playful activities, focusing its attention mostly on the human.

The combination of the physical, analog and digital aspects described above should allow for the construction of a sufficiently responsive, evolving platform. Ideally several machines will be constructed, each of which will perform with different human partners so that different narratives and different artificial personalities can emerge in close-to-identical robots.

Cybernetic performativity and machinic life

In *The Cybernetic Brain* (2010), Andrew Pickering explores the legacy of W. Grey Walter and other British cyberneticists. He describes a 'black box ontology' where knowledge on a given opaque

system is generated from performative experimentation with its inputs and outputs in order to represent its inner workings. Pickering's definition of a black box is 'something that does something, that someone does something to, and that does something back, a partner in (…) a dance of agency'. The dynamic reciprocity of action and reaction (feedback), and the use of the terms 'partner' and 'dance' point towards what Pickering posits as the fundamental originality of early cybernetics: a 'concern with performance *as performance*, not as a pale shadow of representation', with 'a vision of knowledge as part of performance rather that as an external controller of it' [10]. According to Pickering, the benefit of cybernetics' performative approach compared to the representational methods of more traditional sciences is the ability to address 'systems that are so complex that we can never fully grasp them representationally and that change in time, so that present knowledge is anyway no guarantee of future behaviour'. Complexity as a key aspect of contemporary technology is explored by John Johnston in *The Allure of Machinic Life* (2008) - a book that also recognises the importance of early cybernetics. For example the emergent complexity of Grey Walter's tortoises paved the way for what Johnston defines as 'machinic life', 'the forms of nascent life that have been made to emerge in and through technical interactions in human-constructed environments'. Johnston provides a comprehensive survey of recent research in the fields of artificial life, artificial intelligence and robotics, highlighting the 'emergence of complexity'. He posits that 'while machinic life may have begun in the mimicking of forms and processes of natural organic life, it has achieved a complexity and autonomy worth of study in its own right'. Then, expanding on Deleuze and Guattari, Johnston defines the notion of 'becoming-machinic': 'If we follow [Deleuze and Guattari's] idea that becoming-animal is not a mimicking of an animal but an entering into a dynamic relationship of relay and a parallel evolution with certain animal traits, it becomes possible to theorise how becoming-machinic is a force or vector that, under the guise of imitation, is directing and shaping not only ALife experiments and contemporary robotics but much of the new technology transforming contemporary life' [11].

Pickering and Johnston provide frameworks that are complementary to the terrain I want to explore with the *Biting Machine* experiment. Under 'the guise of imitation' - re-enacting a performance with an animal - the *Biting Machine* performance operates within what Pickering calls 'ontological theatre', a space-time where the machines and the world perform 'as aids to our ontological imagination, and as instances of the sort of endeavours that might go with a non-modern imagining of the world' [9]. The co-evolution of human and machine through the course of the performance is an instance of a relational endeavour with a 21st century cybernetic machine, the opportunity to experience a meeting with a species that blurs boundaries between natural and artificial.

Conclusion

In parallel with the generic dimension of Beuys' coyote, the symbolism attached to the *Biting Machine* reaches beyond robotic research, into the more general field of artificial agents, the world of technics. The changes brought by the rapid, constant development of complex and pervasive technologies are deep and not easy to monitor, and even more difficult to evaluate. In Bernard Stiegler's words, 'today we need to understand the process of technical evolution given that we are experiencing the deep opacity of contemporary techniques' [12]. The *Biting Machine* experiment is the latest development in an artistic practice anchored in science and technology that promotes a hands-on, performative approach to the subject in an attempt to shed some light on the opacity mentioned by Stiegler.

References and Notes

1, Caroline Tisdall *Joseph Beuys Coyote* (Schirmer/Mosel, 1976) see also video footage on http://vimeo.com/5904032 (accessed 30th June 2013)

2, *Flying Insects and Robots*, **D.** Floreano; J.C. Zufferey; M.V.Srinivasan; C. Ellington eds. (Springer, 2010).

3, W.G. Walter, *The Living Brain* (Penguin, London, 1961 p. 112).

4, R. A. Brooks, *Flesh and Machines* (Pantheon 2002 p. 46).

5, D. Floreano; S. Nolfi, *Evolutionary Robotics*, (Cambridge, MA, MIT Press, 2000).

6, C. L. Breazeal, C. L. *Designing Social Robots* (MIT Press , 2002, p5).

7, F. Kaplan *Les Machines Apprivoisées* (Vuibert. 2005).

8, F. Kaplan; P. Y. Oudeyer; V.V. Hafner *Intrinsic Motivation Systems for Autonomous Mental Development* (*IEEE Transactions on Evolutionary Computation* Vol 11, nº2, 2007, p265).

9, Saunders, R. et al: *Curious Places, Proactive Adaptive Built Environments*, Proceedings of AISB'07 Symposium on Agent Societes for Ambient Intelligence, Newcastle, UK, (2007).

10, A. Pickering, *The Cybernetic Brain* (The University of Chicago Press, 2010).

11, J. Johnston, *The Allure of Machinic Life (*MIT Press, 2008).

12, B. Stiegler, *Technics and Time* (Stanford University Press, 1998, p21).

EXPLORING THE RESPONSIVE SITE: Ko Maungawhau ki runga

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Abstract

Ko Maungawhau ki runga [1] is a performative research project by the author on the site of a former 17th century Maori *Pa* (fortified village) in Auckland, New Zealand. It is a subset of the long-term project *Do we see in algorithms?* and uses location aware technology to deploy augments at precise nodes in a meaningful location. Accessed on foot, the augments explore multiple strategies for engagement between Global Positioning Systems (GPS), the smartphone as an art interface, user, artist and site.

Keywords: site responsive art, space & ecology, media art, Maori art, mobile technologies, software assemblage, location aware technology.

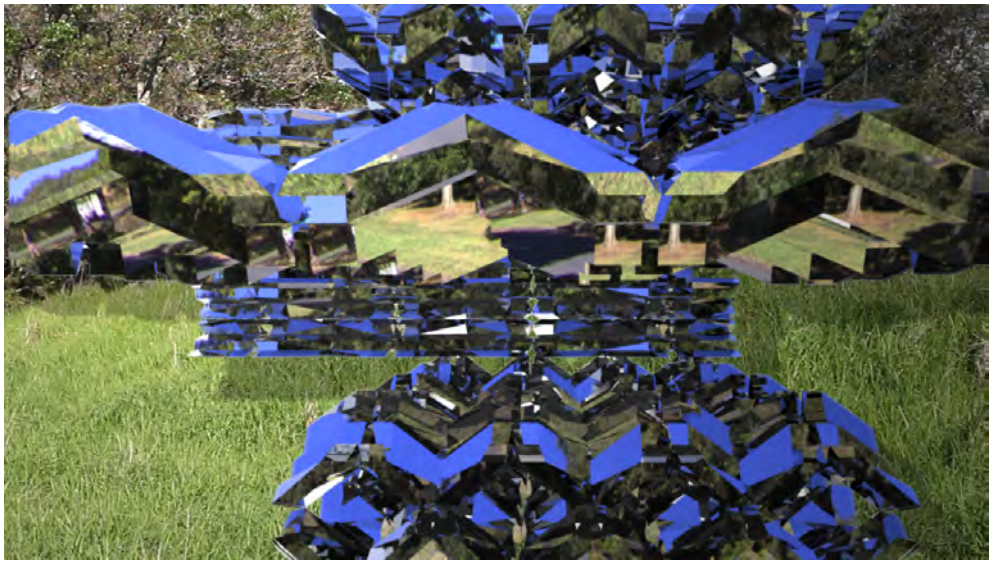


Fig. 1. Still image, *Ko Maungawhau ki Runga: Te Maraekohanga.* (© Rewa Wright, 2013)

Exploring the smartphone as art interface while confronting key issues of scale, user, movement, and site, *Ko Maungawhau ki Runga* seeks to generate a creative exploration of Maungawhau [2] by establishing a situation where the physical and cognitive experience of the user collides with cultural memory, geological shifts, and archeological heritage. During April and May of 2013, participants walked between a series of six augments using their smartphone or portable media device to navigate to each point of interest (POI). Accessible as a channel in the application Layar, POI were embedded as video layers and activated by the user at specific coordinates [Fig. 2].

Since the smartphone is also an everyday interface for performing a variety of non-art based actions - talking, taking photographs, playing games - these behaviors must be taken into account when using the smartphone to deliver an art experience. For example, if it is normal to pull out a smartphone and capture an image of a compelling scene, then this convention provides an opportunity for the artist to design work that operates alongside *and* against what N. Katherine Hayles has described as 'hyper-attentive' behavior [11]. In response to user practices which privilege multitasking, this work has no set order in which to experience each augment: it does not follow a prescriptive trail, and does not assume that it has a captive audience, since users may choose to not complete all of the augments. Each augment is brief (30 seconds) and the six locations are geographically varied to engage attention. Crucially, the user rather than the artist is the agent of the work: their actions are performative and allow the work to unfold.

Ko Maungawhau ki Runga contrasts the (pastoral) act of walking between nodes with a networked (urban) context where time is fragmented between various attention capturing activities and thus entails an experimental collision of 'deep absorption' and 'hyper-attentiveness.' These neural shifts allow fresh insights into human-computer interaction in our global twenty-first century milieu, while foregrounding the molecular potentialities of networks as sites of embodied experience.

Set outdoors, within the ecology of Maungawhau, the project was designed to operate alongside the self-directed practice of walking. When we traverse a natural environment on foot, we tend to do so at our own pace, a slow meander rather than the pressured scramble typical of city walking. Latent in the self-directed experience of exploring an organic ecosystem is the potential for digression, in contra distinction to the linearity of the fast paced urban-scape. Duration as a force of the virtual comes into play, since the time it takes to traverse each node of the work cannot be predicted.

In response to the technical and geographical demands of this project, the need arose for a combination of approaches: augments were produced using interactive 'print triggers' as well as 'geo-layers' [3]. These print triggers were postcard-sized laminates, positioned on physical markers already installed at the site as part of existing

Fig. 2. Key to work. (© Google Earth/ thumbnails added by Rewa Wright).

walking paths [4]. The augments themselves consist of 3D animations made in Autodesk Maya, composited as video then embedded for delivery to a server. The mechanisms that precede the work's technical operations are contingent on a set of networked predicates. Variables effecting the speed and quality of content delivery include cellular wireless networks at the site, the user's data provider and individual phone model. However, it is not technical or functional structures that 'produce' *Ko Maungawhau ki Runga* - it is the actions of the individuated user, the specifics of their affective behavior, and the level to which they engage with the work as a kinesthetic system.

Photographic panoramas taken at the site were used to assemble High Dynamic Range (HDR) images, projected in the 3D modeling environment to layer colour and light information as equirectangular maps. Models appear to break and re-configure as they move, a result of the way non-manifold geometry interacts with the mirror-like surface reflections [Fig. 1].

Reconfiguration, conceptually speaking, is also a geological feature of Maungawhau, whose summit, crater, plateau and basalt fields were formed by geothermal activity between 10,000 and 20,000 years ago. As a changing natural environment, Maungawhau displays radically different seasonal and climactic variations. Furthermore, embedded in the archeology of the site is the legacy of a Māori tribal architecture of impermanence: the seventeenth century fortified village which fell to disrepair and eventually rotted in the elements, was largely constructed of wood and lashed together with rope made of flax. Designed as an engagement between the specificity of the augments and the cultural, geological, and archeological influences, this work opens Maungawhau to the virtual in art, where the past is invoked to explore new possibilities for trans-cultural engagement. Critically, it is the agency of the user that facilitates the connectivity between memory, time, and perception.

Evolutionary Forms

Each model is formally a remediation of a singular prototype, whose animated movement produces differences across the series of six forms. New forms are produced through shifting the algorithmic parameters of the 3D models. At times, certain configurations of the augments appear as bird-like, kite-like, hive-like, without ever actually fixing themselves to that shape. Fluid and evolutionary, abstract or naturalistic, vertex, edge and face (the bifurcated lines of the non-manifold) reveal their construction through shifts in movement, position, and gesture [5]. Following is a brief description of each augment [Fig. 2]:

Meeting place/ *Marae*: Located on a wide northern plateau called *Te Maraekohanga* (place of acceptance and meeting), this augment consists of two forms folding into one another, referencing the ceremonial mingling of peoples that would have occurred at this locale.

Hive/ *Kohanga pī*: The home of bees but also a metaphor used for human populations living in close communal quarters, as in a city. Set adjacent to a tree, this augment features connected cells pushing toward and away from one another [Fig. 3.].

Kite/ *Manu aute*: Set on the blustery Southwestern edge of the summit, this augment explores the traditional Maori kite or *manu aute*. Woven from natural materials, *manu aute* are flown at *Matariki* (solstice) celebrations in June/July.

Mats/ *Whariki*: Māori shaped the natural geographical features of the site between 1100 and 1650, digging terraces for gardens, scarps for fortifications, and middens as storage pits for root crops. Placed in the largest surviving food food-storage midden (6m x 5m), this augment is inspired by traditional *whariki* woven mats, placed as a barrier between earth and food.

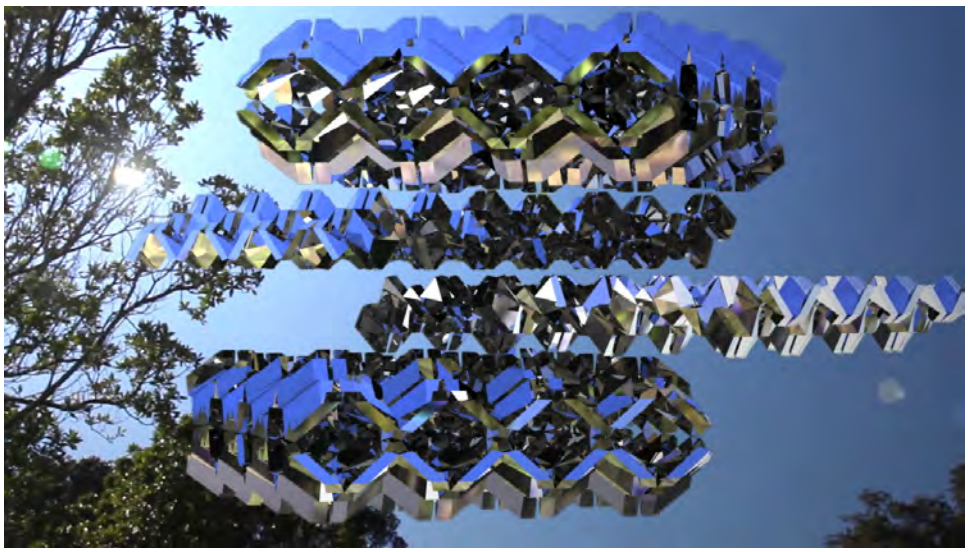
Bird/ *Manu*: Set on the edge of the North facing plateau, this augment references flight and the airborne. The *manu rere* (flying bird) is a popular symbol of freedom and communication, while the accompanying sound design evokes the water storage reservoir beneath.

Fishing net/ *Hao*: Placed in an area where cooking pits - used between 1430 and 1650 - have been unearthed containing shellfish remnants, this net-like augment traditionally symbolizes two types of gathering: food and knowledge. This augment is adjacent to the edge of the crater, known in Maori as *Te Ipu a Mataaho* (the cup of Mataaho) [6].

The sound design of each form is unique, mediated through a combination of amplified field recordings of the hidden sonic world of Maungawhau blended with studio created machine noise. Users were encouraged to wear headphones to enhance the aural experience. When presented back at the site, invisible aural minutae take on an enhanced significance: their smallness stands in stark contrast to the mountain's expansive plateau. Concrete and studio sonics are treated as productive collisions: the sometimes harsh wind as it flows across the mountain, is set against the solitude of birdsong; a simulated cavern space underneath the volcanic ash is juxtaposed with vehicle engines and the distant motorway; flowing underground spring water is blended with chattering insects.

An ancient Māori *whakataukī* (proverb) is pertinent here: *ki mua, ki muri,* or 'the past is the future.' *Ki mua,*

Fig. 3. Still image, *Ko Maungawhau ki Runga: Kohanga pī*. Augment embedded as video (© Rewa Wright 2013).



ki muri is a proverb that has existed in Maori oral narratives for around 900 years, and is recited today as part of traditional ceremonial events. In the last 200 years it has been trans-mediated to different formulations, such as ‘e nga wā o mua’ or ‘the time in front’ [7]. This saying can be treated as providing a conceptual window to a Maori approach to time as non-chronological, and deeply vested in the ‘long duration.’ Crucially, it exposes a non-linear sense of time as crystalline: the past, activated at the site of the human person, ensures that cultural memory exists in the context of a continuous present. The past is not expressed as remnant or ruin as in the conventional Western paradigm: rather it is vital and alive with every moment.

Philosophically, *ki mua, ki muri* can be seen as a strategy wherein the past as virtual is actualized in the present, a cosmological approach to time which seems to share common ground with Gilles Deleuze’s notion of time as ‘crystalline’ [8]. Moreover, the experience of walking between the augments in *Ko Maungawhau ki Runga* resonates with Henri Bergson’s embodied sense of ‘durée’[9]. As the user walks to each augment, activating, perceiving and engaging with it, they are leaving a recent past and moving to an indeterminate future. It is a constant movement where present is always becoming past, and the future, while inevitable, cannot be predicted. In the context of a discussion of Bergson, Anna Munster notes: “Attention is an attending *to,* tracing how something singularly unfolds relationally. This singularization occurs dynamically in relation to previously grasped actualizations and with the sense that the singularity of the unfolding- playing a chord, playing chess, surfing the web- always takes place in a present also littered with virtualities that potentially ‘shift’ the game elsewhere” [10]. *Ko Maungawhau ki Runga* gently points ‘elsewhere,’ toward a terrain without a map, where imagination, memory and perception nudge the user to explore the unexpected. While there are diagrammatic nodes [Fig. 2], there is no set order of augments or fixed duration to the experience. Through the practice of walking between, activating, listening and viewing the augments, the user is asked to engage in a relational experience with the network and the site.

We have spoken of duration, and alluded to the existence of culturally trans mediated perceptions of time, but what of memory? Smartphones are arguably *the* twenty-first century memory aid: at once portable and personal, their close physical proximity to people allows them to occupy the ‘intimate zone’ of personal space, to exist functionally within 45cm of the body. Since the tools for creating AR experiences have shifted from unwieldy and expensive headsets, to the portable and personal smartphone, augments have been accepted as ‘everyday.’ Already, the technological shift from the confined lab to a distributed dispersal in a ubiquitous ‘everywhere,’ has created new problems of perception and recognition. My own questions surrounding augmented and mixed reality scenarios include issues of how augments might participate in art practices, what status they may take on in life, whether or not they can be displaced from hierarchies of power to become a creative and generative force, and how we will cognitively respond to their presence.

Timothy Lenoir identifies an affective collectivity that is emerging within our portable technics: “ Our new collective minds are deeply rooted in an emerging corporeal axiomatic. This is the domain identified by Guattari as the machinic unconscious: a wide range of media ecologies, material practices, and social apparatuses for encoding and enforcing ways of behaving through routines, patterns of movement and gesture, as well as haptic and even neurological patterning and repatterning that facilitate specific behaviors and modes of action” [12]. Since this ‘corporeal axiomatic’ is still emergent and thus yet to be thoroughly defined, its specific modes and patterns are fertile and productive ground for location aware art. How the individuated user will couple with an affective collectivity is not only an issue of context within their localised cultural sphere, but pushes toward the ‘extended mind’ of global virtual culture.

Augments, delivered through our ubiquitous smartphones, are incorporated within a ‘software assemblage,’ [13] and operate as a vector for activating scattered virtualities. If this practice can be connected to an artistic legacy, then Marcel Duchamp must surely be blamed. *Bicycle Wheel* (1913) posited a radical folding of the ‘everyday’ into art: an event-scene which instantiated the destruction of the rarefied art object through a reconfiguration as readymade or assemblage. Perceiving *Ko Maungawhau ki Runga* as a ‘software assemblage’ references the deployment of everyday technology within the ‘privatized’ public sphere, while it also situates the activities of the user as a subject for political critique and aesthetic scrutiny.

Distinct from other uses of AR, such as those from within gaming, military, medical, or advertising paradigms, augments as art can potentially re-inscribe our perception of the locales they inhabit. The process of situating augments inspired by Maungawhau back to it, for display within the particularities of its natural environment, represents a gentle folding of cultural, archeological, and geographical influences, facilitated by AR technology mobilizing an online meshwork driven by code. Like a large spotlight focused to a tiny shaft, vastness- the internet, GPS- emerges in service of the affective and specific. The combined weight of history and ecology that many of us sense when we enter an expansive landscape such as Maungawhau, is mediated by augments as interventions in the network, only to be remediated by the active subjectivity of the user.

References and Notes

1. ‘Ko Maungawhau ki Runga,‘a phrase in te reo Maori, is translated to English as *the mountain of the whau tree is above us.*

2. Maungawhau is the name of a 196m tall dormant volcanic cone and public park situated in Auckland, the location of the work *Ko Maungawhau ki Runga*. Maungawhau was a *Pa* (fortified village) until abandoned in the seventeenth century in the aftermath of sustained and bloody inter-tribal conflict.

3. Both techniques were delivered using the Layar Augmented Reality App. since at the time it seemed to offer an accessible delivery system. Subsequently I have used other systems such as Augmente and Unity. Augments can be accessed as geo-layers at the site. In addition, the 6 full versions of the video can be viewed online:

<http://www.youtube.com/user/TheSTanleyKnives >

4. Maungawhau receives approximately 1.2 million visitors a year, and is an iconic stop on the Auckland tourist itinerary. This intense use has resulted in the severe deterioration of some trails, now nothing more than muddied tracks. The locations chosen by this project were scoria-clad, with the aim of diverting foot traffic away from ecologically vulnerable regions.

5. *n*-manifold or non-manifold geometry refers to polygonal forms which appear visually connected but are actually technically separated either by edge, vertice, or face.

6. Mataaho is a deity who resides in the volcano, who was sent fire by Mahuika (Goddess of Fire) after his wife stole all his clothes leaving him shivering.

7. Te Ahukaramu Royal,,*Te Whare Tapere*, PhD thesis, (Victoria University, Wellington, 1998) p. 211.

8. G. Deleuze, *Cinema 2: The Time-Image*, R. Galeta & H. Tomlinson, trans. (London, U.K.: Athlone, 1989).

9. H. Bergson, *Matter and Memory*, N.M Paul & W. S. Palmer, trans. (London : G. Allen & Co., Ltd. ; New York : Macmillan Co., 1913).

10. A**.** Munster, *An Aesthesia of Networks: Conjunctive Experience in Art and Technology* (Cambridge, Mass : MIT Press. 2013) p. 139.

11. Hayles comments: "What we know is that our experiences with the diverse temporalities of the computer are pushing us toward faster response times and, as a side effect, increased impatience with longer wait times, during which we are increasingly likely to switch to other computer processes such as surfing, checking e-mail, playing a game, etc. To a greater or lesser extent, we are all moving toward the hyper attention end of the spectrum, some faster than others." N. Katherine Hayles, *How We Think: Digital Media and Contemporary Technogenesis* (Chicago : The University of Chicago Press, 2012) p. 105.

12. T. Lenoir, " Contemplating Singularity," in Ulrik Ekman, ed., *Throughout: Art and Culture Emerging with Ubiquitous Computing* **(**Cambridge, MA: MIT Press, 2013**)** pp.579.

13. If we accept Lev Manovich's contention that software has 'taken command,' (Manovich, 2013) then the term 'software assemblage' is highly appropriate. 'Software assemblage' is a term I personally use in relation to my hybridized practice, an extension of 'mixed media assemblage.'

CELEBRA

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Abstract

In this paper we present *Celebra*, a massive, site-specific, interactive installation comprising two hundred balloons, LEDs, custom electronics, and custom software. The artwork allows for different interaction modes: visitors can interact with the piece locally via sound and movements, and remotely via smartphone apps and a dedicated website. The piece can also become an audio-visual performance instrument, allowing its users both direct and high-level control. We will discuss the motivation behind *Celebra*, its implementation, and technical details.

Keywords

new media art, interactive art, balloon, LED, media appropriation, remote interaction

Fig. 1. *Celebra* as installed at EAC, Montevideo, Uruguay. Photo © 2011 Guillermo Berta),

Introduction

In this paper we present *Celebra*, a massive, interactive, site-specific and remote installation and performance tool. *Celebra* comprises a suspended network of two hundred balloons. The balloons have a diameter of one-meter and are lit from the inside by LEDs. The installation presents an organic aesthetic that combines the grunginess and DIY style of the underlying electronics with an elaborate visual output and interaction scheme.

Our work, in *Celebra*, is framed within three main axes: media appropriation, explicitness of interaction, and the geographical and socio-political contexts of the piece.

1) Media appropriation: technology has always played a defining role in art [1], but in *new media art* it is possible to identify a different relationship with technology which arises from its appropriation. In this case, technology becomes a raw medium of artistic expression. This appropriation effectively expands the artistic possibilities, allowing for the search for new solutions, and for the incorporation of technology production to art practice.

2) The explicitness of interaction: Marcel Duchamp once wrote: "The creative act is not performed by the artist alone; the spectator brings the work in contact with the external world by deciphering and interpreting its inner qualifications and thus adds his contribution to the creative act." [2]

We can state that all art is interactive; however, this should not hide the fact that 'explicitly' interactive artworks, ones that actively react to human input, conform to a distinct genre of art production. With an explicitly interactive work, the aesthetic characteristics of the interaction become a relevant part of the work's proposal.

As American computer artist Myron Krueger said [3], *"I have been trying to raise interactivity to the level of an art form as opposed to making art work that happened to be interactive."* In *Celebra*, the different modes and the discovery of the work's possibilities by the audience are integral components of the artwork.

3) The geographical and socio-political contexts: In Uruguayan engineer Eladio Dieste's words [4], "Each problem [...] should be faced with a sort of ingenuity, [...] with an attitude humble and vigilant. It should be thought again, with the basic body of knowledge that is now the heritage of all men." From our perspective, Dieste's assertion implies a radical change of attitude towards art and technology production. Media appropriation permits the creation of art which both reflects its context, and also reflects *on* its context.

Prior, related work does exist; lanterns have been used for almost three thousand years, while artificially illuminated balloons can be traced back to the Chinese Kongming lanterns (sky lanterns) from

Fig. 2. Detail of *Celebra* as installed at ISEA in 2013. Photo © 2013 Tatjana Kudinova)

around 200 AD.
In addition, LED-lit balloons have been used in a number of artworks, perhaps the most wellknown being *Open Burble*, created by Haque et al. for the Singapore Biennale in 2006 [6]. There are also a number of commercially produced LED-lit balloons for sale, together with many tutorials on how to assemble your own.

Celebra

Celebra consists of a network of two hundred balloons, each one metre in diameter, lit by LEDs, cables, LED-controlling boards, computer power sources, computers and software.

According to the definition suggested in the previous section, *Celebra* is both implicitly and explicitly interactive, and any analysis of its artistic proposal must consider this. Its aesthetic characteristics unfold over two dimensions: its physical appearance and its behaviour.

Grunginess and explicitness

Celebra embraces two aesthetics that are frequently seen as contradictory: on one hand, much effort has been put into the design and construction of its very refined control interfaces, interaction schemes, and visual output; on the other, it embraces a rough aspect that arises from its components and their interconnection, and lends it the *grunge* appearance of many DIY projects.

All the physical, functional components of *Celebra* are visible, and spectators can trace the flow of data from the computers to the balloons, following the cables and seeing how the controllers group sets of balloons. When necessary, the circuit boards are covered with transparent protection (made out of recycled plastic bottles), maintaining the visibility of all parts.

The inclusion of technology in the aesthetic proposal is intentional, and this intentionality is based on two aspects: first, in the traditional style of the 'readymade', by recontextualizing the object its aesthetic qualities are reclaimed; second, and more important, these objects are functional components created by the artists. By incorporating them into the piece, technological production is inscribed into the art production; *Celebra* attempts to re-state that technology creation is part of the new media art discourse.

The piece does not only involve a substantial amount of original technology, but also exposes it and makes it immediately perceivable, in an overt attempt to reaffirm that it is not only pertinent, but intrinsic, to the aesthetic proposal.

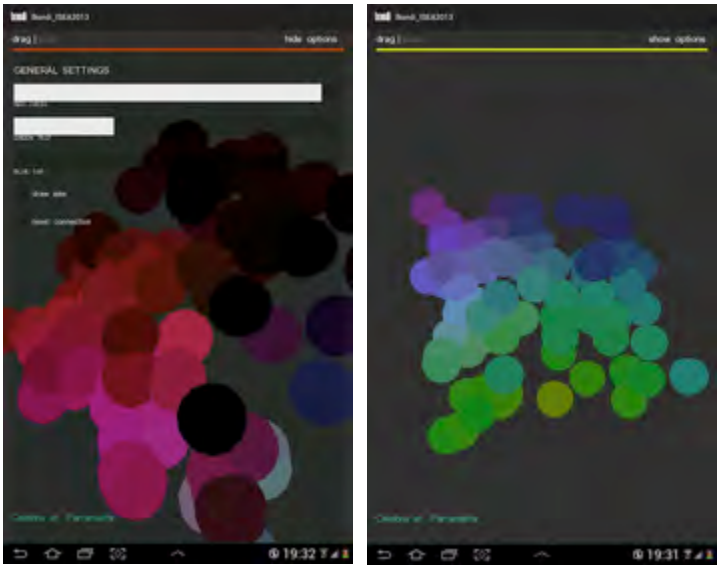


Fig. 3. Smartphone application screenshots

Media appropriation occurs not only in the expansion of the functional spectrum, but also at a pure aesthetic level: by showing these functional components, the appropriation becomes evident.

Celebra's elaborated visual behaviour somewhat collides with the aforementioned 'grunginess' of the installation, creating a tension that is left for the public to resolve, and which becomes central to the artistic proposal.

Interaction and explicitness

As mentioned in the introduction, *Celebra*, like all artworks, is implicitly interactive: its audience can walk into the network of balloons, touching, moving and perceiving them.

However, the piece is also explicitly interactive, admitting several forms of interaction. As a stand-alone installation, it reacts to participants (both present and remote), and to ambient sound or music.

These two interaction modes are both local: some balloons react to stimuli close to them; and global: the behaviour of the installation as a whole is also reactive.

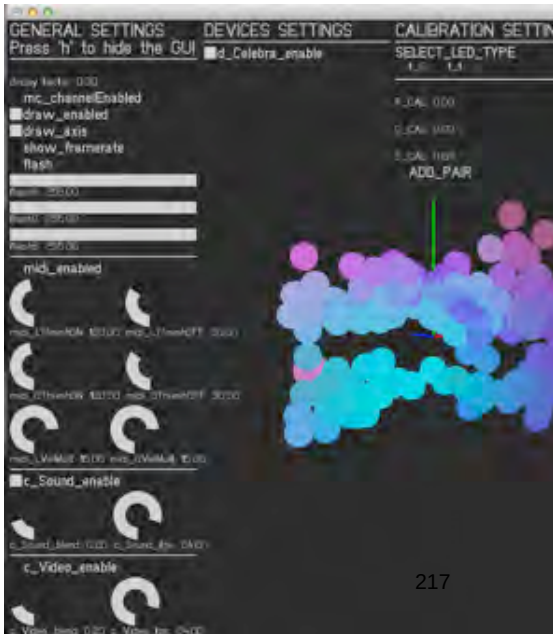
The local interaction channels are aural and visual. We use depth cameras and microphones distributed throughout the installation, and each sensor's data affects only the balloons in its surroundings.

In addition to this local response, the whole installation reacts to ambient sound, creating different visual styles or 'moods'.

The piece also allows for remote interaction via both web and smartphone apps (for Apple's iOS and Google's Android) that reproduce in real-time the light patterns of the piece, and allow users to interact with it. Currently, the only interaction implemented allows ®s to 'paint' the balloons using a colour palette, but other interaction schemes may be added for any particular installation of *Celebra*.

Facilitating remote interaction uncouples the experiencing of the artwork from its physical immediacy; by reaching beyond the geographical borders of the installation, we propose to reflect on modes of artistic consumption, and on the role that participants play in the completion of an artwork.

Simultaneous interaction with an artwork by two or more individuals transforms it into a form of interpersonal communication tool. Exhibition spaces exist not only to facilitate art consump-



tion, but also to favour art-mediated human interaction; allowing remote interaction extends and interpellates these spaces and their relation to art production.

This interweaving of local and remote control also adds an interesting element of playful uncertainty, as participants perhaps wonder how the installation is

Fig. 4. Screenshot of the server

controlled, why certain patterns are appearing, and how many people are interacting (locally or remotely) with the work. The work's responses to their movements and sounds can be perceived not only by those interacting locally with the work, but also by remote participants; thus, again, the reach of *Celebra* extends beyond its immediate perception.

Celebra as instrument

Celebra also functions as a multi user visual instrument, supporting an arbitrary number of concurrent performers.

One performer controls the server (the central computer that handles most of the computing requirements), which blends the input from an arbitrary number of clients (devices, computers, or pieces of software that connect to the server).

Celebra's architecture allows for different configuration involving many clients, computers, and devices. These clients can be operated by one or more simultaneous performers, sharing the physical space or performing remotely.

The clients are stand-alone pieces of software that communicate with the server via the Internet (or a LAN). They all offer interaction via the computer's peripherals (keyboard and mouse), and accept MIDI input. Performers can choose their preferred MIDI controller and map it onto each client's parameters and controls.

Every client allows for real-time control of their parameters, triggering real-time responses from the server, and therefore, from the installation.

As of June 2013, the implemented clients are:

Video. Video (both live and pre-recorded) is mapped onto the balloon cloud, turning it into a low-res deconstructed screen. Each video client supports up to three simultaneous alpha-blended videos, selected from a large arbitrary video library. The client offers the performer some traditional tools of VJing, such as scratching, mixing, pausing, and controlling the reproduction speed.

Sound. A number of virtual illuminators orbit the installation and react to different frequencies. The performer can modify the number of illuminators in real-time, and how they react to the sounds.

Noise. The client maps Perlin noise onto the cloud. The performer can assign different noise generators to different global parameters.

Local sound. The balloons near a microphone react to the sound. Different patterns can be triggered, and different frequencies can be mapped onto different parameters.

Kinect. Each client tracks users' locations and their skeletons. This information is mapped onto different behaviours that can be changed in real-time. By default, users can trigger patterns by waving and shaking their hands. This client can also be used to allow one or more performers to manipulate global parameters using hand gestures and movements.

Direct control. The performer can change any set of balloons to a given colour, cause it to oscillate between several colours, assign pre-stored animations, and other simple behaviours.

Web and smartphone. These two clients implement remote interaction; they obtain commands from a queue managed by a web server. This server publishes a web application that performers can interact with, and listens to the commands sent by smartphone apps (see section four for more details).

Celebra allows for both direct control of the balloons' colours (via the 'direct control' and 'video' clients), and a higher-level control in which the performers affect the parameters of a more autonomous behaviour.

The two modes, interactive and performative, are not exclusive: local and remote spectators can experience the piece and interact with it while one or several performers play it. The piece creates a joint performance in which, again, the roles of performer and spectator are blurred and challenged.

Site specificity

Celebra was originally created under a commission by the Uruguayan Government as part of the celebrations of Uruguay's bicentenary. We chose to use two hundred balloons as a direct reference to the country's age.

The piece is conceived as a communication and connection tool. It brings together the participants, both local and remote, spectators and performers. The work's potential is highlighted and enhanced when the work is experienced by several persons at the same time; they collaborate with it both implicitly and explicitly, and the piece exists in this real-time collaboration.

In its first installation, within the bicentenary celebrations, *Celebra* was shown at *Espacio de Arte Contemporáneo*, a public museum in Montevideo, Uruguay, located in a converted prison. The piece was installed on the former prison's patio, and by installing this playful artwork, the space of the prison is again reclaimed, and a reflection on the country's recent history is proposed. By allowing interaction with the remote audience, the prison walls are perforated; the artwork is expanded, and transcends its physical immediacy.

Subsequent installations have allowed us to focus more on the relationship between work and the space where it is shown. As a blunt example, indoor and outdoor installations differ significantly: outdoors, for example, the wind becomes a feature of the experience.

In a parallel and consonant way with the electronic setup, *Celebra*'s structural solution is also explicit, and easy for its spectators to follow and understand. Its rooting into the physical space is evident, and becomes part of the work.

Technical details

Architecture

Celebra implements a client–server architecture, in which one computer – the server – controls the work's hardware by following the commands of several clients.

Each client runs at an independent speed (frame rate), and sends frames – that is, complete specifications of all the balloons' colours – to the server. The server, in turn, mixes all the inputs to determine the final balloon colour configuration.

The parameters that govern how the server mixes the different sources is controllable in real-time, and is one of the main parameters manipulated by performers.

The piece uses Macetech's Octobar boards as LED drivers, each controlling, by means of eight A6281 chips, eight RGB LED modules. Octobars can be daisy chained (power and data) and thus they can control a very high number of LEDs. The server and all the clients are constructed so that new instances of Celebra can involve an arbitrary number of

balloons.
Connected to the server is an mBed board, a multi-purpose programmable 32-bit micro-controller with a built-in Ethernet interface and an implementation of the UDP stack protocol. The mBed is a relatively cheap microcontroller using an ARM microprocessor. It has the unusual (and annoying) feature of having its development environment on the web.

We run our custom code on this device, which makes it behave as a standard DMX512-A controller, fully implementing the Art-Net protocol [5].

In *Celebra*, the mBed acts as an interface between the low-level light system and the interaction software, receiving Art-Net packets from the interaction software and translating them into TTL signalling, which is understood by the A6281 chips of the Octobar.

We use 3W RGB LED modules and standard PC power supplies that power the Octobars and mBed.

Software

As previously mentioned, Celebra implements a client-sever architecture. One central computer (the server) is fed by multiple clients that instruct the server on how to light the balloons. The server performs all the communication with *Celebra*'s hardware. At any given time, an arbitrary number of clients can be running. Clients can be added and removed as a function of the installation requirements.

The communication between clients and the server uses an ad hoc application network protocol over two communication channels: a TCP channel for control, and a UDP channel for transmitting frames to the server.

During the handshake, the server informs the new client on all aspects of the current installation (number of balloons, their three-dimensional locations and identification numbers, location of some sensors, UDP port and so on), and starts listening on a per-client UDP port. The protocol allows for binary and XML based communication, and the communication speed is negotiated and renegotiated in real-time by the server and its clients.

The server was developed using openFrameworks, an open source framework for creative computing.

Celebra implements different clients; some of them (sound; Kinect) were created using Java and Processing, while the video client was created using C++ (openFrameworks), and the web client using Java and Python.

Web and smartphone clients

To enable web interaction, two-way communication is needed between the server and the devices, as the server must send the smartphones the installation data and frame colouring information, while *Celebra* needs to receive commands sent by the devices.

In our setup, smartphones communicate with a web application using standard HTTP messaging, and obtain all the setup information (balloon positions, identification numbers and communication parameters). This web application is hosted on the cloud (using Amazon's services), and not at the installation site.

After obtaining the parameters of the data feed, the smartphone either starts listening for data on a specified UDP port (which works extremely fast, but has the disadvantage of not performing well on some Internet connections), or opens a WebSocket connection to a web server on the cloud.

This data stream is established on a per client basis, and is generated by *Celebra*'s server, which, in addition to feeding data to the actual hardware LED components, also uploads a single data stream containing the current frame colour information to a Stream Server hosted on the cloud.

The Stream Server, which has a high-speed uplink connection, replicates the single data stream into multiple point-to-point streams, one per connected smartphone. As all the data transmission is delegated to the Stream Server, this allows *Celebra* to use a standard ADSL Internet connection.

The smartphones also need to send data to the server. This consists of simple lightweight colouring commands, which are sent, using HTTP messaging, to another web server: the 'Command Server'. This Command Server is set up in the same LAN as the server, and exposes the message queue to the clients.

Finally, the two-way connection is completed by a standard *Celebra* client that translates commands from the message queue into coloured frames.

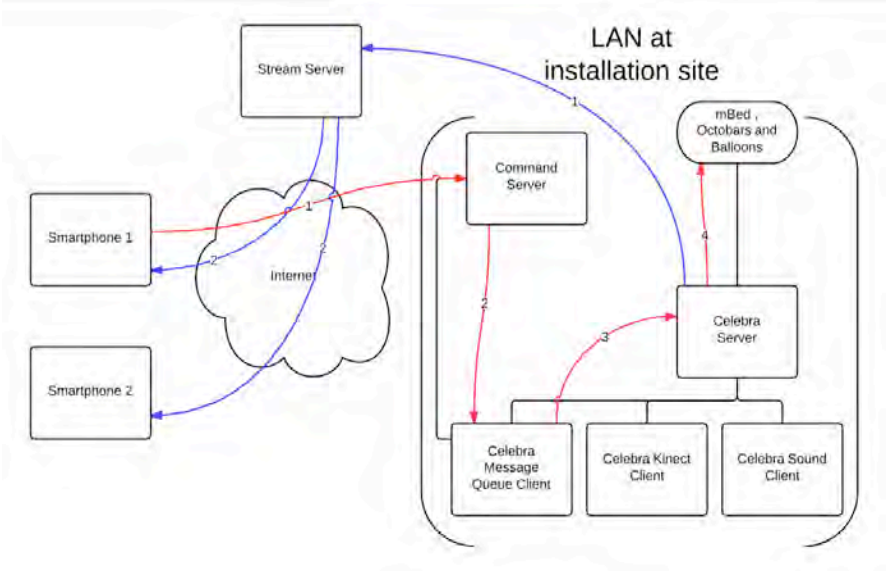


Fig. 5. Network scheme and data paths. In red: connections from the smartphones to the server. In blue: from the server to the smartphones.

Conclusions

With *Celebra*, we found a new solution to a previously tackled technical problem: using LEDs and balloons in a massive interactive installation. This could have amounted to little more than a technological anecdote or an engineering exercise; however, we conclude that it has become something much richer, an artwork in which the artists appropriate the work's medium to build a new relationship with technology. This allows a search for new aesthetics, and the proposition of new dialogues and new solutions. Site specificity, for example, becomes relevant not only in the layout of the work, but also in the lower level aspects, and also the purely technical decisions.

In this way, the artists are concerned not only with the general aesthetics, but with all components of the work.

Media appropriation offers a new sensation of freedom, a widening of the spectrum in the search for solutions, and new aesthetic and technological alternatives.

With *Celebra*, we found, this also had an impact on the appearance of the artwork: we decided that the functional

components (boards, cables, controllers, computers, switches, power sources) should collaborate in *Celebra*'s appearance, and assisting our claim that the underlying process of design and construction of the piece, and its context, are integral parts of the work.

Or, at least, we intended *Celebra* to suggest that there may be a reason behind its appearance. Even if it is obvious that there is an aesthetic reason behind the avoidance of a sterile refinement, we present the installation to suggest that there is also a narrative that we believe relevant.

Celebra is intended as both a dialogue with its environment, and a proposal for dialogue with its public, with other artists and with ourselves; a humble tool for discussion - one with lights, interaction, music and balloons.

Acknowledgements

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References and Notes

1. Laurenzo, T. 2009. New Media Art. Facultad de Ingeniería. Montevideo, Uruguay.

2. Duchamp, M. 1957. The creative act. Session on the Creative Act, Convention of the American Federation of Arts.

3. Mitchell, B. 1999. Krueger M. W. http://www.siggraph.org/artdesign/gallery/S98/pione/pione3/krueger.html, web site. Last visited March 2013.

4. Dieste, E. 1998. Introducción a la teoría. Facultad de Arquitectura. Montevideo, Uruguay.

5. ArtNet. 2012. Art-Net 3 Ethernet communication standard.

6. Openburble. http://www.haque.co.uk/openburble.php.

7. Bondi. http://bondi.cc

AUTISM AND THEORY OF MIND IN INTERACTIVE SPACES

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Abstract

How is an Interactive Media Arts practice placed to explore what is often considered a scientific field of research? This paper is a discussion on the main areas of study situating an observational PhD study on non-verbal children with autism. The author suggests that in fact an arts practice allows for more sensitive research and allows natural emergence to explore and facilitate the expression of Theory of Mind and physical consciousness.

Keywords: autism, Theory of Mind, interactive arts, agency, language, enacted mind, sensory processing

When an arts practitioner moves across disciplines that are considered scientific in nature, such as empirical human research, the rigor of artistic practice may be questioned. If they are not gathering scientific results, what do they consider their research purpose to be? This strange desire for a structured role or title may actually involve overlooking one of the great strengths of the artist; there is a sensitivity associated with an arts practice that allows the practitioner to be flexible and responsive to participant engagement. This is not necessarily the case with a scientific approach to studying a human population, where the pressure of proving a hypothesis[1] drives the researcher to treat the participant in an objective but disconnected way.

As an early career researcher, currently in the second year of my PhD studies in Interactive Media Arts, I not only attempt to place my work within multiple fields, but continually question my own place and role within the study. I think of this stage of my work as being a conversation, or a short provocation; designed not only to engage with participants during observational studies to be carried out throughout my research, but entailing that I remain open to others who may question my role and direction. This is an openness not afforded within most scientific studies.

Adopting a philosophical perspective, the research presented in this paper aims to look at the potential of physical and interactive media to engage and facilitate agency in non-verbal children with autism. Early decisions around the media I choose to employ for these studies will discuss why the screen - particularly 'smart' touchscreen devices - are not the most appropriate interface for engaging with this population.

I find it useful to question whether screen-based devices are in fact a worthwhile addition to the therapeutic toolkit. It seems we are quick to imagine these devices are capable of being assimilated into a therapeutic environment and do not question whether there is any loss of engagement in the process. Bret Victor is a useful touchstone on this point. Victor is an ex-Apple employee and left the company in spectacular fashion around the same time as the release of the first iPad in 2010 [2]. Victor worked on experimental interfaces for human-computer interaction and has much to say on why the gesture of touch-based screens is not a good interaction metaphor [3]. He makes the important point that the use of a touchscreen does not reflect the way that we interact with our natural world.

Victor's thoughts align well with my own study. I believe that universally, we should be engaging more physically and sensorily with our digital devices. For instance, what does it say about our attitude toward something if we grab it roughly, versus cradling the object gently? Whilst the discussion around interactive media often uses metaphors weighted in the physical, sensory world (dialogue, extension, reflection and so on) this kind of question can't be explored fully through current touchscreen devices.

There are still designers, such as Bill Verplank, for whom physicality is an important interface to interaction, though interestingly, this approach is often referenced as a relic of simplistic technologies of the past [4]. However, this simplicity belies the deep understanding Verplank has for the role of the computer in interactivity. In his Interaction Design Sketchbook, Verplank asks the reader to "consider a deeper understanding of the essence of computers: representation for manipulation" [5].

Much of the work that I am undertaking will look at human senses and how we might represent and engage them more fully in interactive systems. Vision is generally given primacy amongst the senses, which is reflected in the way that we approach interface design and interaction feedback. Auditory, and on occasion haptic feedback are also acknowledged, but often these are an afterthought to the importance placed on vision.

The relevance of sensory engagement to the autistic population is manifold. Being a spectrum disorder, autism presents in numerous ways, but it can be regularly observed that those with autism display either a hyper, or hypo-sensitivity to sensory stimulus [5]; whilst some will seek out certain sensations, others will avoid them as much as possible. This makes them a particularly interesting population to work with for my own study. This is not because I believe that this study will form an intervention or treatment, but because this group have such specific responses to sensation, most of which will remain with them for life.

A diagnosis of autism is generally made early in life [6]. Identified by a therapist, the diagnosis is made based on three main observations: impaired social development; resistance to change and repetitive mannerisms; and impaired language and communication skills [7]. This last point is growing in its significance to my own study. Again, the role of conversation arises, and my work is beginning to take shape around the observation of communication without the use of language.

Acquisition of language is linked to having Theory of Mind (ToM) [8]. Between 25-40% of autistic children have non-functional speech [9], but it is not clear whether the often noted lack of ToM is connected to this figure. Developed during the early years of life, ToM displays an understanding that your personal hopes, beliefs, desires, and so on are different to those of others. Its importance in relation to language is that it leads to the desire to share information. This desire to communicate internal knowledge or desires is an important building block for social engagement and interaction, both of which are important throughout life.

Given that there is such a close relationship between language and ToM, it is strange that many of the tests for ToM rely on some understanding of complex language structures. The False-Belief Test is one of these. A person lacking ToM would not understand that their knowledge differs from that of someone else and therefore cannot understand differing beliefs. This is the crux of the "Sally-Anne" False-Belief Test, carried out by asking the subject where another person believes an object to be, after it has been moved in their

absence. A person lacking ToM would not make the distinction from the knowledge of themselves and the absent other. Even from this simplified explanation, it is easy to see how difficult this could be to explain to someone without complex language skills.

This leads to the question: could there be other ways to observe ToM, perhaps without the use of language altogether? I believe that we approach interacting with technology through too narrow a lens. So too, I think we define communication in a limited and very structured way. Of course, much of this is based upon necessity: to communicate, we need to express ourselves in a way that can be decoded in a reliable and persistent way. However, much of this decoding happens internally; it doesn't encourage external engagement and relies heavily on cultural cues. There is evidence that gestural interaction is a precursor to language acquisition[10] and this is an area that I believe is worth exploring through interactive media.

On this point, I am looking to the work done by scholars who straddle the fields of philosophy and neuroscience, particularly that of Alva Noë and Shaun Gallagher. Embodiment of the mind - both through a consciousness of the body, but also engagement with the external environment - is an area that I believe is rich for discussion on how we might display ToM in physical ways. Are we able to observe the mind through physical, rather than semantic interaction? Noë suggests that the mind, or consciousness, is an emergent property of interacting with the world [11], while Gallagher suggests that this emergence occurs on the level of 'prenoetic', or pre-conscious, phenomenological engagement [11]. Here I also see interesting connections to the fields of Cybernetics and the event-based nature of Interactive Media Arts.

The direction I am taking on the use (or non-use) of language and expression through the physical environment was originally inspired by a well known YouTube video by autistic activist, Amanda Baggs, titled *In My Language* [12]. In this video, Baggs shows us the many and varied ways she sensorily engages with her environment, and in the latter half of the video, she describes this interaction as being in her "native language". Baggs then goes on to state, "Far from being purposeless, the way that I move is an ongoing response to what is around me. Ironically, the way that I move… is described as being 'in a world of my own', whereas if I interact with a much more limited set of responses... people claim that I am opening up to true interaction with the world". This is a wonderful example of the way that the mainstream population has a desire to normalise autistic people; that it is only through behaving in the correct way that you can engage in the conversation.

Pursuing this work requires me to move across several disciplines: design; neuroscience; psychology; and so on. This is not to say that I am an expert in any of these fields; and despite my enrolment in an arts school, nor do I consider myself an artist. I see the processes that I engage in as having much in common with a design approach, and treat my own role as that of a facilitator. Whilst I acknowledge that it is an impossible goal, I aim to remove my own hand from aesthetic choice in the work where possible: there should be an ongoing aesthetic conversation between the system and the participant - they should be considered the artist or author. The iterative design process that emerged from my own Honours work in 2011 established this methodology. Through an observational case study involving a single 2 year old girl with Autism Spectrum Disorder (ASD), I looked to the engagement of the child, the feedback from her mother and Occupational Therapist, as well as some data gathered from the systems created during the study [13]. By not entering into the study with a pre-conceived question or idea of what outcomes I required, it was an unexpected event which shaped the case study and proceeding direction of my work today.

One of the devices created to engage with the child was a series of vibrating 'joysticks'. These were covered in different material and this stage of the process was designed to separate her interest in texture (material) and her interest in haptic feedback (vibration). While using this device, the child looked to her mother and made eye contact - an important indicator of social engagement, particularly for those with autism. The child showed an awareness that her mother and herself were having different experiences and she wanted to express her own excitement to her mother. I believe that the child was displaying an instance of ToM.

As I mentioned above, ToM is loosely defined as the understanding that your own desires, beliefs and intentions are different to those of others. The display of social interaction could be considered a precursor to developing ToM, similarly to the display of Pretend Play. Observable as an external, physical act, Pretend Play leads to use of symbols and ultimately ToM, in that it shows imagination and can reference absent objects or places [14].

There is an underlying suggestion in much of the way that interventions and therapies for autistic children are carried out that a quiet child is a 'good' child. It is in relation to this desire to manage the behaviour of children that I see screen-based interventions getting much traction. It is also my belief that in replacing multi-sensory physical engagement with screen interaction we lose an important ability to explore ideas such as Pretend Play and ToM.

One example of a widely used physical intervention which has recently been emulated on the screen is the Picture Exchange System (PECS) [15]. Visual cues allow a non-verbal child to express their intention or desire through the construction of sentences based on pictorial representations. Although the focus of this intervention is to allow the child to express themselves through images, there is also an important secondary part of the experience: the eye contact between the child and the therapist/teacher/parent, who is leading the intervention. Often, it is important to be led by the gaze of others - once again it shows that we recognise and are open to the thoughts of others, which could be considered to correspond to some level of ToM. Placing this in the world of the screen removes this indirect interaction.

This kind of interpersonal engagement could also be considered a type of Co-operative Interaction and was used in the final design of my Honours work: a haptic change table. Two triggers were placed far enough apart that the child could not engage them both on her own, but required the assistance of her mother to achieve the vibrating response of the device that she desired. This circumstance encouraged her to communicate this desire in some way. Whilst this is a simple cause-and-effect style interaction, the 'sabotage' of the trigger mechanism encourages much

more complex and interpersonal engagement.

The structure of this research is not only *about* systems, but looks at interaction *through* systems. By being open to the knowledge that each participant brings to a study - in this case the child, a teacher, a therapist, a parent, or myself – this process can be compared to the Action Research methodologies established by social psychologist, Kurt Lewin [16]. Acknowledging that the contribution of each person is of value again reinforces the idea that the approach of this study is akin to an open and ongoing conversation. Although some of the methods borrow from scientific practice, it's important to point out that the results of this study cannot be considered scientific in nature.

Also of relevance to this methodology is the Cybernetic approach of Gordon Pask, known for his pioneering Cybernetic machines. Pask's ideas on learning and conversation are particularly interesting, specifically the concept of the 'P-Individual'; an emergent point of agreement between systems, which may build to create a language of their own [17]. However, rather than the system or the child trying to 'learn' from each other, I am looking to observe reproducible events, or points of agreement which show a conversation.

The challenge will be in deciding how these systems will be structured, to keep them as open and aesthetically self-determinable as possible. One of the areas I will first explore is that of natural systems, such as light colour temperatures and the physicality of sound waves. By emulating naturally existing phenomena, I hope to avoid the cultural bias of colour and sound embedded in many children's toys and instead observe their experiential interaction: is the child aware of their control and is the engagement repeatable, suggesting a conscious dialogue with the system?

The observational studies will also begin to establish a language - and hopefully a methodology - of their own. The vocabulary of this language is currently absorbing much performance or theatrical terminology: the event, actors, play, and so on. Like the theatre, the goal in these interactive experiences is to create immersion, so that the prenoetic experience that Gallagher speaks of can be observed and perhaps explored as a mode of conversation. When we enter the theatre, we are prepared to suspend disbelief. We do not require the sense of realism that 3D cinema may strive toward, but it is instead the connection with a physical presence that focuses our attention and creates a new reality. Similarly to engaging in the dreamlike spaces of Pretend Play, the physical props of theatre suggest enough of a real world experience for our suspension of disbelief and willingness to be immersed in the narrative experience.

Modern theatre often uses multi-sensory, high technology devices to create this immersive experience for the audience. This follows from a rich history of using new technologies to immerse the audience and as Oliver Grau notes, this use of contemporary media can be traced back as far as the travelling panoramas of the nineteenth century, or even the Roman fresco paintings [18]. Where I see current interactive technologies making interesting changes is not only through facilitating the agency of the participant, but also through the handing over of the evolution of a system to that participant, so that they become a vital director of the conversation.

Often I am told that, because I am working with autistic children, I am undertaking important research. However, I think it's vital to continually remind myself that this is always an ongoing conversation with a small population and the people who care for them. I don't yet have results to share and I'm doubtful about there ever being a point where this work will feel finished. In the poignant words of Fluxus academic, Hannah Higgins, "The account that follows, therefore, is not merely subjective but takes its lead from a collective instinct and intuition. Insofar as all intellectual endeavor does precisely that, this particular project is unremarkable"[19]. There is no scientific end-goal in this study, nor do I think there should be; I believe it's important to remain open to the emergent and unexpected nature of interactive technology. Depending on how others view this work, this may be either its greatest strength, or greatest weakness. I hope that through conversation with the participants in the study, they will be the ones to decide which it is.

References and Notes

1. SFARI (2013), <http://sfari.org/news-and-opinion/columnists/jon-brock/2013/connections-registered-reports>, accessed 21 June 2013.

2. Bret Victor (2010), <http://worrydream.com/#!/Departure>, accessed 12 June 2013.

3. Bret Victor (2011), <http://worrydream.com/#!/ABriefRantOnTheFutureOfInteractionDesign>, accessed 17 May 2012.

4. Cycling 74 (2013), <http://cycling74.com/2013/06/20/nime-day-2/>, accessed 25 June 2013.

5. Ashleigh Kendall, "A Teachers Manual for Sensory Processing," University of Sydney (2009).

6. Grace Iarocci and John McDonald. 2005. "Sensory Integration and the Perceptual Experience of Persons with Autism," *Journal of Autism and Developmental Disorders* **36**, (2005) pp. 77–90.

7. Fred R Volkmar and Brian Reichow, "Autism in DSM-5: progress and challenges," *Molecular Autism*, (2013) pp. 1-12.

8. Bertram F. Malle, "The relation between language and theory of mind in development and evolution," in T. Givón & B. F. Malle, eds., *The evolution of language out of pre-language* (Amsterdam: Benjamins, 2002).

9. Amy S Hewitt et. al. "Characteristics of adults with autism spectrum disorder who use adult developmental disability services: Results from 25 US states," *Research in Autism Spectrum Disorders* **6**, No. 2 (2012) pp. 741-751.

10. Rhiannon J Luyster et. al., "Language Assessment and Development in Toddlers with Autism Spectrum Disorders," *Journal of Autism and Developmental Disorders*, No. 38 (2008) pp. 1426-1438.

11. Shaun Gallagher, *How The Body Shapes The Mind* (Oxford, U.K.: Oxford University Press, 2011).

12. YouTube (2007), <https://www.youtube.com/watch?v=JnylM1hI2jc> , accessed 27 June 2013.

13. Scott Brown, "The Aesthetics Of Negotiation: Using interactive technology to facilitate aesthetic choice of children with sensory processing disorders," in Julie Lunn, Stephanie Bizjak and Sue Summers, eds., *Changing Facts, Changing Minds, Changing Worlds* (Bently, WA: Black Swan Press, 2013).

14. Rhiannon J Luyster et. al., "Language Assessment and Development in Toddlers with Autism Spectrum Disorders," Journal of Autism and Developmental Disorders 38, (2008) pp. 1426-1438.

15. Andrew S. Bondy and Lori A. Frost, "The Picture Exchange Communication System," *Focus on Autism and Other Developmental Disabilities* **9**, (1994) pp. 1-19.

16. Clem Adelman, "Kurt Lewin and the Origins of Action Research," *Educational Action Research*, No. 1 (1993) pp. 6-24.

17. Gary Boyd, "Reflections on the conversation theory of Gordon Pask," *Kybernetes* 5, pp. 560-571.

18. Oliver Grau, *Virtual Art: From Illusion to Immersion* (Massachusetts, The MIT Press, 2003).

19. Hannah Higgins, *Fluxus Experience* (London, U.K.: University of California Press, 2002).

INTERPLAY OF SCRIPTS AND RESISTANCE IN A PARTICIPATORY WORKSHOP

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Abstract

The article reports on a participatory workshop in which, we were faced with two different types of resistance. We employ the notion of scripts to describe how this resistance emerged. On the one hand, we explain how a weak script caused distrust of the workshop rationale, while on the other, we explain how a strong script rendered the technological materials of the workshop useless and led to termination of the activity. We suggest that structuring workshops according to the notion of scripts may prove a useful way of exercising and learning from resistance and expanding our territory of exploration.

Keywords: Codesign, workshop, scripts, constraints, agency, Actor-Network Theory

The main motivation of this research is to explore ways to support multiplicity in exhibition of human agency in design process. To this end, we conducted a series of participatory design workshops with various design activities mobilizing many concepts mainly imported from Actor-Network Theory and feminist techno-science [1]. This article, which reports on the last workshop of the series, focuses on the relation between the workshop activity scripts and the resistance by workshop participants. It highlights the generative role of scripts in relation to resistance during such design activities.

Design activities, in varying degrees, ultimately aim to create, modify, enable and/or constrain some capacities of action through designed artefacts. Designers inscribe values, visions, programs of actions and modalities of perception into technology design [2]. Akrich explains the notion of inscriptions in technology design in the following way:
Designers thus define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, … A large part of the work of innovators is that of "inscribing" this vision of (or prediction about) the world in the technical content of the new object [3].

The technical content of the objects embodies a script similar to a film script, defining the actors, roles and their settings [4]. A script involves, in varying strengths, 'programs of action' that are 'translated' in practice [5, 6]. However, these inscribed programs of action may not succeed should the translation processes vary; in addition, actual interactions between entities may unfold in unexpected ways. There is a mutual influence between interacting entities: objects enable or constrain the actions of humans; but, at the same time, humans reshape the objects and their relationships with them. For Akrich [7], humans, objects and their relations are co-constituted in this 'translation' or 'description' process through acts of appropriation, resistance and displacement.

The strength of an inscription may vary from very strong, i.e., imposing one particular inflexible program of action, to very weak, offering many flexible programs of action. Hanseth and Monteiro [8] note that the strength of an inscription does not depend merely upon the technical content of the object but relies on the size and complexity of the surrounding network of human and non-human actors and the degree of connection between the inscription and the surrounding network. Latour [9] provides an example of progressively increasing the strength of an inscription. The case cited is that of a hotel manager, who wants his/her guests to deposit their room keys at the reception desk when departing the hotel. The manager first uses oral communication, then written notices to invite the desired behaviour. However, neither form of communication, implemented to define a desired program of action, proves successful. Finally, a metal weight is attached to the room keys, an inscription that proves successful. While the first two inscriptions were weak inscriptions, the final one was strong enough to impose the desired behaviour on the hotel guests.

One important area in which the notion of inscription has been used effectively is in politics and values in design. The relation between politics, values and design is highlighted in Langdon Winner's widely cited and contested article 'Do artifacts have politics?' [10]. Winner explains that technologies are not neutral: they embody 'specific forms of power and authority' [11]. He further claims that city planner Robert Moses deliberately designed and built bridges low to 'discourage the presence of buses on his parkways'. Since the buses couldn't use the bridges, this limited 'access of racial minorities and low-income groups to Jones Beach, Moses's widely acclaimed public park' [12]. Winner argues that Moses 'inscribed' his values and ethnic and class prejudices into the design of the parkway bridges. Black people and low-income groups, who could only go to the park by public transport, were prevented from accessing the park. Although Winner's argument was criticized for being too (technologically) deterministic [13], and was much later refuted by Joerges [14] for being counterfactual, it has been very influential in demonstrating the ways in which technology or artefacts can embody politics and values.

In the next section, we employ the notion of scripts to describe our workshop with two dance performers. There can be many ways in which scripts and artefacts can be brought together. For example, scripts can be embedded into artefacts like in the case of the hotel key with a metal weight, or they can be accompanied with an artefact like in the case of the hotel key with a written notice. In our workshops, we use artefacts together with scripts describing activities.

Workshop

The workshop was conducted as part of a larger research project [15], which is inline with the recent developments in the field of interaction design initiated by various approaches such as participatory design, value sensitive design and reflective design. Although all these 'situated approaches' [16], in various degrees, aim to support multiplicity in ways of being, knowing and doing, this research explicitly deals with the relational nature of human agency and its multiplicity, and ways to support it during design process. In addition to this high-level research aim of supporting multiplicity, the practical aim of the workshop was to investigate various human-technology-environment (H-T-E) couplings in various activities. There were four different sessions: silence session, physical sensitivity session, rich-poster session and machine-mediate performance session. The activities were structured according to their potential of facilitating different ways of engaging with a design concept. However, the important point is not about this particular set of activities but about bringing together a diverse set of activities and facilitating multiple ways of knowing, performing and relating.

In the silence session, participants are asked to close their eyes and concentrate on the existence of their own and their partner's body and space. This session aims to increase the participants' awareness of themselves and of others' selves through a non-visual way.

In the physical sensitivity session, participants perform physical exercises encouraging interaction through body

Fig. 1. Some human-technology-environment (H-T-E) couplings in the workshop

movements. These exercises are structured to help participants to understand and analyse elements and qualities of touch-based connections between the bodies.

In the rich-poster session, participants make a collage of pictures, texts and objects on an A0-paper sheet. The aims of this session are to understand what "togetherness" meant to participants, to increase their awareness of the concept and to see different forms of connection on a shared medium.

In the final machine-mediated performance session, participants perform five short activities using three technological devices: two wearable devices with tilt and distance sensing capabilities and one webcam with image processing capability. The aim is to explore different forms of connection with other bodies and space through technologies, which allowed participants to create various sound effects through their body movements. Participants played with the technological tools and experimented with different ways to communicate with their partners and co-compose sound effects.

In this paper, we focus on the final machine-mediated performance session only. The aim of the final session was to explore various human-technology - environment (H-T-E) couplings through the aforementioned wearable devices (see Fig. 1). In the session, we employed strong scripts similar to what Erin Manning refers to as 'enabling constraints' [17]. According to Manning, the very existence of the constraints allows an actor to experiment new ways of interacting with other actors and take part in generation of new forms of agency. Our workshop activity script was as follows: "There are particular movement patterns for each activity that we would like you to perform. These movement patterns describe the speed of your movements and the mobility of your body. In the first activity, the movement pattern is slow and stationary, in the second, fast and stationary, in the third, slow and mobile, in the fourth, fast and mobile, and, in the final one, you can make movements in any pattern. For each activity, we would like you to find a theme that you want to perform along with a technological device".

In other words, the participants were asked to explore H-T-E couplings by being stationary in the space and by making slow movements in the first activity, by being stationary in the space and by making fast movements in the second and so on. They were also asked to select a theme for the each activity and associate it with either their movements or sound.

The participants were only able to perform the first two activities and could not complete the remaining activities in the session because of some perceived technological deficiencies. In the first activity, the system did not capture the Participant-1 (P1)'s large movements as required, and hence P1 could not understand the relation between the sound feedback and her movements. As a result, the P1 got frustrated because of not being able to get the feedback properly.

In the second activity, both participants found the mapping between the sound and movements complicated, and again, they felt frustrated. Thus, we decided to stop the activities and continued with the participants' reflections and suggestions. According to P1, the technological devices were not sensitive enough and, overall, not capable of achieving the activity goals involving many constraints. The participants also found the constraints unnecessary.

After discussing the concerns of the participants, we suggested that we could remove some of the constraints from the remaining activities. The proposed script involved just the prompt of "explore human-technology-environment couplings by using the devices". The new script had neither constraints on movements nor the requirement of associating movements with a theme. Therefore, the new script was much weaker than the one used in the first two activities. However, this time, P1 criticized the changeability of activity constraints/scripts. According to P1, if the constraints could be changed, then there was no point to act within the defined activity constraints or scripts. P1 considered the constraints on the activities as strict procedures rather than generative guides for their actions. Ultimately, the flexibility of the process caused a distrust of overall research aims and methods.

Here, we observe two different types of resistance. While one type of resistance emerged out of the strong scripts employed in the first two activities, the other emerged out of the new proposed weak scripts. Both resistance types prevented participants from performing the remaining activities in the workshop. On the one side, the strong scripts caused resistance due to the perceived incapability of the technological devices in achieving the activity goals. On the other, the weak scripts led to resistance because of the fact that changeability of the activity scripts made the participants question the legitimacy of the constraints on the activities and further resulted in distrust of overall research.

Although the participants could not complete the activities, and we could not obtain the results that we aimed, the discussions with the participants provided us with many important insights. While some of the insights were on the actual content of the workshop, the majority were on our methods in the workshop.

The next section briefly presents a performative understanding of methods followed by a discussion on the relation between scripts and methods.

Methods and Scripts

Actor-Network Theory scholars Law and Singleton [18] and Mol [19, 20] are advocates of ontological multiplicity in understanding reality. According to them, there is no single reality out there waiting to be uncovered. What is out there are multiple realities, multiple not because of the numerous perspectives of a single reality, but because they are ontologically multiple realities [21, 22].

As there are multiple realities that emerge relationally, methods are considered not as some neutral means for accessing said realities but as active transformative actors [23]. Law argues to the effect that methods construct a particular kind of reality:

Method is not ... a more or less successful set of procedures for reporting on a given reality. Rather it is performative. It helps to produce realities. ... Enactments and the realities that they produce do not automatically stay in place. Instead they are made and remade. Thus they can, at least in principle, be remade in other ways. The consequence is that method is

not, and could never be, innocent or purely technical. If it is a set of moralisms, then these are not warranted by a reality that is fixed and given, for method does not "report' on something that is already there. Instead, one way or another, it makes things more or less different. The issue becomes how to make things different, and what to make [24].

Therefore, the critical question becomes what kind of reality one aims to create, and which methods are suitable for creating such realities. One way of thinking about methods is to consider them on a range of scripts from weak to strong. On the one side, there are methods that employ strong scripts involving strict conditions with many constraints. On the other, there are methods that employ weak scripts involving flexible conditions with few constraints. While methods with strong scripts can be associated with controlled experiments, methods with weak scripts are usually employed by open exploration type activities.

In a workshop context, using strong scripts is like placing a workshop participant into a locomotive on a railway track. The participant can control the steering wheel but the places that s/he can go are well defined and limited. However, using weak scripts is like providing the participant with a bicycle in an open landscape. The participant can take any direction and go anywhere, but, at the same time, s/he can perform quite unexpected actions. Both approaches have their own strengths and weaknesses. Strongly scripted methods are generally effective in obtaining cohesive results but can be too restrictive. On the other hand, methods with weak scripts facilitate a larger solution space but can produce outcomes that are out of scope or irrelevant. Loke [25] conducted a series of two similar workshops in which she wanted to facilitate the generation of meaningful and coherent movements. Loke employed weak and strong scripts in her first and second workshops respectively. She explains why there was a need to use strong scripts or more constraints in the second workshop:
[the first workshop] was set up with too few contextual constraints for the dancers to work within, resulting in the production of dislocated fragments of choreographed movements that lacked coherency and significance. This highlighted the need for a specific and well-defined context or domain within which to generate meaningful movements [26].

Here, Loke draws our attention to the importance of setting a balance between openness and specificity in workshop activities. While openness was obtained by using very few constraints (i.e., weak scripts), specificity, by using well-defined context (i.e., strong scripts).

Although Loke employed scripts with different strengths in order to obtain a balance between openness and specificity and to obtain coherence, this paper suggests that the same strategy may prove useful for exercising resistance in workshop activities.

What follows is a discussion of the dual role of resistance in workshop activities and ways to structure workshops in order to facilitate resistance as a generative resource by means of scripts with different strengths.

What does Resistance do?

In our workshop, the resistance worked in two different ways: first, it made visible actors (human and nonhuman), their relations, and different understandings, and, more importantly, it allowed us to question what we do and how we do; and second, it prevented us from obtaining the desired workshop outcomes since the remaining three activities could not be completed. Therefore, resistance can be considered both fertile and futile. While it is futile in terms of not being able produce what is expected, it is fertile in regard to being able to question what is expected and how to obtain it.

If we focus on the case that resistance is fertile, one relevant question is: can we use resistance as a strategy/resource for exercising different ways of knowing and expanding our territory of exploration? Another subsequent question is: How can we structure our methods to play with resistance?

In regard to the first question, as resistance enables us to question our methods, it can be considered an opportunity to switch to a different method that can provide us with access to a different sort of reality which may not be accessible otherwise. Another way of thinking about the role of resistance is considering it as a breakdown. Briefly, Heidegger [27] explains that breakdowns taking place in our use of tools allow us to notice the tool that is otherwise transparent or unnoticeable to us. In other words, we stay unaware of the tool itself while it is working properly. The tool becomes noticeable or present-at-hand (in Heidegger's terms) when it gets broken. In a similar way, resistance we face with in a workshop process disrupts the process and makes visible actors, their understandings and relations and, consequently, opens up new possibilities.

In regard to the second question, one way to structure our methods can be using the scripts in a dynamic way in workshops. For instance, a series of scripts with different strengths can be defined and employed from the weakest script to the strongest. If we take our workshop as a case, the series of scripts can be defined as follows:

1. Explore H-T-E couplings
2. Explore H-T-E couplings + move slowly
3. Explore H-T-E couplings + move slowly + be stationary
4. Explore H-T-E couplings + move slowly + be stationary + think about a theme

In this example, which is structurally similar to the hotel manager's case, we see that strength of scripts is getting increased from the first one to the fourth. In a workshop, starting with the weakest script and then gradually increasing the strength of script within the same workshop may prove effective in exercising resistance. Doing the opposite, i.e., starting with the strongest script and weakening it, may result in negative outcomes such as distrust in research rationale as in the case of our workshop.

Despite its generative quality, resistance involves many challenges. Firstly, it slows down processes and may even lead to termination of activities. Secondly, one needs to be prepared for being questioned about his/her methodological choices. Ultimately, the following critical questions need to be answered: How much should we open up the decision-making process in our research activities? And, what should/should not be open to negotiation? Our future research will be guided by these questions.

References and Notes

1. Kocaballi, A. B., Gemeinboeck, P., Saunders, R., Dong, A. and Loke, L. "Embracing Relational Agency in Design Process," *Proc. of DESFORM*, Wellington (2012) pp. 99-109.

2. Akrich, M. "The De-Scription of Technical Objects" in Bijker and Law (eds.) *Shaping Technology/Building Society: Studies in Sociotechnical Change* (Cambridge, MA: The MIT Press, 1992).

3. Akrich [2], p. 208.

4. Akrich [2].

5. Akrich [2].

6. Latour, B. "On Technical Mediation: Philosophy, Sociology, Genealogy". *Common Knowledge*, **3**, (1994) pp. 29-64.

7. Akrich [2].

8. Hanseth, O., & Monteiro, E. "Inscribing behaviour in information infrastructure standards," *Ac-*

counting, Management and Information Technologies, **7,** No. 4 (1997) pp. 183- 211.

9. Latour, B. *Reassembling the social: An introduction to actor-network-theory* (Oxford University Press, 2005).

10. Winner, L. "Do artifacts have politics," *Daedalus*, **109** (1980) pp. 121-136.

11. Winner [10] p. 121.

12. Winner [10] p. 124.

13. Woolgar, S. "The Turn to Technology," *Social Studies of Science. Science, Technology, & Human Values*, **16** No. 1 (1991) pp. 20-50.

14. Joerges, B. "Do Politics Have Artefacts?" *Social Studies of Science*, **29** No. 3 (1999) 411- 431.

15. Kocaballi et al. [1]

16. Harrison, S., Sengers, P., & Tatar, D. "Making epistemological trouble: Third-paradigm HCI as successor science". *Interacting with Computers*, **23** No. 5 (2011) 385-392.

17. Manning, E. *Relationscapes: Movement, Art, Philosophy*. Cambridge (MIT Press, 2009).

18. Law, J., & Singleton, V. "Object Lessons," *Organization*, **12** No.3 (2005) 331-355.

19. Mol, A. "Ontological politics. A word and some questions," in J. Law & J. Hassard (eds.), *Actor network theory and after*. (Oxford: Blackwell Publishers, 1999).

20. Mol, A. *The Body Multiple: Ontology in Medical Practice* (Duke University Press, 2003).

21. Mol [19].

22. Strathern, M. *Partial connections* (Rowman and Littlefield, Savage, 1991).

23. Law, J. *After method: Mess in social science research* (Abingdon: Routledge, 2004).

24. Law [23] p. 143.

25. Loke, L. *Moving and making strange: a design methodology for movement based interactive technologies* (University of Technology, Sydney: Unpublished doctoral dissertation, 2009).

26. Loke [25] p. 187.

27. Heidegger, M. *Being and Time* (New York: Harper & Row, 1962).

Experimental Cultures and Epistemic Spaces in Artistic Research

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Abstract

In this paper we use developments in the history of science to demonstrate the significance of experimental cultures and epistemic spaces within artistic research as an experimental system. We propose that 'artistic products' are process artefacts, which are of epistemic nature (epistemic-aesthetic things). We suggest that artistic research provides a unique opportunity to integrate diverse epistemic practices that currently exist outside traditional institutional frameworks to develop new hypotheses-generating experimental cultures.

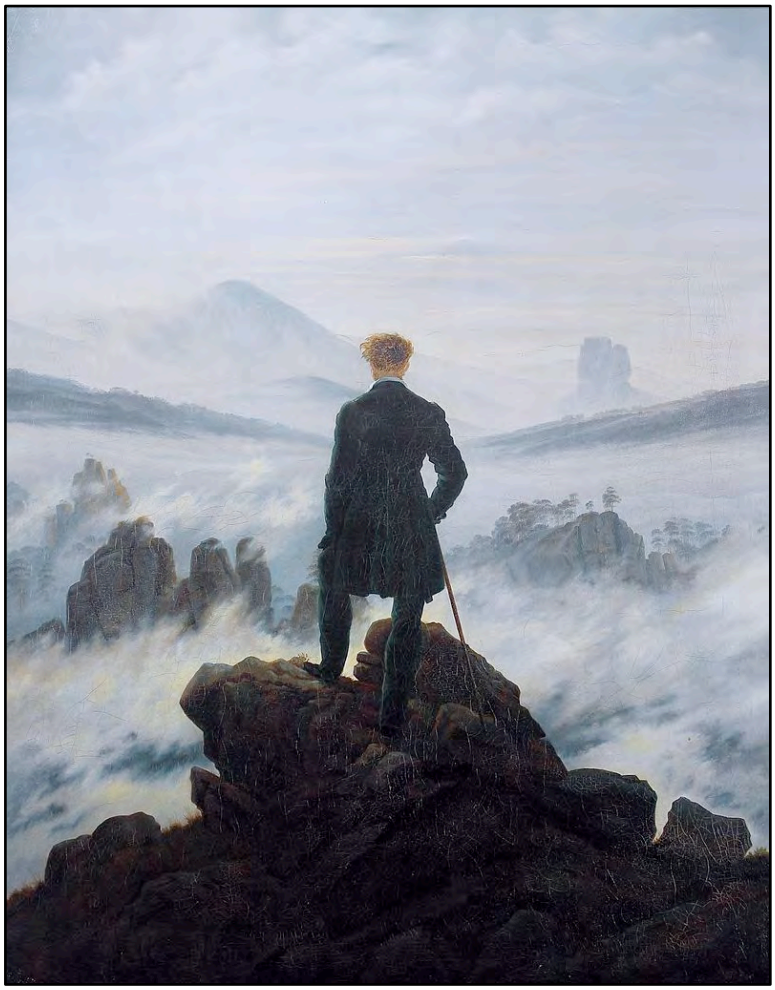
Keywords: artistic research, experimental system, experimental cultures, history of science, research cultures, experimental arts, epistemology.

Artistic practice relishes its amorphous existence. It has been possessed with an avant-garde mentality of being beyond boundaries. Attempts to install boundaries have often been met with fierce resistance, and it is feared that the reconfiguration of artistic practice as a type of research is such an attempt. This can largely be reduced to a misunderstanding on the artist's behalf of what constitutes research, and more significantly, a misconception of the scientist, who is commonly regarded as the quintessential researcher, as an oppositional archetype to the artist. The argument that scientists discover what already exists, while artists create what does not exist, is built on a bastardized Cartesian dualism that positions culture as independent from nature. Culture is produced by biological organisms, and is manifested within the physical realm from things that already exist. Sounds engineered within a musical composition are not metaphysical incarnations conjured by an artist alchemist who is possessed of a creative spirit gifted by some omnipotent being. The arrangement of these sounds is indebted to an accumulated history of technological experimentation, a millennia of manipulation of the world, from the vibrating flesh in our throats to the tonal variations of differing air pockets in sea shells. The musical systems that have emerged over time, such as the standardised twelve-tone equal temperament, are language systems that have been developed and tampered with to describe the world, by the world. The data sets, theorems, vowels and nouns featured in the bound, shredded sheets of trees that are described as scientific papers are not so dissimilar from the musical manuscripts of Mozart.

There is the parable of the theoretical physicist Heisenberg sitting at the piano and playing Beethoven's last sonata, *Opus 111*, for some peers. After the performance he reportedly said, "If I had never lived, someone else would probably have formulated the principle of determinacy. If Beethoven had never lived, no one would have written Opus 111" [1]. However, by extending Donald Brook's concept of "art as memetic innovation" [2] we can understand that had Beethoven not lived, *Opus 111* in its exact form may never have existed, yet something very much like it would have been produced. Beethoven was not born in a vacuum, but inhabited a cultural moment, and his musical compositions were an extension of the accumulated cultural and technological knowledge that had preceded him. It is interesting to note that Heisenberg, when questioned over the accuracy of the account, replied that he could not remember if it was *Opus 111* that he had played on that particular occasion [3]. Another unborn composer and another unwritten sonata could have substituted; the sacred aura instilled around *Opus 111* is irrelevant.

The myth of the artistic genius wandering alone beyond boundaries hinders the possibility of recognising artistic practice as a form of research, favouring the artist as Caspar David Friedrich's *Wanderer above the Sea of Fog* (Fig. 1) over Isaac Newton's "dwarf standing on the shoulders of giants" [4]. However, although the scientist and the artist inhabit separate epistemological communities and produce different kinds of knowledge, they are both researchers.

Fig. 1. Caspar David Friedrich, *The Wanderer above the Sea of Fog*, 1818, oil on canvas



Artistic Things and Scientific Things

Hans-Jörg Rheinberger's description of the sciences as a "permanent process of reorientation and reshuffling of the boundaries of what is thought to be known and what is beyond imagination" [5] could equally be applied to artistic practice. This "process" can be more suitably used to describe what *research* is rather than what *the sciences* do. It is this miscalculation of what scientists do and what artists do that problematises the configuration of artistic practice as research. The ideas that 'artists create things' and 'scientists discover things' are not mutually exclusive; scientists must also create to discover. As Rheinberger has described, scientific things "are not simply hidden things to be brought to light through sophisticated manipulations" [6].

Hans-Jörg Rheinberger also outlines the similarity between 'scientific things' ('Wissenschaftsdinge') and 'artistic things' ('Kunstdinge') by observing the "processual character of their coming into being", and their "similar innovative moments" [7]. After the *practice turn* or *processual turn*, not only did scientific research change, but with it experimental art practices. Scientific practice became performative, even playful, if we look at descriptions of historical epistemology. Falko Schmieder sees a parallel with the new avant-gardes of the twentieth century, which can be described as 'experimental cultures' [8].

The emerging crisis of reflection on scientific knowledge within the natural sciences, particularly in the field of physics, began in the beginning of the twentieth century with the development of quantum science and Albert Einstein's theory of relativity [9]. The two critical thinkers discussed by Rheinberger are Ludwik Fleck and Gaston Bachelard. Both were "outsiders in the eyes of their contemporaries, belonging to no definite tradition" [10], and were postulating the experimental and technical character of modern science, as well as its social character.

Historical epistemology (exemplified by the writings of Gaston Bachelard and Georges Canguilhem, among others) reconfigured the development of scientific thought through various social and material preconditions that were historically determined, significantly shaping the way (scientific) research was undertaken and understood. Ludwik Fleck acknowledged this shift in thinking with the term 'experiment': "every experimental researcher knows how little a single experiment proves and enforces. There is always the need of a system of experiments ..." [11]. He goes on to argue that if an experiment were clear from the beginning, there would be no purpose in undertaking it. In the 1970s, Rheinberger pursued Fleck's ideas extensively to demonstrate that "Experimental systems ... are systems of manipulation designed to give unknown answers to questions which themselves we are not yet able clearly to ask" [12].

Experimental Systems in Artistic Research

Rheinberger described the 'experimental system' as "a basic unit of experimental activity combining local, technical, instrumental, institutional, social, and epistemic aspects" [13]. By looking at the research practices of (experimental) natural sciences in the laboratory, he suggested that the idea of the experiment as validating/invalidating clearly defined hypotheses is plainly wrong (also referring to Fleck). The actual process of research is much more chaotic and unplanned than communicated, with linearity and stringency mostly constructed afterwards.

Henk Borgdorff, in his discussion of Rheinberger's experimental systems in artistic research, poses the question of the epistemological status of art practices. He asks if "artworks are capable of creating, articulating, embodying knowledge and understanding", and further "if so, what kind of artworks and practices do this?" [14] If we accept artistic research as experimental community, any artistic output could be understood as 'process artefacts' [15], which are in this context epistemic things (hypotheses) generated out of the larger context of the experimental system. Borgdorff has previously demonstrated that "researchers employ experimental and hermeneutical methods that reveal and articulate the tacit knowledge that is situated and embodied in specific artworks and artistic processes." [16] Yet beyond these processes and products, we need to also recognise and understand the social character of artistic research, and of the artistic/academic communities in which a specific output is created and placed, in 'thought collectives' and 'thought styles' as Ludwik Fleck described [17]. In this context, we have to not only think of the process of knowledge generation in the lab/artist's studio, but to extend the viewpoint from experimental systems to experimental cultures and epistemic spaces.

The role of technology in research practice

Gaston Bachelard demanded that we look more closely at what happens in the laboratory, since not every scientific practice can be seen as the same. He challenged philosophers of science to "familiarize themselves with the laboratories and workshops of science, and especially with the history of science as the epistemological laboratory par excellence" [9]. Historical epistemology emerged from Bachelard's concept of 'realization' – 'technological realism' through which the constitution of modern scientific thought is mediated by instruments.

Thomas Kuhn was "favoring concept-driven research as a paradigm over tool-driven research" [18], but is "non-tool driven research" even possible in the current technology-driven society? 'Phenomenotechnique' (the term was coined by Gaston Bachelard to describe the relationship between scientific thinking and technology in modern science) is integral to the understanding of not only the concept of historical epistemology [19], but also how technology shapes our way of thinking, and how we generate new knowledge. Rheinberger focuses on the "material, instruments, arrangements ..." that are to be considered when thinking about the "uncertainty principle of aesthetic things" [20]. What he describes as the process of "tapping in the dark" (tâtonnement) is determined by the technology (or technique) used, where "the new comes into being" [20]. According to Bachelard's 'phenomenotechnique' – in which instruments are to be understood as materialised theories, products of technique [21] - "The electric bulb is an object of scientific thought … an example of an abstract-concrete object." [22]

Simon Werrett, in his essay 'The Techniques of Innovation', suggested that "art, invention, experiment, media or technology have always been related ... dependent on local, historical circumstances" [23]. By constituting that "there is nothing inherent in actions to designate them as artistic or scientific" he indicates that the "process of social negotiation, in which techniques emerge, stabilise and then endure as media, art or experiments", but still "always remain

open to change and reinterpretation, or reinsertion into novel arenas" [23]. He states that these experiments in art and technology "have been ongoing since the Renaissance, though much of the map of their various forms and relations remain to be explored" [23].

Ludwik Fleck acknowledges that "patterns of knowledge are patterns of culture" [24]. Epistemic things generated within experiments in art and technology will intrinsically cause patterns of knowledge to develop, and therefore patterns of culture. This can be observed within media art practices, where auxiliary 'thought collectives' emerge around those who work with and develop specific tools and techniques. Artistic research as experimental culture has the unique capacity of an 'antidiscipline discipline' to foster and integrate these 'thought collectives' with their special 'styles of thought'.

Experimental Cultures and Epistemic Spaces

As Simon Penny has noted, the emergence of these technological cultural forms always involves diverse communities of toolmakers, and their "particular contributions and motivations are seldom noted, except in specialised studies" [25], [26]. Often such cultures, are, as Penny calls them, 'renegades' or 'eccentrics', producing their tools outside of institutions. They are creators of "visionary technologies", that are "by definition, ahead of the technological-industrial curve" [25]. One of the aims of our project *Artistic Technology Research* is to insert these production cultures into the domain of institutions of art and higher education, whilst also displaying their efforts in the context of contemporary research and artistic production. The initiative *Coded Cultures* [27], while reflecting on critical potential in diverse (technological / artistic) subcultures [28], also examined what the intersections of contemporary art, technology, media and research could bring to the domain of 'artistic research' and other transdisciplinary practices. This initiative was initially intended as a festival including hacker-, maker- and artistic contexts.

The framework of artistic research not only offers artists the opportunity to "explore areas of reality and knowledge they weren't necessarily 'entitled' to explore" [29], but fosters the ability to question methods and 'usual' processes of knowledge generation. We are asking for a strong interdisciplinary practice, which various academic and artistic fields could participate in and benefit from. Artistic research understood as experimental culture needs to take into account the design of experimental systems, which can only be successful if they offer "epistemic things enough room to evolve" [30]. Extending this thought, epistemic spaces such as project configurations [31] that are not only present in laboratories, but also in distributed locations (see the concept of 'macro-epistemics' [32]), are to be kept vivid and active. By exploring these experimental cultures and epistemic spaces, artistic research promises to incorporate the avant-garde mentality that has historically been associated with artistic practice, and to continue to challenge both the perceived boundaries of knowledge and the imagination.

References and Notes

1. As recalled by John U. Nef, "Discovery in Art and Science", in Owen Gingerich (ed.), *The Nature of Scientific Discovery: A Symposium Commemorating the 500th Anniversary of the Birth of Nicolaus Copernicus* (Washington D.C.: Smithonian Institute, 1975).

2. Donald Brook, *The Awful Truth About What Art Is* (Adelaide, Aus.: Artlink Australia, 2008).

3. Richard Panek, *Of Heisenbergs and Beethovens* (2011) <http://j.mp/19JjxWo>, accessed 8 June 2013.

4. Isaac Newton, 'Letter to Robert Hooke. February 5, 1676', in Herbert W. Turnbull (ed.), *The Correspondence of Isaac Newton, Volume 1* (Cambridge, U.K.: The Royal Society, 1959).

5. Hans-Jörg Rheinberger, *Toward a History of Epistemic Things: Synthesizing Proteins in the Test Tube* (Stanford, CA: Stanford University Press, 1997), p. 11.

6. Rheinberger [5], p. 28.

7. Hans-Jörg Rheinberger (2012) <http://j.mp/18epBdj>, accessed 1 July 2013.

8. Falko Schmieder, 'Experimentalsysteme in Wissenschaft und Literatur', in Michael Gamper (ed.), *Experiment und Literatur. Themen, Methoden, Theorien* (Göttingen: Wallstein, 2010), pp. 17-39.

9. Hans-Jörg Rheinberger, *On Historicizing Epistemology* (Stanford, CA: Stanford University Press, 2010).

10. Rheinberger [9], p. 20.

11. See Schmieder [8], quoting Ludwik Fleck.

12. Hans-Jörg Rheinberger, 'From Experimental Systems to Cultures of Experimentation', in Gereon Wolters and James G. Lennox (eds.), *Concepts, Theories, and Rationality in the Biological Sciences* (Pittsburgh: University of Pittsburgh Press, 1995).

13. Rheinberger [5], p. 238.

14. Henk Borgdorff, *The Conflict of the Faculties: Perspectives on Artistic Research and Academia* (Leiden: Leiden University Press, 2012), p.189.

15. Matthias Tarasiewicz, 'Query public(s) in the next society: »Artistic Technology Research« as [dispositif] and synergetic discipline for the agency of research and development in next (media) cultures,' A Peer Reviewed Journal About Vol. 2 Issue 1 (2013) <http://www.aprja.net/?p=866>.

16. Henk Borgdorff, *The Debate on Research in the Arts* (Bergen: Bergen National Academy of the Arts, 2006).

17. Ludwik Fleck, *The Genesis and Development of a Scientific Fact* (Fred Bradley and Thaddeus J. Trenn, trans.) (Chicago: University of Chicago Press, 1979).

18. Ahmed Zewail, *Science and Technology in the Twenty-First Century* (Pasadena, USA: California Institute of Technology, 2007), pp. 1–11.

19. See Hans-Jörg Rheinberger, 'Gaston Bachelard and the Notion of "Phenomenotechnique"', in *Perspectives of Science*, Vol. 13, No. 3 (Massachusetts: MIT Press, 2005), pp. 313-328.

20. See Rheinberger [7], p. 16.

21. Teresa Castelao-Lawless, 'Phenomenotechnique in Historical Perspective: Its Origins and Implications for Philosophy of Science', *Philosophy of Science* Vol. 62, No. 1 (Mar 1995), pp. 44-59.

22. Gaston Bachelard, *Le Rationalisme appliqué*, (Paris: Presses Universitaires de France, 1949), p. 104.

23. Simon Werrett, 'The Techniques of Innovation: Historical Configurations of Art, Science and Invention from Galileo to GPS', in Dieter Daniels and Barbara U. Schmidt (eds.), *Artists as Inventors - Inventors as Artists* (Ostfildern, Germany: Hatje Kantz Verlag, 2008), pp. 55-69.

24. See Rheinberger [9], p. 32.

25. Simon Penny, 'Bridging Two Cultures: Toward an Interdisciplinary History of the Artist-Inventor and the Machine-Artwork', in Dieter Daniels and Barbara U. Schmidt (eds.), *Artists as Inventors - Inventors as Artists* (Ostfildern, Germany: Hatje Kantz Verlag, 2008), pp. 55-69.

26. Simon Penny (2005), <http://j.mp/1aF1naX>, accessed 1 July 2013.

27. 5uper.net (2004), <http://codedcultures.org>, accessed 1 July 2013.

28. Matthias Tarasiewicz, Michal Wlodkowski and Georg Russegger (eds.), *Coded Cultures - New Creative Practices Out of Diversity*, (New York: Springer Vienna, 2012).

29. Tom Holert (2011), <http://j.mp/17ptXe3>, accessed 1 July 2013.

30. Hans-Jörg Rheinberger, *Experimentalsysteme und epistemische Dinge: Eine Geschichte der Proteinsynthese im Reagenzglas* (Frankfurt: Suhrkamp, 2001).

31. Christian Reder, 'Project Work: Energy Concentrated on the Extraordinary', in Siegfried Gronert and Thomas von Taschitzk (eds.), *Vom Labor zum Projekt / From Laboratory to Project* (Weimar: Verlag der Bauhaus-Universität Weimar, 2011).

32. Karin Knorr Cetina, 'Culture in global knowledge societies: knowledge cultures and epistemic cultures', in Mark D. Jacobs and Nancy Weiss Hanrahan (eds.), *The Blackwell Companion to the Sociology of Culture* (Oxford, U.K.: Blackwell, 2007), pp. 65-79.

PUBLIC INTERFACE EFFECTS: RE-EMBODIMENT AND TRANSVERSALITY IN PUBLIC PROJECTION

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Abstract

Public projections serve to both complicate and augment the relationship between various entities in public space by creating affordances for the enfolding of temporal, spatial, and material contexts via digital-networked media. Drawing on the work of Rafael Lozano-Hemmer and Camille Utterback, the authors argue that re-embodiment and transversality are key interface effects of successful public projection installations. These tactics serve an important function in engaging negotiated subjectivities and identities within the shifting parameters of media and the city. The discussion concludes with a brief description of "The Line," a research-creation project proposed by the authors which attempts to instantiate some of the strategies covered.

Keywords

projection, public space, interaction, participation, visual culture, new media

To what degree does the creative use of public projection enable highly specific, deeply embodied experiences that might at once exacerbate and assuage the shocks of "media cities" [1] today? How can public projection in an art context deepen our experience of increasingly hybrid spaces that enfold spatial and experiential contexts, namely the digital and material? How can we map ourselves, literally and figuratively, onto larger social, natural, and technical dynamics in order to realise expanded political potentialities?

In this paper we briefly outline historical precedents in screen-based media that inform our understanding of the interrelationship between public space, visual culture, and media, and provide examples of public projection artworks that explore this confluence. Throughout, we situate reactive public projection within transformations in public space, visual culture, and subjectivity. For our purposes, public space is broadly defined as spaces of interaction outside of the private living space with an emphasis on spaces of public exhibition such as civic squares, buildings, and public events. These sites are well suited for crowds and large-scale projections and have been viewed historically as sites of public culture. Visual culture is taken to be a set of related practices and artefacts that rely heavily on visually perceptible phenomena — the study of which entails looking at perception as a historical and cultural phenomenon bound up in the relations between visuality and embodiment, subjectivity, ideology, social relations, techniques, and technologies [2] [3] [4]. Our aim is to consider how theoretical claims about new media apply to contemporary public projection tactics, while identifying potential degrees of freedom within visual culture and public space by operationalizing these hypotheses in practice. We have proposed a research-creation [5] project entitled "The Line" to investigate the increased transversality of identity and subjectivity [6], and the re-embodiment [7] of the experience of media, that sees the body less as a passive point in a perspectival system and more as an active vector in hybrid space [8] that is enabled within the public interface effects [9] of public projections. We contend that, as an artistic strategy, public projection can play an important role in assuaging the often alienating effects of a contemporary visual culture in public space dominated by advertising. Moreover, public projection can provide a platform for engaging social, technical, and political awareness within increasingly conflated and complex systems.

Media, Visual Culture, and Public Space

Our relationship with public space has always been intimately linked with the means by which we describe it. For example, Walter Benjamin noted that cinema, with its ability to take us through, around, and over walls, so to speak, could blow up the labyrinth-like prison world of the modern metropolis that, despite its many wonders, could also isolate and alienate [10]. Commenting on Benjamin's *Artwork* essay, Buck-Morss notes that Benjamin also viewed technological reproduction in the form of film and photography as a means to comprehend the city fragmented and sped-up by industrialization [11]. According to Buck-Morss, "film shows a healing potential by slowing down time and, through montage, constructing 'synthetic realities' as new spatio-temporal orders, wherein 'fragmented images' are brought together 'according to a new law'" [12]. The cinema helped to stitch together images in order to generate a dynamic representation of confounding, illegible urban spaces [13]. It thereby created abstractions that could be transposed into experience, expertise, and ultimately a new embodied understanding. The cinema made the modernizing city more manageable and, in hindsight, served to prepare its inhabitants for the shimmering surfaces and shifting vistas that lay ahead.

The television screen was one of these shimmering surfaces that proliferated in various sizes, configurations, and modes. Although the television is considered most often in its transformation of the private dwelling, beaming images of domestic products, global triumphs (and atrocities) into living rooms, it also became a force in public spaces. In her book *Ambient Television*, Anna McCarthy describes the "visual statements" and social scenarios constructed by various screens in public spaces [14]. For example, McCarthy describes the placement of screens in shopping malls, airports, and storefronts as creating relational spaces via their placement in and amongst other visual cues, most notably architecture. Throughout, McCarthy highlights the importance of deliberate distinctions of scale, multiplicity, and access, showing how screens are designed, deployed, and appropriated in a number of ways that run the gamut from infuriating and disorienting to comforting and grounding, both obfuscating and co-creating their surroundings. McCarthy's work on public screens and Benjamin's work on cinema give us diagnostic tools for screen-based media, describing their various functions within a shifting politics of visibility, representation, attention, awareness, and presence that emerge from the imbrication of bodies, media, and space.

Technological and artistic developments continue to have unique and significant effects on our relationship with public space and the politics therein. Public screens and projections are particularly interesting as one such development, because they serve to both complicate and augment the relationship between various entities in public space by creating affordances for the enfolding of temporal, spatial, and material contexts via digital-networked media. We would argue that what emerges from this particular confluence is a multi-layered, highly contingent space wherein the development of a potential for the contestation of public visual culture and the contestation of otherwise individualizing and alienating media experiences becomes an important political dimension

of contemporary existence. Public projections can enable the conditions for an interface effect [15] that maps participants and viewers onto larger cultural, social, spatial, material, and abstract dynamics. It creates the conditions for understanding this mutual enfolding which is an important step in fostering a post-human political awareness, and thus calls out for a poetic engagement.

Transversality and the Enfolding of Identities

In "Body Movies" [16], Mexican-Canadian artist Rafael Lozano-Hemmer creates social and political awareness through light, bodies, architecture, and images. "Body Movies" creates an interface effect amongst the disparate elements and contexts it juxtaposes. Images of local strangers projected at an architectural scale merge with abstracted shadows of participants. At the same time, a computer tracking system reacts to the movements of participants, advancing the projected images once live silhouettes match up with the outlines of the projected bodies. "Body Movies" allows for the performance of the enfolding of identities and contexts, and the witnessing of this connection between them in a public space itself charged with political importance. This interface goes beyond the simple mirror-type, 'wave-and-it-changes' effect that most often characterize large, interactive outdoor displays, by seeking wider and deeper connections.

The incorporation of digital systems into public projection, and the consequent richness of user participation that can be built around responsive spaces, sets participatory public projection work such as "Body Movies" apart as expressive of contemporary shifts in media and public space. It is when the identity of a person, place, or a thing is understood as deeply enmeshed within and contingent upon other forces and entities, that it can be described as transversal [17] and contemporary public projections can be seen as an expression of a growing desire and ability to express and embody a transversality of identity and context, such as on- and off-line identities, contextually relevant data, time-based photo-series, and so on. In de-materializing the physical movement of the body, while enabling its re-materialization, re-mediation, and relation to other systems through digital means centred upon a public projection, responsive public projections enable and express a transversality that open publics to an embodied complexity and productive ambiguity of representation.

From Points to Vectors

What interactive outdoor displays such as "Body Movies" also represent is another step away from the interpolation of viewers (and citizens) as relatively inert points in a perspectival (and political) system, to the construction of a more active position within contingent media environments. This is an argument Mark Hansen makes in *New Philosophy for New Media*, albeit about virtual reality environments [18]. Our application of this theory to public projection is a grounding theoretical claim for our inquiry into media and public space. We believe that public media experiences such as augmented reality, gestural interfaces, and public projection all serve to prepare individuals for the potency of transversal and contingent perspectives; floating perspectives that better represent our shifting relationship to data, public space, and the state. The place and role of the observer within the apparatus [19] of display has changed as the mediating role of the proscenium arch and, by extension, the frame of the display screen [20] of previous modes recede through the layering of media and architecture, be it by the expressive skinning or mapping of buildings via digital displays and projection, or other emerging technologies such as Google Glass. Like augmented reality, public projections introduce a radicalization of contingency via indeterminate viewing conditions, [21] and the disruptive potential of digital forms [22], into the experience of the built form that must be understood for its unique relational potential and for the degrees of freedom and critique that the combination of digital media and public space enable.

That said, it is the publicly visible, device-independent display — the urban screen or public projection surface — as opposed to the relatively fragmented experiences of augmented reality, that make public projections the dense communal transfer points that they are, and identify them as sites of a particular political, historical, and perceptual significance. At the moment, public projection serves as a useful hinge upon which the cognition of transversality can be introduced, enabled, witnessed, contested, and developed.

At the same time, with the addition of greater access to the subtleties and expressivity of position and movement through reactivity and sensors, the body is situated as an intensive source of potentiality not only within public space, but within a combination of public and information space. While perspectival systems provide a rich means by which we can extract information from media and the world around us, interactivity and participation in public, transduced via the body, light, data, and architecture, provide us with an expanded potential for cognitive mapping and political awareness amongst increasingly complex and interconnected information spaces.

There is, of course, the additional political significance of an amplification of the subtleties of surveillance, and thus control [23] and commodification, by way of tracking bodies digitally and physically. This circumstance poses a new and potentially dangerous avenue for control over bodies and representation in public space. In spite of, or perhaps because of these dangers, artistic interventions through interactive public projections are of great importance.

Equally important here is the role that interactive public projections play in shifting the ordering principle of perspective. Take, for example, the perspective offered to the viewer in Camille Utterback's 2010 public projection, "Shifting Time – San Jose" [24]. Here, archival film footage of a street scene blends into present-day high definition video when triggered by a viewer's proximity to the projection. Instead of addressing viewers as if located at the ideal perspectival point, Utterback's apparatus entreats participants to understand themselves as vectors in space, their perspective shifting along with the content before them. This proprioceptive position expresses their enhanced role within the interface effect substantiated by the installation. Although less overtly political in content than "Body Movies," Utterback's piece substantiates an embodied relationship to space and, in this case, the dimension of time and the politics of perspective. It therefore suggests and demonstrates degrees of freedom upon which the exploration of gestural, embodied interaction and public visual culture may be mined and explored.

Much of the creative and critical use of public projection, such as Lozano-Hemmer and Utterback's work, can be seen as enabling what Mark Hansen calls a "(re)embodiment through technics" [25]. As Hansen notes, "embodiment no longer coincides with the boundaries of the human body, as disembodiment of

the body forms the condition of possibility for a collective (re)embodiment through technics" [26]. The common ground formed in the creative and critical use of participatory and interactive outdoor projection is not of consensus, but of mutual recognition and play between the body and technical, environmental, temporal, and social networks.

The Line

Our latest work of *research-creation* [27] proposes to operationalize and test suggested possibilities of re-embodiment, transversality, and the creation of interface effects linking human and non-human actors through interactive public projection. Our proposal, entitled "The Line," consists of an interactive video database of linear built forms at various scales (a sidewalk, a fence, a road, a row of houses, a strip mall, a highway, etc.) projected onto a 200-year old barn on the site of a re-created, late nineteenth-century village. Depth sensors distributed along the base of the building will detect the proximity of people to the projection surface and recombine video segments of the set of lines described above. Thus, an interaction space will be created in front of the barn in which a scattering of participants will produce a *cadavre exquis* of lines displayed in a single panorama on the barn. Re-embodiment will take the form of participants recognizing the effect of their movement on the projected image, and a collective re-embodiment is possible through cooperative efforts to "line" images up. Transversality will be expressed via the relationships between environmental, social, political, technological, and human systems [28] [29] enabled by the interface effect that links multiple participants to a photo series through sensors and computation. This will allow participants to witness and embody these relationships publicly at an architectural scale. As such, they will be granted an expanded presence in this hybrid space, and treated not as inert points, but as vectors of potentiality.

"The Line" is to be presented as part of Land|Slide: Possible Futures [30], a site-specific art exhibition in Markham, Ontario, one of North America's fastest growing suburbs. The exhibition aims to encourage a collective conversation around the future of land use. The site itself, a reconstructed nineteenth century village, represents a utopian collection and configuration of heritage buildings. These buildings were salvaged from outlying areas now primarily occupied by strip malls and suburban homes. It serves as a fitting backdrop to an inquiry into how and why we might desire to question the authority of space, the methods of its construction, and our changing role within it.

Our goal in merging projected representations of various infrastructural lines, embodied interaction, and public space is to create a hybrid space that relates people and things to one another in order to highlight responsibility and empowerment. Transversality, (re)embodiment, and an active engagement with public visual culture by these means contributes to an experience of the flows and networks of people and things that are either perceptually overwhelming or concealed within the built form, governmental policies, and technologies. Exposing this may be one way to contribute to Latour's goal of "making things public" [31]. For a public to see itself in itself, at once, is crucial to critical reflection and engagement around any issue. Therein, ultimately, lies the power and importance of developing interactive public projection as a poetic and political tool: it can become a powerful way for us to participate in image and place making, challenging the prevailing "distribution of the sensible" [32] that discourages or denies access to public visual culture.

Fig. 1. Artists' rendering of "The Line". (© Patricio Davila and David Colangelo)

References and Notes

1. Scott McQuire, *The Media City: Media, Architecture and Urban Space* (London: Sage, 2008).

2. Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990).

3. Guy Debord, *Society of the Spectacle* (Soul Bay Press, 2009).

4. Walter Benjamin, "The Work of Art in the Age Mechanical Reproduction," in Hannah Arendt, ed., *Illuminations* (New York: Schocken Books, 1969) pp. 217-242.

5. Hazel Smith and R. T. Dean, *Practice-led Research, Research-led Practice in the Creative Arts* (Edinburgh: Edinburgh University Press, 2009).

6. Andrew Murphie, "The World as Clock: The Network Society and Experimental Ecologies." *Topia: Canadian Journal of Cultural Studies* 11 (2004) pp. 117-138.

7. Mark Hansen, *Bodies in Code: Interfaces with Digital Media* (New York: Routledge, 2006).

8. Mark Hansen, *New Philosophy for New Media* (Cambridge, MA: MIT Press, 2004).

9. Alexander Galloway, *The Interface Effect* (Cambridge, MA: Polity, 2012).

10. McQuire [1].

11. Susan Buck-Morss, "Dream world of mass culture: Walter Benjamin's theory of modernity and the dialectics of seeing," in D.M. Kleinberg-Levin, ed., *Modernity and the hegemony of vision* (Berkeley: University of California Press, 1993).

12. Buck-Morss [10] p. 322.

13. Jonathan Crary, "J. G. Ballard and the Promiscuity of Forms," *Zone 1/2* (1986) pp. 159-65.

14. Anna McCarthy, *Ambient Television: Visual Culture and Public Space* (Duke University Press, 2001) p. 125.

15. Galloway [9].

16. Rafael Lozano-Hemmer, "Body Movies" <http://www.lozano-hemmer.com/body_movies.php>, accessed 15 June 2013.

17. Murphie [6] pp. 117-138.

18. Hansen [8].

19. Jean-Louis Baudry, "The Apparatus: Metapsychological Approaches to the Impression of Reality in the Cinema," in Philip Rosen, ed., *Narrative, Apparatus, Ideology: A film Theory Reader* (New York: Columbia University Press, 1975).

20. Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (MIT Press, 2006).

21. Janet Harbord, *The Evolution of Film: Rethinking Film Studies* (Cambridge, MA: Polity, 2007).

22. D.N. Rodowick, *The Virtual Life of Film* (Harvard University Press. 2007).

23. Gilles Deleuze, "Postscript on the societies of control." *October* 59 (1992), pp. 3-7.

24. Camille Utterback, Shifting Time – San Jose, <http://camilleutterback.com/projects/shifting-time-san-jose/>, accessed 4 June 2013.

25. Hansen [7] p. 95.

26. Hansen [7].

27. Smith and Dean [5].

28. Bruno Latour and Peter Weibel, *Making Things Public: Atmospheres of Democracy* (Cambridge, Mass. [Karlsruhe, Germany]: MIT Press ZKM/Center for Art and Media in Karlsruhe, 2005).

29. Jacques Ranciere, "The Distribution of the Sensible," *The Politics of Aesthetic*s, Gabriel Rockhill, trans. (London: Continuum, 2000).

30. Land / Slide : Possible Futures, <http://www.landslide-possiblefutures.com/>, accessed 12 Nov 2012.

31. Latour and Weibel [28].

32. Ranciere [29].

MANAGING MULTI-PLATFORM MATERIALS: SELECTED CASE STUDIES

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Abstract

Mobile devices and Internet usage are now common in most parts of the world. Archives and other cultural agencies are challenged by the increasing amounts, and complexity, of digital content. New strategies are being developed and promoted to enable digital acquisition and preservation. The National Film and Sound Archive of Australia (NFSA) is examining and addressing acquisition and preservation challenges for a range of complex digital content, within available resources. This paper will discuss issues associated with a range of multi-platform content with reference to selected case studies.

Keywords: multi-platform, digital archiving, digital preservation, case studies, complex objects, apps

Introduction

Digital technologies have become ubiquitous, with an ever-increasing number of people creating and using digital content [1]. The NFSA acquires nearly 200 Australian feature films annually. Around 40 of these are digital, each averaging two terabytes [2]. In Australia, collecting institutions typically represent the historical divisions between the various cultural industries and agencies. Archives, libraries, museums and galleries are part of the memory sector, but the roles and business drivers of these organisations differ according to their interests. Australia currently has no national legal deposit legislation for audiovisual materials [3]. The NFSA selectively archives [4] a representative sample of Australia's audiovisual heritage, spanning feature films, broadcast content, published audiovisual material and multi-platform works [5]. Selection is guided by principles outlined in the NFSA's Collection Policy [6], such as cultural significance [7]. It is important to note that our Collection Policy does not cover all forms of audiovisual practices. A formal Deliverables Deed [8] which mandates archival deposit of funded productions [9] has been negotiated with the federal funding agency Screen Australia and adopted by a number of state agencies [10]. We do not collect games and at present there is no clear mandate for any specific government institution in Australia to do so. Our focus is on works where the "audiovisual experience" is the primary element.

Audiovisual material then and now

Fundamental changes in audiovisual production and delivery challenge traditional archival models. Collecting institutions can no longer wait until a work has been presented and then archive the results. For example, feature films used to arrive on reels of film or video tapes (Fig. 1). Now "films" are delivered on a variety of digital media, ranging from LTO [11] tapes through to USB flash drives (Fig. 2). In the same way that the physical carriers that film arrives on have changed, the way that content is stored on a carrier has also been transformed. Traditionally, analogue film had a base (polyester or nitrate) that contained a sequence of still images and an optical sound track. Feature films are primarily distributed commercially as a Digital Cinema Package (DCP) [12]: a sequence of separate image and audio files in MXF [13] wrappers plus an asset map, playlist and a volume index in XML [14]. In addition, as our case studies show, feature films are often accompanied by networked media (e.g. websites and apps), delivered via the Internet or FTP [15]. These fundamental changes in the way that audiovisual material is created, delivered and stored means that we need to actively engage with content creators as early in the production process as possible to identify the best preservation approaches for their work. The *ABCDE Model* (Fig. 3) being developed by the NFSA is one response to managing these changes.

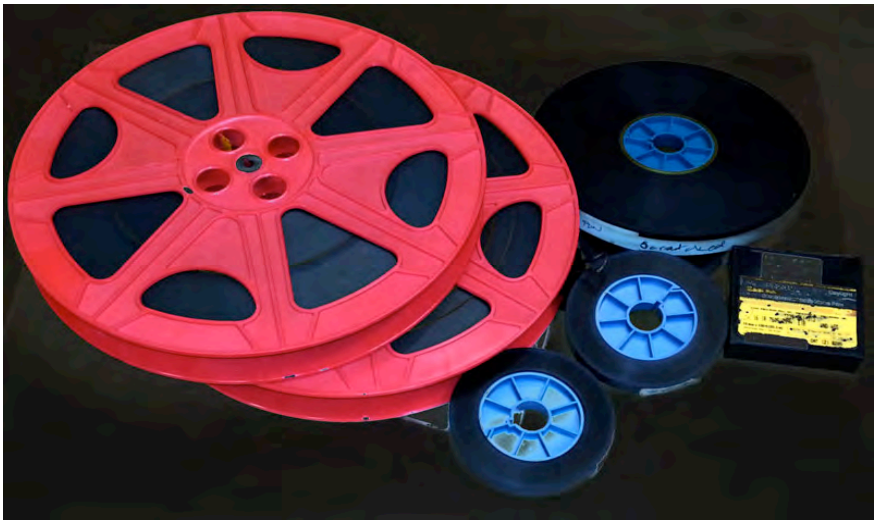
Collecting Networked Media

Networked media is a broad and overarching term. For our purposes, the NFSA defines networked media as:

> "…content which is created, distributed and used on mobile devices or networked computers, predominantly via the Internet and wireless services. It is distinguished from traditional one-to-one telecommunications, and from one-to-many broadcast networks, by being a global array of publically accessible many-to-many networks which enables participation and contribution of content." [16]

Archiving networked media builds on our extensive experience in acquiring and preserving complex analogue linear content, and is also made possible by our large-scale digital storage infrastructure (that includes backup and redundancy mechanisms). We predominantly aim to acquire networked media, however we have also archived complex non-

Fig. 1. Analogue film reels. (© National Film and Sound Archive of Australia. Photo © Trevor Carter.)



networked content (such as interactive multimedia CD-ROMs), interactive audiovisual installations and works incorporating data from sensors systems (e.g. Lynette Wallworth's digital work *Coral: Rekindling Venus* [17] for planetarium dome environments). As a partner organisation in the National Library of Australia's (NLA) PANDORA [18] project, the NFSA has been archiving websites related to Australian audiovisual culture since 2001.

Sustainability must be considered as part of any archival selection process. Issues inherent in the preservation of all audiovisual content (such as encryption, proprietary formats and technological redundancy) are ongoing concerns and must also be addressed in the course of digital stewardship [19]. Memory sector organisations must now deal with: ongoing management and active preservation of complex digital content (such as multi-platform works); the lack of scalability of current archival practices; curatorial selection processes in the digital space; and, problems caused by the lack of explicit donor guidelines to support acquisition processes.

Fig. 2. Physical format digital carriers. (© National Film and Sound Archive of Australia. Photo © Trevor Carter.)

Developing Proactive Approaches: The ABCDE Model

Changes in production and delivery technologies have required corresponding changes to the NFSA's approach to archival thinking. The NFSA is developing a Networked Media Strategy to inform the acquisition and preservation of digital material. As part of this strategy we are reviewing existing models used to address the curation, description, documentation, management and preservation of complex works [20]. We are developing the *ABCDE Model for Curation and Content Management* (Fig. 3) to support curatorial and technical assessments. Based on the principles and concepts of the three-tiered Fédération Internationale des Archives du Film (FIAF) preservation model [21], our evolving model is both conceptual and technical in nature. It will inform the ongoing management of our collection materials.

The *ABCDE Model* (Fig. 3) is multi-layered; it classifies the inherent and temporal attributes of analogue and digital items [22] into five levels that inform acquisition and collection management decisions. These decisions must be made regarding various attributes of an audiovisual item: the quality and technology (including complexity); its role in creative development (at all stages of production and reuse); sustainability; and, the delineation of its role and usage in an archive.

The following examples show how a particular item (or format) may be ranked differently against various types of attributes.

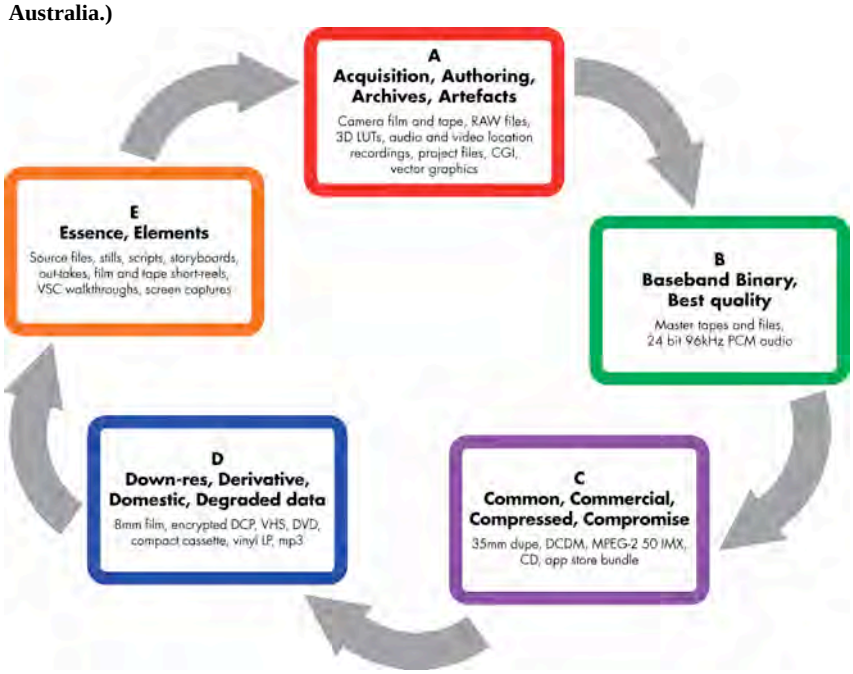
Quality

- Highest: 70mm film, 8k RAW files, 32 bit 384kHz PCM [23] audio
- High: 35mm negative film, 24 bit 96kHz PCM audio
- Medium: MPEG-4 Hi444PP, 16 bit 44.1kHz PCM audio
- Low: DVD, DVB [24], mp3 128 kbs
- Lowest: 384 kbs h.263 video link, low bitrate mp3

Production

- Unconformed and preproduction items: field recordings, camera tapes, P2 cards, scripts, storyboards
- Production items: AVID project files, Digital Multitrack Audio, Music and Effects submasters
- Complete, full-resolution masters: Composite Dupe-Neg, MXF-Op1a
- Items packaged for commercial distribution: film-print, DVD, CD
- Lower quality derivatives: thumbnail image

Fig. 3. The NFSA's evolving ABCDE Model. (© National Film and Sound Archive of Australia.)



Sustainability

- Highest: stone tablets and pyramids
- High: BWF [25], PNG [26], TIFF [27]
- Medium: celluloid phonograph cylinders, U-matic video, unencrypted DCPs
- Low: wax phonograph cylinders, 2" Quadruplex video, Pro-Res
- Lowest: iOS apps, encrypted DCPs

Archival Usage

- Level A (acquisition and authoring): camera negative film, RAW files
- Level B (complete, full-resolution masters): D1 video, ¼" audio tape
- Level C (commercial or compressed): DV AVI [28], CD, vinyl disc
- Level D (lower quality derivatives): DVD, mp3, audio cassette
- Level E (elements): out-takes and items such as text or still images from a webpage

Acquiring a range of items from all levels of the *ABCDE Model* (which is not always possible) maximises opportunities for sustainable access, repurposing and re-presentation. In general, it is easier to preserve Level B [29] items and to use copies to derive or enable subsequent access outcomes. Level D [30] items are typically only acquired when no other options are available. Level C [31], Level A [32] and Level E [33] items should support the long-term preservation and access to archival material. It may also provide context, to enhance opportunities for researchers, producers and content creators to repurpose and re-present their work for future audiences.

Content Creators as Digital Curators

Due to the complexity of contemporary digital works (including multi-platform content), artists and creators can no longer simply submit their works to a collecting institution at the completion of a project. It is increasingly necessary to consider the archiving requirements of the work throughout the entire creation process. The NFSA encourages artists, creators and producers to reference resources including *How To Write a Transmedia Production Bible* [34] and the *Electronic Arts Intermix Resource Guide* [35] as well as using a *Sheer Curation* approach [36]. The curation of digital data should be embedded into the development phases of the work's lifecycle, ensuring that appropriate metadata and documentation are created along the way.

Where a Deliverables Deed is in place, requested materials include the work plus a range of documentation and information (such as an Electronic Press Kit [EPK] and scripts) [37]. To suitably support archiving a complex digital object, a range of additional materials [38] (documenting and supporting the work itself) are also likely to be required. These include:

Documents and Elements

- Video Screen Captures [39] (VSC)
- Screen captures [40]
- Storyboards [41]
- Wireframes [42]
- Creator statements [43]
- Audience experience documentation [44]

Descriptive and Rights Information

- Credits [45]
- Rights [46]

Functional, Structural and Technical Details

- Structural information [47]
- Structural maps [48]
- System diagrams [49]
- Production workflow diagrams [50]
- Functional specifications [51]
- Technical requirements [52]
- Technical specifications [53]
- Interaction behaviours [54]
- Instructions and guides [55]

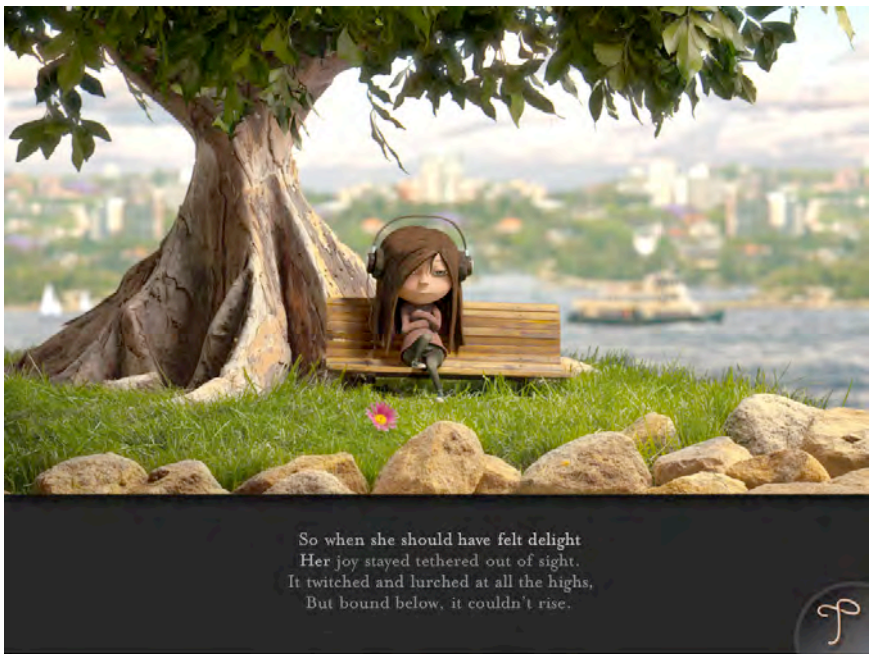
Any additional lists of assets [56], metadata [57] plus checksums [58] are also important. If the work requires external inputs, such as a dataset or if it is sensor-driven, it would also be advisable to include an example dataset or a bitstream of the raw sensor data. This may enable the work to be re-presented in the future.

As well as content creators becoming citizen curators, archivists need to become more engaged in the creative process. Collecting and archiving digital multi-platform content (such as apps), is a relatively new activity for the NFSA and this content is typically being acquired via a formal Deliverables Deed [59]. We are expanding our expertise in dealing with this material by learning from each new acquisition. The following case studies (acquired via Deliverables Deeds) were selected for the variety of items (and formats) submitted. They demonstrate some of the issues we are facing, and enable us to develop more detailed information to provide to producers; assisting them with submitting complex digital content.

Case Study 1: A Cautionary Tail

A Cautionary Tail [60] featuring Cate Blanchett, David Wenham and Barry Otto, was originally conceived as an animated short film [61], which premiered at the 2013 Flickerfest in Sydney. Images were created from digitally-

Fig. 4. *A Cautionary Tail*, iPad app still, 2013. (© RAWR Media.)



tracked stop motion animation of a min-

annotated storyboard image stills (Fig.

user experience and interaction behav-

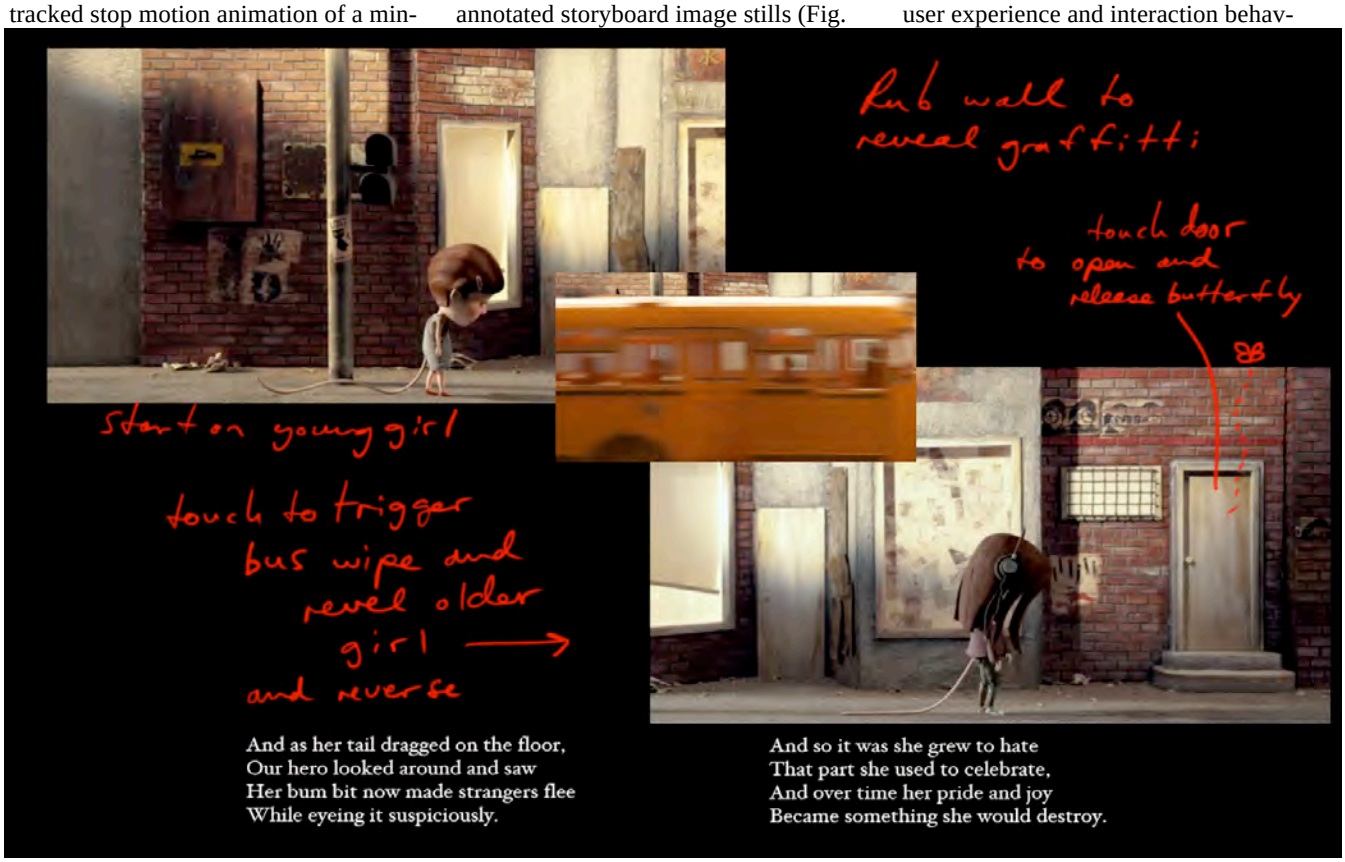
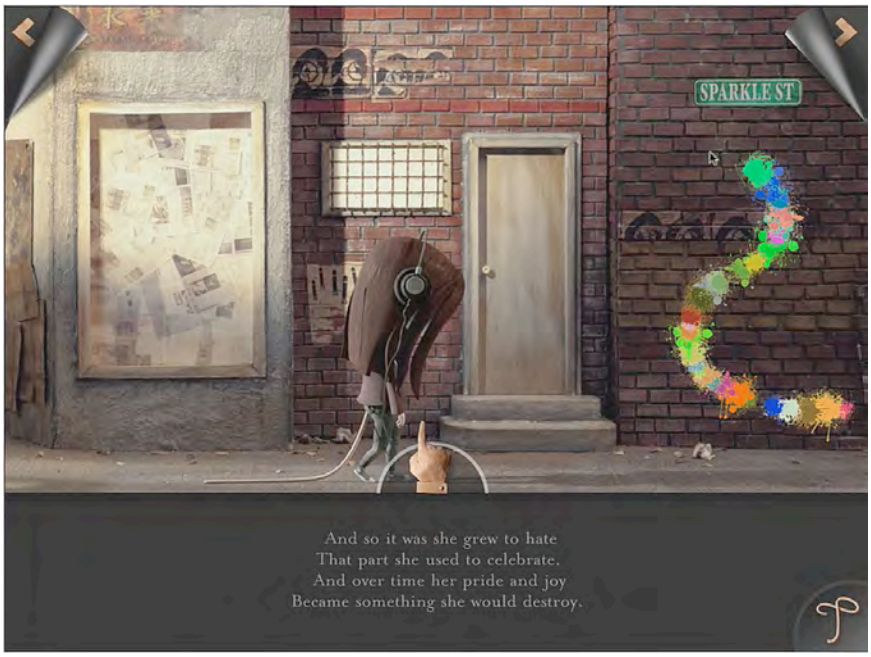


Fig. 5. ***A Cautionary Tail,*** **iPad app storyboard still describing interaction behaviours, 2013. (© RAWR Media.)**

iature set with 3D characters rendered in AutoDesk software. This was subsequently developed into an interactive children's story iPad app (Fig. 4.).

In addition to the short film, multi-platform files received by the NFSA included: a VSC; audiovisual elements, 5.); and text files indicating various interactive behaviours. The NFSA did not receive the binary iPad app, technical specifications (e.g. production workflow documents) or details of the platforms and versions the app was developed for. The VSC (Fig. 6.), which displays the

Fig. 6. ***A Cautionary Tail,*** **iPad app video screen capture still, 2013. (© RAWR Media.)**



iours, was created during the testing phase of the (final) beta app. It demonstrates some of the interaction aspects of the app and provides a reasonable representation of the work.

Although a Digital Picture Exchange (DPX) sequence was not created as part of the original production chain, the producers created and supplied DPX files to the NFSA, based on their understanding of the NFSA's Deliverables Deed. This created additional, unnecessary work for the production company and highlights the need for greater communication at an earlier stage in the process. Through consultation we were able to obtain a range of required digital items. However in order to fully understand the work, a personally purchased copy of the app allowed us to gain valuable insight. Due to the NFSA's close working relationship with the producer, it is anticipated that we will be able to obtain additional materials (e.g. technical information documents, the binary app file and the fully resolved website).

Case Study 2: The Gradual Demise of Phillipa Finch

The Gradual Demise of Phillipa Finch [62] is a 17-part multi-platform 2D animation created by Emma Magenta (that first aired on ABC Television in 2011). In addition to the animation, other multi-platform components included: an iPhone game app; two websites; *The Waking Heart* (a hybrid interactive installation); and, an iPhone app enabling users to interact with the installation. The second website specifically associated with *The Waking Heart* installation is no longer available online.

Files received by the NFSA included: the binary iOS app; a VSC walkthrough of the iOS game app; selected audiovisual and image elements (some in proprietary formats such as Adobe Illustrator [Fig. 7.]); a zipped file (ZIP) of the website (including hidden system files and code subversion files [SVN]) plus additional documentation (including a high-level website storyboard [Fig. 8.]).

This is one of the earliest examples of a multi-platform work acquired by the NFSA [63] and it was submitted with limited supporting documents. For us to facilitate the ongoing management and long-term preservation of this type of multi-platform work (other than maintaining access to the VSC), we may need to obtain further technical specifications.

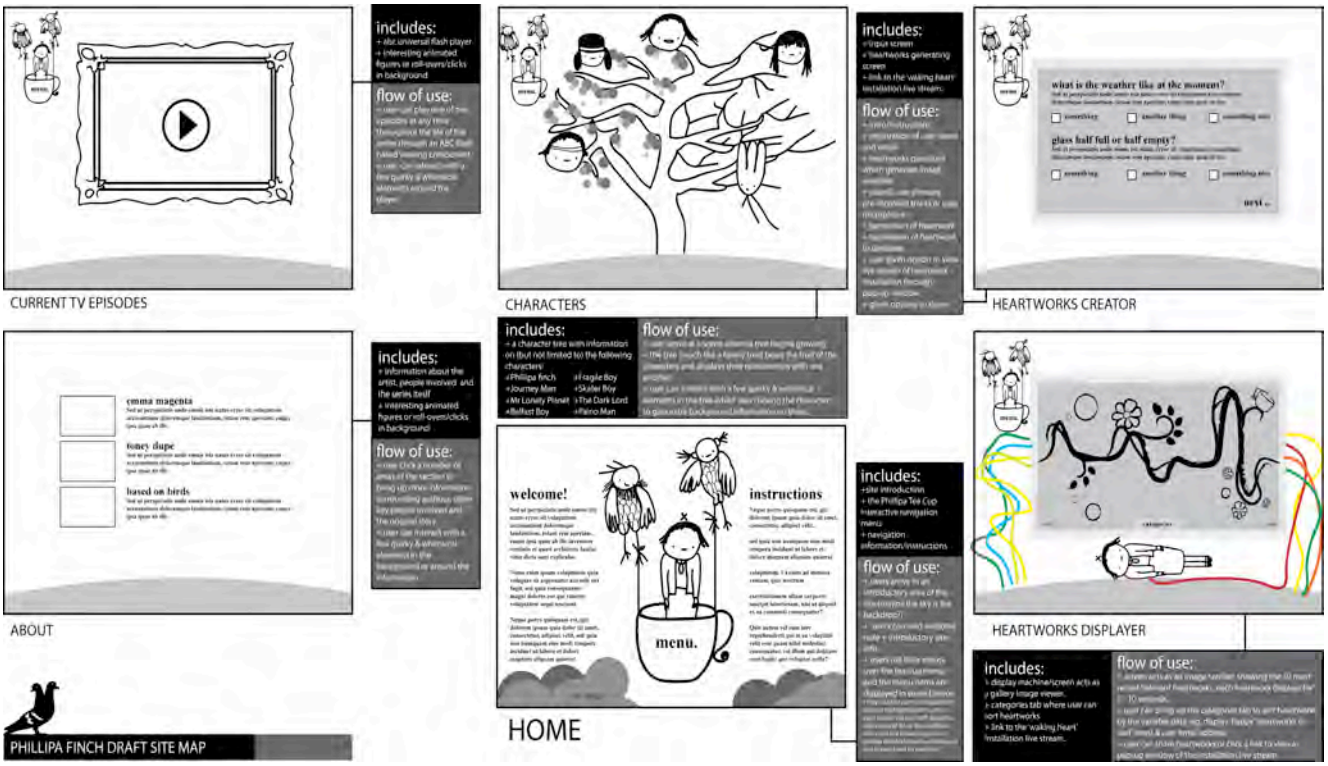
Fig. 7. ***The Gradual Demise of Phillipa Finch*****, website character element, 2011. (© Emma Magenta, Based on Birds.)**

Case Study 3: The Sapphires Soul Sync App

The Sapphires Soul Sync [64] app is an interactive iOS app (produced by Digital Arts Network Sydney) that accompanies the 2012 release of the award winning Australian feature film *The Sapphires*. The NFSA received: a short promotional video about the app and how to use it (Fig. 9.); screen captures of the app (Fig. 10.); and, server-side and client-side code. We did not receive the binary iOS app, a VSC (representing the interaction behaviours or the user experience) or technical documentation. Without technical documentation, it is difficult to confirm whether the various code files that were submitted could be recompiled into the app.

The app is dependent on functionalities only available on certain models of Apple mobile devices. For example, it requires a front-facing camera and stores photos in the Photo Album on the client device. Downloading and using the free

Fig. 8. ***The Gradual Demise of Phillipa Finch*****, website storyboard, 2011. (© Emma Magenta, Based on Birds.)**



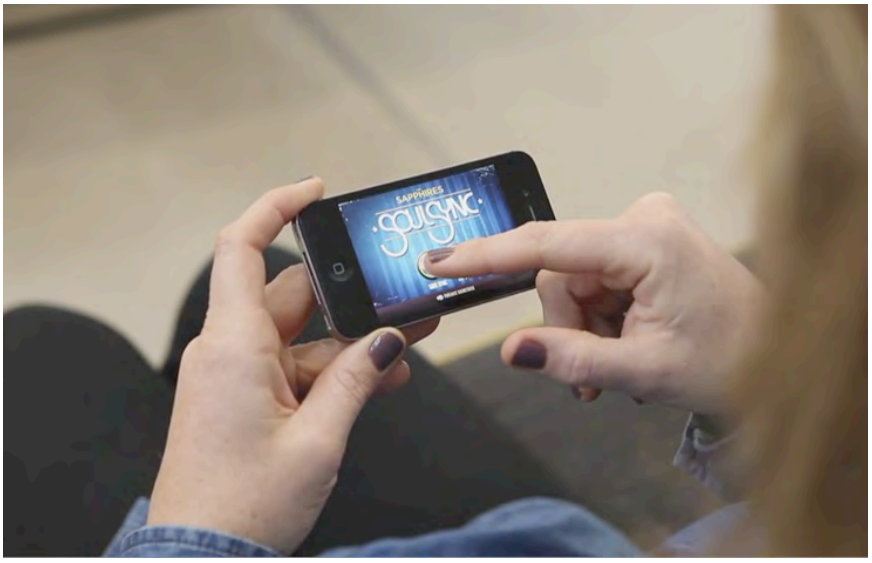


Fig. 9. *The Sapphires Soul Sync*, iOS app promotional video, 2012. (© Digital Arts Network Sydney, Goalpost Pictures.)

app was the only way to discover these limitations. As technical information (describing these dependencies) was not supplied, this app may be difficult to support in the future.

Case Study 4: Storm Surfers 3D

Storm Surfers 3D [65], a film about surfers seeking out and riding gigantic waves, premiered as a 3D movie in 2012. A series of webisodes, a website, an eBook and a mobile game (for iOS and Android) were also created [66]. This was the first stereoscopic movie we have received, and it raised issues of sustainability. We archived the Digital Cinema Distribution Master (DCDM) as TIFF images for the left and right eye [67] to allow the film's stereoscopic effects to be recreated in future formats.

Storm Surfers was delivered to cinemas as a DCP; a complex digital object. For archival purposes, it is important to understand the stages of a DCP production chain. A DCP consists of a series of separate image and audio files in MXF wrappers plus an asset map, playlist and volume index in XML. To produce a DCP, a Digital Intermediate (DI) is created (made up of a series of high-res uncompressed images and a collection of audio files). From the DI a DCDM is produced; usually a series of TIFF files in the XYZ colour space, with accompanying audio files. The DCDM is used to produce the DCP — the moving images ultimately seen on the cinema screen. These files are often encrypted. Due to the difficulties presented by preserving encrypted material the NFSA does not currently collect encrypted files.

Fig. 10. *The Sapphires Soul Sync*, iOS app screen capture, 2012. (© Digital Arts Network Sydney, Goalpost Pictures.)

Storm Surfers' DCDM contained approximately 270,000 TIFF images (approximately five terabytes of data), which stretched the hardware and storage capacities of the NFSA's ingest systems. In addition, the image files, the website, webisodes and television episodes all arrived on the same eight terabyte hard drive. The NFSA has a number of separate (specialised) sections based on traditional production chains (film, sound etc.). With all the material arriving on one large hard drive, ingest had to be handled by one area (the film section). This challenged our traditional (section-based) approach to archiving, providing an opportunity to examine the ways in which communication can be improved across areas.

Conclusion

Collecting institutions and cultural industries are constantly adapting to new modes of production, advances in digital content creation and technological innovation. These case studies have taught us that while we are making progress in archiving multi-platform content, there is still a considerable way to go. Archivists and curators must continue to develop emerging models, create standards and processes (based on established principles), and take into account the increasing complexity and continued evolution of media technologies. Likewise, creators and producers must build an awareness of digital archiving requirements. Good communication between creators and archivists is key.

Our hope is that this paper will inform and encourage creative producers to contact collecting institutions, like the NFSA, early in the production process. As cultural custodians, collecting institutions need to work in partnership with artists and creators, exchanging knowledge and experience in order to achieve the best outcomes for long-term sustainability of digital content.

Acknowledgements

The authors would like to thank NFSA staff and colleagues who have contributed. Edited by Pam Carter.

A Cautionary Tail
Courtesy of RAWR Media

Director: Simon Rippingale
Producer: Pauline Piper
Writer: Erica Harrison
Funding: Screen Australia and Screen NSW

The Gradual Demise of Phillipa Finch

Writer/director/character design: Emma Magenta
Interactive game design and build: The Project Factory
Website and digital strategy: Based on Birds
Producer: Rachel Okine
Broadcaster and distributor: ABC
Funding: ABC, Screen Australia, Screen NSW and Hidden Agenda

The Sapphires Soul Sync

App: Digital Arts Network Sydney
Film production: Goalpost Pictures
Funding: Screen Australia and Screen NSW

Storm Surfers 3D

6ixty Foot Productions in association with Firelight Productions
Funding: Screen Australia

References and Notes

1. YouTube states that "…100 hours of video are uploaded… every minute" and over six billion YouTube videos are viewed per month. More than 25 percent of views are via mobile devices. YouTube (2013), <http://www.youtube.com/yt/press/statistics.html>, accessed 5 July 2013.

2. National Film and Sound Archive of Australia, *Annual Report 2011-12* (2012), <http://www.nfsa.gov.au/site_media/uploads/file/2012/11/02/NFSA_Annual_report_2012__webversion.pdf>, p. 29, accessed 18 July 2013.

3. As of 2013, while there is no legal deposit legislation for audiovisual material or for electronic publications at the federal level, several states in Australia have legal deposit for electronic publications and some for audiovisual materials or recordings. Legal deposit legislation at the state level differs from state to state. To summarise: Queensland, the Northern Territory, South Australia, Tasmania and Western Australia have legal deposit for audiovisual recordings. Queensland, the Northern Territory, Tasmania, Western Australia also have legal deposit for electronic publications. National Library of Australia, *Legal Deposit requirements Australia wide* (2012), <http://www.nla.gov.au/legal-deposit/requirements-australia-wide>, accessed 7 July 2013.

4. The NFSA's approach to selective archiving is such that "…the collection of Australian works will be comprehensive in those fundamental areas that are a formal record of Australian audiovisual production, such as annual feature films, government-funded television drama, and commercial recording releases. The collection will selectively represent the more expansive fields of television and radio broadcast as well as online media." National Film and Sound Archive of Australia, "Acquisition Policy" in *Collection Policy* (2011), <http://www.nfsa.gov.au/site_media/uploads/file/2011/06/20/NFSA_Collection_Policy_May_2011_Webready.pdf>, p. 9, accessed 6 July 2013.

5. As of 2013, the collection comprises over two million works.

6. National Film and Sound Archive of Australia, *Collection Policy* (2011), <http://www.nfsa.gov.au/site_media/uploads/file/2011/06/20/NFSA_Collection_Policy_May_2011_Webready.pdf>, accessed 6 July 2013.

7. The NFSA's significance assessment includes: aesthetic, technical/scientific/research, cultural/social/spiritual, historical, provenance, completeness/condition/intactness, representativeness, rarity and interpretive potential. National Film and Sound Archive of Australia, "Appendix C: Statement of Significance" in *Collection Policy* (2011), <http://www.nfsa.gov.au/site_media/uploads/file/2011/06/20/NFSA_Collection_Policy_May_2011_Webready.pdf>, p. 53, accessed 6 July 2013.

8. National Film and Sound Archive of Australia, *Information for Delivery Materials of Funded Productions* (2011), <http://www.nfsa.gov.au/site_media/uploads/file/2011/08/04/NFSA_Deliverables_Listing__for_NFSA_website_Aug_2011.pdf>, accessed 6 July 2013.

9. This includes film, television, documentary and some multi-platform productions.

10. Screen NSW and Film Victoria have implemented the Deed with other states expected to follow.

11. Linear Tape-Open.

12. For preservation purposes, the NFSA acquires earlier production elements such as the Digital Source Master (DSM), Digital Intermediate (DI) or Digital Cinema Distribution Master (DCDM). A DCP is not a preferred preservation format.

13. P. Ferreira, *MXF – A Technical Overview* (EBU Technical Review, 2010), <http://tech.ebu.ch/docs/techreview/trev_2010-Q3_MXF-2.pdf>, accessed 19 July 2013. The outline of Material eXchange Format (MXF) sustainability and use in archives can be found in the Library of Congress, *Sustainability of Digital Formats* (2013), <http://www.digitalpreservation.gov/formats/fdd/fdd000013.shtml>, accessed 8 July 2013.

14. Library of Congress, *XML (Extensible Markup Language)* (2009), <http://www.digitalpreservation.gov/formats/fdd/fdd000075.shtml>, accessed 8 July 2013.

15. File Transfer Protocol.

16. National Film and Sound Archive of Australia, *Networked Media* (2013), <http://www.nfsa.gov.au/collection/networked-media/>, accessed 6 July 2013.

17. Lynette Wallworth, *Coral: Rekindling Venus* (2012), <http://coralrekindlingvenus.com/>, accessed 6 July 2013.

18. Preserving and Accessing Networked Documentary Resources of Australia (PANDORA) <http://pandora.nla.gov.au/>, accessed 6 July 2013.

19. As part of the *National Digital Information Infrastructure and Preservation Program* (NDIIPP), The Library of Congress (LOC) has outlined several important factors in the sustainability of digital formats. These include: adoption, transparency, self-documentation, external dependencies, the impact of patients and Technological Protection Mechanisms (TPMs). Library of Congress, *Sustainability of Digital Formats* (2013), <http://www.digitalpreservation.gov/formats/sustain/sustain.shtml>, accessed 5 July 2013.

20. In particular, the NFSA has been examining: the *DOCAM Documentation Model* <http://www.docam.ca/en/documentation-model.html>; the *Media Arts Notation System* (MANS) <http://www.bampfa.berkeley.edu/about/formalnotation.pdf>; the *Variable Media Questionnaire* <http://variablemediaquestionnaire.net/>; and, *FRBRoo* (Functional Requirements for Bibliographic Records - object oriented) <http://www.cidoc-crm.org/frbr_inro.html>, which is a joint model developed by harmonising the *CIDOC Conceptual Reference Model* (CRM) <http://www.cidoc-crm.org/> and the *Functional Requirements for Bibliographic Records* (FRBR) <http://www.ifla.org/publications/functional-requirements-for-bibliographic-records>.

21. *A Handbook for Film Archives*, E. Bowser and J. Kuiper, eds. (Brussels: International Federation of Film Archives, 1991), p. 28.

22. For our purposes, the NFSA considers an item to be a single unit that may be a part of a component of a larger work: a discrete artefact that contributes to the reproduction of a work. It should be noted that relationship between "item" and "component' is the opposite to that of the *DOCAM Documentation Model* [17].

23. Pulse-code modulation.

24. Digital Video Broadcasting**.**

25. Broadcast Wave Format.

26. Library of Congress, *PNG, Portable Network Graphics* (2012), <http://www.digitalpreservation.gov/formats/fdd/fdd000153.shtml>, accessed 8 July 2013.

27. Library of Congress, *Tagged Image File Format. TIFF, Revision 6.0* (2013) <http://www.digitalpreservation.gov/formats/fdd/fdd000022.shtml>, accessed 8 July 2013.

28. Library of Congress, *Audio Video Interleaved. AVI* (2013), <http://www.digitalpreservation.gov/formats/fdd/fdd000059.shtml>, accessed 8 July 2013.

29. Level B is essentially, a final edited master, the most complete version of a work, ideally on a sustainable, high-quality format. For 35mm film, a spliced negative would be retained and preserved as an interpositive. Nowadays, RAW files are graded, using 3D lookup tables (LUTs), then edited into Digital Intermediates (DIs), before compositing with audio and other elements into a Digital Cinema Distribution Master (DCDM). In analogue audio, multitrack studio sessions were mixed-down into ¼" or ½" master tape, whereas current practice is based upon 24 bit, 96kHz PCM audio (and higher resolution) recordings, captured on portable recorders or studio workstations, and finished in Broadcast Wave Format (BWF). Uncompressed video tape formats such as D-1, D-2, D-3 and D-5 are now relegated to Level A, due to sustainability issues.

30. Level D content is considered domestic and lower quality, such as cassette tapes, mp3 audio files, MPEG-4 video and DVDs.

31. Level C includes common, commercial formats that often represent a compromise between cost, size and quality. Earlier examples include 16mm film, U-matic video, succeeded by lossy compressed video, including Digital Betacam, DVC-Pro, MPEG-2 IMX and HD-Cam. Audio Compact Discs are included in Level C, as they are second-tier, lower bit rate and uncompressed, even though they are also a domestic format; they were used in sound effects and music libraries.

32. Level A includes camera film, RAW files, location recordings on tape or disc and P2 cards, used for acquisition and capture of audio, images and data; as well as authentic, original artefacts such as sets, props and costumes. Level A also includes project files, 3D lookup tables (LUTs), computer generated imagery (CGI), vector graphics, texture maps, music and effects, edit decision lists (EDLs) and fader automation used in authoring, production, and archives.

33. Level E encompasses the elements or component parts which are assembled to reconstitute an instantiation of a work: the audio, video, images and data essence are embodied in reels of film, tape

or files that contain stems, music and effects, voice-overs, still and moving image sequences, composited in the correct order and structure, as determined by a structural map.

34. Gary P Hayes, *How to Write a Transmedia Production Bible: A template for multi-platform producers* (Screen Australia, 2011), <http://www.screenaustralia.gov.au/about_us/pub_transmedia_bible.aspx>, accessed 11 October 2013.

35. Electronic Arts Intermix, *EAI Online Resource Guide for Exhibiting, Collecting and Preserving Media Art* (2013), <http://www.eai.org/resourceguide/>, accessed 6 July 2013.

36. Alistair Miles created this term during the *ImageStore* project where he intended it to mean that curation of digital data and other activities is almost imperceptibly embedded into the content creation phases. Wikipedia (2013), <http://en.wikipedia.org/wiki/Digital_curation#Sheer_curation>, accessed 9 July 2013.

37. National Film and Sound Archive of Australia [8].

38. Additional materials will be collected where they are available, and negotiation between creators and NFSA archivists or curators will determine other documentation or technical information that needs to be created to support the archiving of a work.

39. A linear walkthrough of an interactive environment, captured as a digital audiovisual recording of the output of a computer screen. Also known as a screencast.

40. A still image capture of the content displayed on a computer screen. Also known as screenshot, screen grab or screen dump.

41. Hayes [34] p. 10.

42. Hayes [34] p. 11.

43. These may include written or oral history audio or audiovisual recordings with artists, creators, collaborators, producers or other individuals involved with the creation, development or presentation of a work, describing the ideas, intent and other important details of the work. Also known as an Artist Interview or Artist Intent.

44. Interviews with audience members describing their experience of an artwork, particularly an interactive work. Lizzie Muller, *Towards an Oral History of New Media Art* (2008), <http://www.fondation-langlois.org/html/e/page.php?NumPage=2096>, accessed 7 July 2013.

45. Provide a detailed list of all credits, including all companies and individuals involved in the creation of the multi-platform work, funding agencies and sponsors. Include contact information for all relevant parties.

46. Provide complete rights information including details on Intellectual Property (IP), licencing information and any underlying third-party rights. Include contact information for all relevant parties.

47. Information about the structure of a complex work. This may come in the form of a directory listing or directory dump in XML. Alternatively, the *Media Arts Notation System* (MANS) could be used. Richard Rinehart, A Formal Notation for Scoring Works of Digital and Variable Media Art (2004), <http://www.bampfa.berkeley.edu/about/formalnotation.pdf>, accessed 5 July 2013.

48. The structural map forms the major component of a METS document, outlining a hierarchical structure for a digital library object. METS: An Overview and Tutorial: Metadata Encoding and Transmission Standard (METS) Official Web Site (2011), <http://www.loc.gov/standards/mets/METSOverview.v2.html>, accessed 6 July 2013.

49. This should illustrate the relationships between different components of the system for a complex digital (or hybrid) object, in order to be able to represent the work in the future. Include all schematic diagrams.

50. For linear production workflows, a diagram displaying the order of creation of the various items will enable an archive to ascertain as part of the acquisition process which items were generated or derived from specific master files.

51. Include the "service build overview" describing of each of the "channels" of a multi-platform work as well as the "user journey" between these channels. Hayes [34] pp. 7-8.

52. The framework around the work such as the specific hardware, operating system(s), peripherals (including dongles, sensors, custom-constructed hardware), details of dependencies (including access passwords, external systems – external databases, local databases, Application Programming Interfaces (APIs), server software etc.) and details of the overall system architecture, all of which is necessary in order for the work to operate so that it is possible for it to be re-presented in the future. Ensure that all version information is included. This may also be known as system requirements.

53. Specifications about the work, such as details of version of the work, limitations, list of all parts or components including the function of each. Include details of the "service build infrastructure". Ensure that all version information for the various components of the work and other services are included.

54. Information providing details about the interaction behaviours, this could appear as a diagram as an annotated storyboard, in text or XML, or as a form of notation.

55. Often interactive art installations and sometimes, complex digital objects (such as interactive works) have instructions or guides. These are typically created in order to assist gallery invigilators in managing the exhibition of a work, for example starting, shutting down or restarting if an issue is encountered.

56. Hayes [34] p. 12.

57. Including, but not limited to, administrative, descriptive, rights, structural, technical, financial, provenance and relationship metadata. (If metadata is unable to be embedded in file headers or as a file wrapper, a spread sheet detailing the metadata should be provided.) Somaya Langley, *Archives in the Digital Era, Scoping Study Report* (Australia Council for the Arts, 2012), <http://www.australiacouncil.gov.au/digitalarchives>, p. 133, accessed 5 July 2013.

58. Checksums, cryptographic hash functions (hashes) and cyclic redundancy checks (CRCs), which in the international digital preservation community are sometimes referred to as fixity, are unique alphanumeric or numeric codes generated from algorithms that are used to ensure data integrity. Common checksums in use by the international digital preservation community include MD5, SHA1 or SHA256. Checksums are more easily generated for smaller files. Tools for creating checksums do not handle large files well (for example, files over 4GB in size).

59. National Film and Sound Archive of Australia [8].

60. *A Cautionary Tail* (2012), <http://www.acautionarytail.com/>, accessed 6 July 2013.

61. The animation, which received initial funding for the production from Screen NSW, was also substantially crowdfunded (via Kickstarter).

62. *The Gradual Demise of Phillipa Finch* (2011), <http://www.abc.net.au/tv/phillipafinch/>, accessed 6 July 2013.

63. The NFSA typically doesn't collect materials produced by government (such as audiovisual content created by Australian national broadcasters: the ABC <http://www.abc.net.au/> and SBS <http://www.sbs.com.au/>). As the ABC was the broadcaster and distributor (and partially funded the production), the 17 animations were not acquired by the NFSA. These should typically be archived in the ABC Archives and the National Archives of Australia. As the various components of multi-platform works tends to fall into the collecting responsibilities of several cultural agencies, this often creates collecting responsibility "grey areas".

64. *The Sapphires Soul Sync app* (2012), <http://work.wtbwa.com.au/gpp/sapphires/>, accessed 6 July 2013.

65. *Storm Surfers 3D* (2012), <http://www.stormsurfers.com.au/>, accessed 6 July 2013.

66. The NFSA did not receive the eBook, mobile game app or the soundtrack.

67. The left and right TIFF sequences were included as part of the submission.

RE:CINEMA

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Abstract

This paper discusses the conceptual underpinnings of the exhibition project Re:Cinema. Rather than settling around the relatively stable formal and ontological parameters of the historical forms of cinema, the moving image is addressed in terms of its fragmentation, ubiquity and volatility. Through a discussion of key examples, the very embeddedness of historical forms within the contemporary moving image-scape is examined. To this end the idea of the 'cinematic' is evoked not as a totalising system, but rather as a persistent conceptual and visual presence that informs contemporary moving image production and artistic inquiry.

Keywords: cinema, contemporary art, video art. curating, exhibition, moving image, digital,

By way of an introduction I would like to address the title of this essay *Re:Cinema*. It is also the title of an exhibition-based project conducted between Sydney College of the Arts, The University of Sydney and Parsons the New School for Design in New York. Instigated and curated by the author, the project is, to put it simply, concerned with examining the "persistence of the cinematic in contemporary practice." At the time of writing the first of two exhibitions has been completed in Sydney; with the second scheduled to take place in New York in December 2013 [1].

Fig. 1. Re:Cinema installation view. Sydney College of the Arts Galleries, May/June 2013. L-R Andrew Robards, Jack McGrath & Silas Darnell *The Town With No Name*, Jeesu Kim, *I'm here now*, Lillian Handley, *untitled & Image 01*, Salvatore Panatteri, *Chroma Key Red* (© Respective Artists Photo © Ryszard Dabek.

The Sydney-based exhibition featured the work of twenty-seven artists across three gallery spaces at Sydney College of the Arts. It contained a variety of work ranging from single channel video and video-based installation to sculpture, photography, digital imaging and a computer-controlled diorama. Within the curatorial remit of the project I have sought to select work that, to varying degrees of abstraction, can be identified as on some level engaging the cinematic. In this sense the very idea of the cinematic is evoked not as a purely formal entity or as a fixed referent but rather as a presence that can be recognised as operating through and upon the works in the exhibition. It is this very idea of the cinema as a persistent and pervasive formal and conceptual presence in much of contemporary artistic practice that is the crux of my investigation.

In recent times, the most poignant (and effective) example of this idea of cinematic engagement in the sphere of global contemporary art is undoubtedly *The Clock* (2011) by Christian Marclay. The work, consisting of a 24 hour cycle of film sequences purloined from the history of cinema, is deceptively simple both in terms of formal and narrative structure. Through the deft use of a recurring motif; the filmic representation of clocks and watches, *The Clock* is possessed of temporal logic that sees the time space of events depicted on the screen synchronised with the real time of the viewer.

Viewed as a work of pure montage, *The Clock* employs a range of visual and aural links to slide from one narrative space to another with often surprising and disarming effect. Even seemingly arbitrary editing decisions are subsumed by the greater design of the work as the viewer is constantly reminded not only of the passage of screen time but also the simultaneous expenditure of real lived time. It is a situation that is further complicated by the numerous narrative ellipses that litter the work as characters and situations unexpectedly return to the screen. Within *The Clock* the viewer is drawn into an increasingly labyrinthine conceptual space that at once reveals and draws upon the mechanics of cinematic engagement. While we may know what time it is, we are never really sure where we stand.

It is perhaps this sense of disorientation that is the most powerful aspect of *The Clock*. Beyond the easy pleasures that the work offers in allowing us to recognise snippets of our favourite films lies a much more profound meditation on spectatorship and our relation to the cinematic. That this is done through a collapse of filmic montage into that most contemporary of forms: the mashup, is indeed remarkable. At the very heart of the work is an acknowledgement that the cinematic itself is, in this post-digital age, an entirely negotiable and volatile entity and that art itself may just be key in understanding what it has and will become.

If we are to speak of the cinematic we should perhaps first address the time-honoured question: What is Cinema? Indeed, the answer to this question remains as elusive today as it was in 1958 when it was used for the title of a collection of essays (*Que-est-ce que le Ciném-a?*) by the then recently deceased film theorist and critic André Bazin. For Bazin the cinema was a system of total representation of mythical proportions. Indeed it was his contention that the very idea of cinema existed well before its invention and that its development was guided by an insuppressible human drive to reproduce reality with greater and greater fidelity. In his words: "Every new development added to the cinema must, paradoxically, take it nearer and nearer to its origins. In short, cinema has not yet been invented!" [2]

For all Bazin's insight and lasting influence his ideas are inescapably tied to a particular technological and historical epoch. They were born to an age of cinema spectatorship that required moving images to be displayed and viewed under strict architectural and perceptual conditions. These were conditions that de-

manded that one must visit a movie theatre to fall under the spell of moving images. This classical model of cinema spectatorship is now but a mere strand of the multiplicity of ways we engage and are engaged by moving images. Rather, we must consider the ways in which Bazin's total system of cinema is renegotiated and redefined by forces arising from the conditions of ubiquity, instantaneity and malleability that are the hallmarks of the digital era. As J.Hoberman recently observed "Bazin had imagined cinema as the objective "recreation of the world". Yet digital image-making precludes the necessity of having the world, or even a really existing subject, before the camera – let alone the need for a camera." [3] As tellingly simple as it is, Hoberman's observation reveals the impact the very condition of "digitalness" has had on notions of the cinematic. However, it is not only production that is re-negotiated but also distribution and reception, as the very appearance of the spectacular undergoes a process of constant reconfiguration.

At this point I should note that not all the twenty-seven works included in *Re:Cinema* are immediately recognisable as "cinematic", at least not in the common sense of the term. As an adjective, cinematic is often and seemingly indiscriminately applied to a range of contemporary visual productions; from advertising photography to graphic novels. Its use denotes an affinity to the narrative and spectacular forms of classical cinema, and as such is bound to an idea of the cinema that is historically defined and conceptually ossified. While the twin motors of spectacle and narrative are certainly present in many of the works I have included in the *Re:Cinema* project, I would argue that the idea of the cinematic can admit a much wider range of formal strategies and effects; approaches that do not simply reinforce a particular historically prescribed understanding of the cinema but rather engage the splintered shards of cinema that are embedded in the ever expanding field of technologies and relations that the digital engenders.

Within the *Re:Cinema* exhibition this idea of the cinematic as a point of engagement is overt in the case of some works. In others its presence is like that of a trace element that none-the-less directly informs the formal and conceptual constituency of the artwork. I offer a brief inventory of these 'cinematic' traces by way of orientation:

spectacle/hallucination
spectatorship/participation
projection/light
materiality/immateriality
medium/genre
narrative/performance
document/fiction

In each case I have sought to present these traces as pairs, not to set up binaries but to hint towards the unstable and fluid nature of the cinematic in the contemporary moment. In doing this I acknowledge those often vertiginous and undetectable moments when spectacle becomes hallucination, where the real collapses into its own image.

Indeed, such is the sheer fluidity of forms and effects that the moving image now engenders that one could just as easily recombine these pairs to effectively map its efficacy. For example the intimate relationship between document/performance established by filmmakers like Errol Morris and Werner Herzog has in recent times been pushed to astonishing ends in films like Joshua Oppenheimer's *The Act of Killing* [4] where the performative acts as both an enabler and generator of the revelations of the document.

It is this very space between performance and document that a number of works included in *Re:Cinema* interrogate. In each case the moving image is employed not merely to document a performance but also as an element that is integral to its realisation in actual and represented form. It is a cinematic logic that ultimately informs these works: without the over-riding imperative of disclosure through representation there would be no performative act. In Robert Hickerson's *Debasement Triptych* (2012) the artist directs his divorced and estranged parents through a range of performative tasks that were designed to explore and question their relationship as members of a family. However, what is played out in these performances owes little, if nothing, to traditions of cathartic expression. Rather we are made acutely aware of the status of these troubled relations as a type of representational impasse; a series of interpersonal exchanges that are wholly directed and enacted for the benefit of the camera. The work is infused with a representational logic that simultaneously rests upon the realness of the characters portrayed and the artifice of the situation they are placed in. It is logic that lies at the heart of cinematic illusion and the tension between performance and document that exists at all levels of produc-

Fig. 2. Robert Hickerson, Debasement Triptych, production still, digital video, 5 min 12 sec, 2012. (©Robert Hickerson)

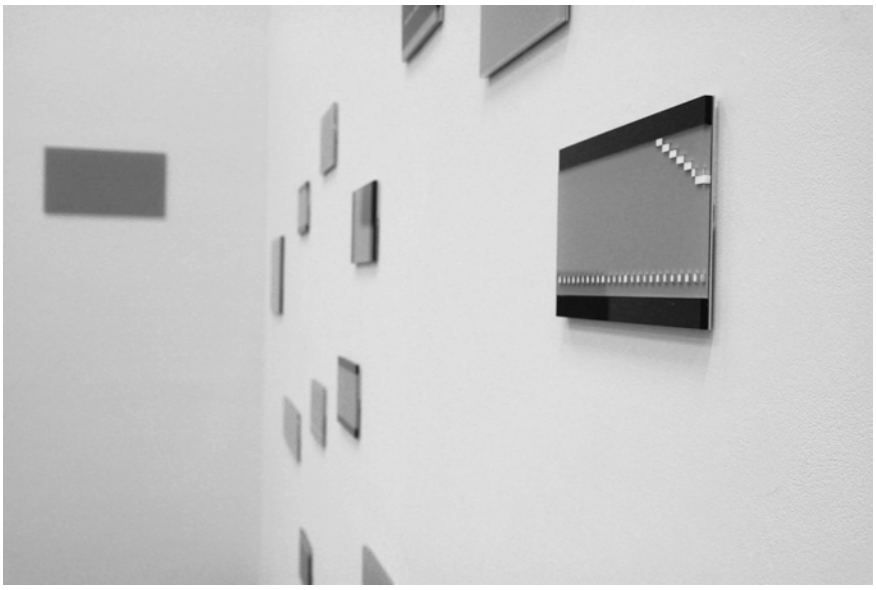

Fig. 3. Salvatore Panatteri, Chroma Key Red.
Untitled [CKR 01-03] Plexi Glass / Acrylic, Chroma-Key Red, Aluminium.16:9 aspect, each measuring approx. 33.6 x 59.7 cm. 2013.
Untitled [CKR 01-16] Plexi Glass / Acrylic, Chroma-Key Red, Aluminium.16:9 aspect, each measuring approx.16.75 x 29.8 cm. 2013
(© Salvatore Panatteri. Photo © Ryszard Dabek**.**

tion regardless of genre. As Jean Luc Godard observed of the actors' performance: "I just want them to be in a situation which is not a real situation for them – a fiction situation – but I want them to be in this fiction exactly as they would be in life". [5]

Indeed it can be asserted that this idea of "cinematic performance" persists as a point of engagement across a range of ubiquitous (mobile devices/ YouTube) and rarefied forms (video-art) of the moving image. However, as I have shown, it is one of many points of engagement for artists working with or through the cinematic. Traces of the ematic can be detected in a wide range of secondary forms that engage different pictorial orders or are materialised through ways and means other than the moving image. In the same way that the still images of advertising can be read through the lens of the cinematic meaning so too can a range of artistic practices traditionally tied to the formal concerns of painting and sculpture be seen to be infected by this elemental cinematic trace. Within the exhibition *Re:Cinema* I have sought to include a number of works that engage the language and concerns of minimalism. In each case the presence of the cinematic comes a complicating and problematising force.

For the industrially produced acrylic/aluminium wall works of Salvatore Panatteri the cinematic is both a formal pre-condition and a point of pictorial ground zero. Using a series of dimensional constraints based on cinema aspect ratios (1.33, 1.78 etc.) Panatteri plays out a system of minimalist abstraction that at once references the history of the moving image and alludes to its sheer ubiquity. That he chooses to do this in Chroma Key Red further implicates the digital in this state of ever-multiplying pictorial abundance. Here is the image before the image, the starting point of the re-composition and reconstitution that has become the modus operandi of contemporary moving image production. Only the odd stray glitch of simulated pixels upsets the perfection.

A similar rejection of iconography marks the work of Berlin-based Australian artist Jai McKenzie. In her *Space Oddity* (2012), Mckenzie projects a slowly-morphing colour field through a hand woven net onto the wall behind it. The resulting work has a visual effect that is as ephemeral as it is materially tangible. The gridded presence of the net makes explicit the structured nature of our very gaze and the often-transparent apparatus of cinematic projection. As one approaches the net it becomes more difficult to behold as its form enters into a visual confusion with its shadow on the wall directly behind it. Through this deceptively simple arrangement the work implicates both the viewer and the cinematic apparatus in an irresolvable play of appearances. I am reminded of Sean Cubitt's discussion of Erwin Panofsky's writings on perspective. Here, Cubitt contends that for Panofsky the very conditions of perspectival representation enable the "perceiving self" to externalize its "visual perception as a field" that invariably activates "the irruption of strangeness into consciousness"[6]. For Cubitt this process goes some way to explaining the inherent strangeness of realist cinema, the gap between the viewer and the world as represented. It is this very gap between seeing and representation that McKenzie's work so astutely traverses.

Up to this point my discussion has been primarily concerned with examining the ways that artists have engaged the visual and conceptual mechanics of cinematic experience. By doing this I have sought to show how a range of techniques and material responses have

Fig. 4. Jai McKenzie, *Space Oddity*, metal tubing, cotton rope, video projection. 200 x 300 cm, 2012. (©Jai McKenzie. Photo © Ryszard Dabek.)

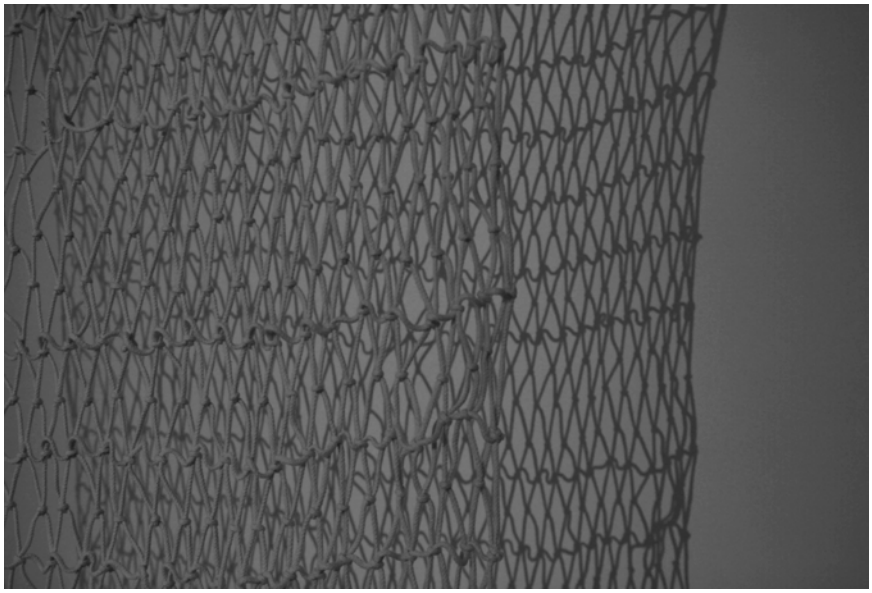

Fig. 5. **Clare Ferra, *Love Oscillation,* production still, digital video, 7 min 50 sec, 2012. (©Clare Ferra.)**

been employed by contemporary practitioners to work through what I have termed the splintered shards of the cinematic. In each case these shards (montage, performance, projection etc.) have acted as points of engagement that set in train varyingly complex propositions regarding subjectivity and representation. Each artist intrinsically understands that the moving image is now defined as much by fragmentation, ubiquity and volatility as by the relatively stable formal and ontological parameters of historical cinema.

But what becomes of the image under this ever morphing and multiplying economy of representation? If, as I have contended, the cinematic in the contemporary sense is a fragmented and pervasive presence, how do we approach the image and its relationship to both time and movement? As we survey the mediascape and the dizzying array of content and delivery mediums that constitute the field of the moving image, it is resoundingly apparent that no singular approach can account for the multiplicity of operations at play. However, what we can do is attempt to consider the image and its attendant poetics as being in a state of play with the very conditions of its production.

Indeed, the very idea of playing the medium against itself has in many ways become a defining strategy of the age. Here I am thinking of the rise of the mashup as a dominant mode of cultural production and the endless stream of remixes, redos and remakes that make YouTube the participatory force it is today. It is mode of production, that under the networked conditions of video sharing platforms, replaces accepted notions of authorship with an aesthetic of the "unfinished"[7] that simultaneously acts as homage and critique. It is a strategy that draws the image into a play not only with the medium, but also with its own system of poetics.

The video work *Love Oscillation* (2012) by Clare Ferra included in *Re:Cinema* consists of moving imagery that has been intensively reworked and reimagined. The original footage, which pictures extended moments of ecstatic pleasure/performance was sourced from lo-res pornographic videos gleaned from the internet. Like all camera-based imagery there is a surprising resilience to this source material. Processes of layering and data corruption at once liquefy and reinstate the authority of these images. Through these processes Ferra infuses her base source materials with a sense of temporal and pictorial suspension. In *Love Oscillation* the image is constantly on the threshold of unbecoming, falling apart under the sheer weight of representation and the stresses of its digital volatility.

It is this process of oscillation between representation and abstraction, animation and stasis that is key to understanding the poetic possibilities of Ferra's work and its ability to generate affect. As Steven Shaviro contends: "Films and music videos, like other media works, are machines for generating affect and for capitalising upon, or extracting value from this affect." [8]

In a very real sense the artist's role is increasingly one of finding ways to generate and amplify affect from the fragmented mediascape that endlessly unfolds before them. As Brian Massumi has observed: "There seems to be a growing feeling within media, literary and art theory that affect is central to an understanding of our information - and image - based late capitalist culture, in which so-called master narratives are perceived to have foundered." [9]

If we are to consider Cinema itself as a master narrative that has not so much foundered but has replicated and fragmented then the function of *Re:Cinema* as an exhibition that tracks this movement is especially timely. As I have argued the moving image is increasingly defined by its sheer multiplicity and potential instability. As an exhibition project *Re:Cinema* seeks to not only pay witness to this contemporary phenomena but also signpost the often pervading sense of irrationality and new, barely graspable forms of affect that are generated through this new post-cinematic mediascape.

References and Notes

1. The website for the Re:Cinema project can be accessed at: http://www.recinema.net

2. André Bazin, "The Myth of Total Cinema" in *What Is Cinema? Vol. 1,* Hugh Gray trans. (Berkeley, CA: University of California Press,1967) p21.

3. J.Hoberman, Film After Film (London, U.K.: Verso, 2012) p4.

4. Joshua Oppenheimer, *The Act of Killing* (2013), film.

5. Jean-Luc Godard, "Jean-Luc Godard: No Difference between Life and Cinema" an interview with Gene Youngblood 1968, in David Sterritt ed., *Jean-Luc Godard Interviews* (Jackson, University Press of Mississippi) p32.

6. Sean Cubitt, *The Cinema Effect* (Cambridge, Massachusetts, 2004) pp 140-1.

7. Here I am referring to the essentially unfinished state of digital products as discussed in Peter Lunenfeld's essay "Unfinished Business." Peter Lunenfeld, "Unfinished Business" in *The Digital Dialectic*, Peter Lunenefeld ed. (MIT Press, Massachusetts, 2000) pp 6-23.

8. Steven Shaviro, *Post Cinematic Affect* (Winchester, Zero Books, 2010) pp 2-3.

9. Brian Massumi, *Parables for the Virtual* (Durham, Duke University Press, 2002) p 27.

MIRRORING SHERRY TURKLE: A DISCUSSION ON AUTHENTICITY, HUMANITY AND TECHNOLOGY.

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"We expect more from technology and less from each other… Technology appeals to us most where we are most vulnerable.. "[1]

Abstract

This paper expresses a reflective approach to the themes and issues surrounding Sherry Turkle's new book, Alone Together: Why We Expect More from Technology and Less from Each Other. This can be seen as the culmination of a trilogy of books concerned with human and computer relations and its implications for identity and psychology (The Second Self, 1984 and Life On the Screen, 1995). Turkle argues that, having already filtered companionship and relations through machines, we are now facing our own "robotic moment". Real life interactions with flesh and blood people are becoming onerous and too stressful and untidy. Instead, we prefer to organise them through digital interfaces and ultimately even replace them with technological alternatives. In response to Turkle's questions, we speculate: are we changing what it means to be human? Have we become over-reliant on technology to mediate human relations? Does social networking encourage us to become narcissistic and to regard others as merely problems to be managed, resources to be exploited? And do we, the creative community, have some responsibility in considering these ethical dilemmas and making technologies that respond to these questions? Juxtaposed with Turkle's insights is a commentary on the work of the neuroscientist Susan Greenfield. Her research on the neuroscience of identity offers a biological interpretation of how the brain adapts to environment which suggests that Turkle's question of what it means to be human is complexified further by unprecedented changes to identity itself.

Key words: alone together, dystopia, speculative futures, authenticity, robotics, electronic textiles and technological based arts, digital: identity; heritage; death, and visual arts.

Introduction to Human Computer Relations

Sherry Turkle published *The Second Self: Computers and the Human Spirit* in 1984 where she observed the changing relationship between people and technology, particularly computers. At the time she questioned the affect these new technologies are having on our lives, relationships and cognition. This is a theme that still runs through all of Turkle's work as she analyses the changing role and social positioning of technology and human beings over time. In 1984 Turkle was already questioning whether 'machines' were truly an extension of their users or whether they were something 'other'. She defined machines as something 'other' if they imposed their own rhythm, pace and rules onto the person using them. In this case, Turkle observed, rather then humans simply using computers to extend their physical capabilities, as was previously the case with tools, the computer actually affected human cognition [2]. Through sustained interaction computers have successfully altered our pace, rhythm and sense of self. As society becomes more complex we develop new technologies to cope with our current situation, assuming that this will make things easier. However by developing new technologies we are inevitably changing the most fundamental of human principles: our conception of self, our relationships to others and our understanding and practice of love and death.

In Turkle's most recent book *Alone Together: Why We Expect More from Technology and Less from Each Other* [3] she considers how technology affects the younger generation's definition of life, death and authenticity. She suggests that the mid-1990s saw a turning point for her research. She described two key developments, the first being the 'fully networked life' in which we are infinitely connected to anyone from anywhere, and the second being the robotics movement. Turkle argues that what connects these two seemingly disparate topics is our reduced need for authenticity, especially within the younger generation. Turkle even documents cases where some children begin to preference their robotic pet over their current organic ones. When asked why, they simply state 'they are easier to care for and don't die' [4].

Perhaps we should consider the fact that although this may seem an obvious reaction to things that make us uncomfortable, we must consider what roles 'loss and forgetting'[5] play within society and be very careful of attempting to erase the very aspects of randomness that also make life, people and relationships interesting, spontaneous and metamorphic.

Brave New World

Having asked what may be lost through the continual development of the computational technologies without a critical examination of the ethics posed by these new systems, this section aims to map out in greater depth the "future" fictions and narratives surrounding the current tableau of digital human relations.

In literature which represents fictional societies, a number of novels portray ideas, characters and scenarios of future relations with technology. This is the case, for example, in George Orwell's *Nineteen Eighty-Four*, Aldous Huxley's *Brave New World*, Ray Bradbury's *Fahrenheit 451*, or Margaret Atwood's *The Handmaid's Tale*. The editor of an anthology based upon Ira Levin's short story fiction *This Perfect Day*, Jeremy V. Pitt [6], makes the point that Science Fiction, as an extrapolation into the future, is often rooted in the fears of its own present:

"Tomorrow's world is a place where computers rule, where monthly treatments keep people docile, where sex is programmed weekly, and where death occurs at the age of sixty-two in the interest of efficiency (...)"[7].

This Perfect Day, published in 1970, imagined a (supposedly) utopian global society governed by a single computer. At the time the novel was considered to be one of the great dystopian thrillers ever written—alongside Aldous Huxley's *Brave New World* (1932). In his introduction to Levin's story in the anthology *This Pervasive Day, The Potential and Perils of Pervasive Computing*, Pitt notes that "in common with other science fiction novels of the time, [it] avoided apocalyptic nuclear conflict but touched a number of socio-technical nerves (or aspirations) of the time"[8].

We may debate whether or not the social, political, and/or technological developments surrounding pervasive computing may render Levin's social vision plausible. Beyond that one may also ask whether it is feasible to build and program a computer to fulfill the functionality attributed to it in Levin's book. What, then, is the potential — and what are the perils — of the necessary computing and communications technology for the actual human society as we experience it in the twenty-first century, from social, legal, ethical, political, and/or economic viewpoints? Cultural critics such as Karen Barad [9], Lucy Suchman [10], and Donna Haraway [11] know how technology is taken up in, and

influences, broader culture, as well as how cultural background can encourage the development of certain forms of technology and utopian discourse at the expense of other arguments and positions.

Technological Provocations

Susan Greenfield is a neuroscientist who wonders what the brain will physically look like in future generations. As articulated in her book *iD : The Quest for Identity in the 21st Century*, her central anxieties are that galloping technological advances, and the social changes that they bring, will not only transform our sense of who and what we are, but might alter our identity to the point where we may no longer have the capacity to be fully developed persons [12]. Her prediction is that interaction with technology, from mobile phones to video games, might produce a brain as a first-person perspective of identity that is stuck in what she terms "infancy immediacy". Twenty-first-century technologies may bend our brains, and hence erode our identities, she argues, but in ways previous generations could not have envisaged. However none of the interesting questions about subjective identity and objective identification are explored in *iD : The Quest for Identity in the 21st Century* [13].

Greenfield argues that sensation has replaced cognition, process has replaced content and movement has replaced thought. In response to a question on a BBC Radio 3, Nightwaves BBC programme [14], about how interaction with technology is responsible for this, Greenfield took up the theme of ecstasy, which in Greek means 'to stand outside of yourself'. Greenfield drew upon this theme in order to explore the tension between, on the one hand, letting go and, on the other, achieving things and having a little niche, a personal identity, a brick in the wall. Anxiety over the stripping of cognitive content in the wake of rave music venues where flashing lights and sweaty bodies, loud music and abstract patterns propels Greenfield's concerns. She further argues that the brain connections get meshed up and consequently sensory overload, in the moment, will give rise to a schizophrenia of the perpetual present. But Greenfield's point is that when individuals let themselves "go the focus is on the here and now, it's the sensation that matters."

Greenfield fears that a child habituated to a "strong sensationalist present" will become addicted to thrill-bombardment, and that, instead of becoming Someone, the future human brain will remain No One – a collection of "inputs", which is perhaps a rather gloomy view and rooted in the fears of the present. Following this line of thinking, cyberspace kids and teenagers, blitzed with information from anywhere and everywhere, may never acquire the capacity to see things in context; they may never get beyond the stage of "taking the world at face value". Does Greenfield reduce humanity to the "physicochemical context of the brain itself"?

Greenfield is in agreement with other leading neuroscientists. "You are your brain", said Nobel prizewinner Eric Kandel; "You are nothing but a bunch of neurons", wrote Francis Crick, one of the co-discoverers of the structure of the DNA molecule in 1953. The problem with this reductionism is that it equates a part with the whole andeschews much of the complexity of thinking. The brain is not a problem-solving machine but an evolved organ adapted to enhance the survival changes of the organisms they inhabit. How does our brain assess current situations? How does it compare them with past experiences? How are appropriate actions generated? It is this evolutionary imperative that has resulted in our large and complex brains. We don't have a comprehensive brain theory that lets us bridge the gaps between molecules, cells and systems to enable us to begin to answer the questions: how do we experience and how do we remember what we wore when we were 4 years old? What images and sounds are meaningful to us over our lifetimes? These get confused according to the stories we want to tell about ourselves. It is possible to stimulate particular brain regions to evoke sensations, memories, even emotions, but does this mean that a particularly memory can be located in that region or is it that the activity in that region is a correlate to the memory? The best anyone can do, in Greenfield's view, is match up "biochemical processes with reports of how people feel". We all have the hunch that incessant escape to cyberspace (youngsters are in front of screens six hours a day on average in the UK which correlates to some of Turkle's findings in the USA) must be having a bad effect. In *iD : The Quest for Identity in the 21st Century*, Greenfield sets out to give this hunch respectable scientific backing. In summary, the implication of the book seems to be that when societies change, such as by developing new technologies, this must by extension alter the very physical make-up of the brain. In the chapter, "Twenty-First Century Thinking," Greenfield suggests that the decline of reading in favour of fragmentary encounters such a computer games or the internet, threatens the substance both of our neurological makeup and our social structures.

Turkle: Alone Together: Why We Expect More from Technology and Less from Each Other

Sherry Turkle thinks it may be necessary to learn about the limitations as well as what we can know about our behavior and the brain. Right now we think we can look into the brain and see what's happening and in her research she advises that our cognitive faculties decay as we enter the marketization of life, live in the schizophrenia of the perpetual present and skim distractedly from one webpage to another.

The argument in Turkle's *Alone Together: Why We Expect More from Technology and Less from Each Other*, unfolds in two halves. The first section deals with objects that imitate living things. Turkle's subjects, mostly children and the elderly, are given robot companions for varying lengths of time [15]. A bond is formed. Accordingly, the Furby – a fluffy, robot toy, which was popular in the late 1990s and looks part hamster and part owl and which is programmed to respond to human attention – exerts a hold over anyone who nurtures it for a few weeks.

Turkle reports that scientists developing the latest robots report feelings of pseudo-parental attachment. In Turkle's observations, the difference between playing with a doll and playing with a robot is the difference between pretence and belief. She argues that even when a replica behaves implausibly, we compensate, filling the gaps in its repertoire with imagined feelings. This is perhaps not the sensory overload that Greenfield is skeptical of, but rather a move from the "robotic moment" of "infancy immediacy," sweaty bodies and flashing lights, to Turkle's provocation of the "robotic moment" as companions are filtered through machines and robots are deployed in 'caring' roles. Children, she suggests, are no longer entertaining or nursing the elderly, filling gaps in the social fabric left where the threads of community have frayed.

Sherry Turkle has been called the "Margaret Mead of digital culture" in her

analysis of how young people navigate the emotional undercurrents in today's technological world [16]. As an anthropologist, Mead had been trained to think in terms of the interconnection of all aspects of human life so that the production of food cannot be separated from ritual and belief, and politics cannot be separated from childrearing or art. This holistic understanding of human adaptation allowed Mead to speak out on a very wide range of issues, and in particular the relationship between generations [17]. When she wrote of a global culture made possible by mass media, her words actually foresaw fundamental changes made by computer communication networks that were just beginning during the period in which she conducted her research. Mead believed that in the past culture was transmitted from an older to a younger generation through social rituals and an exploration of what might be shared experience in the process of full attention face to face. Turkle argues that new technologies – including e-mail messages, Facebook postings, Skype exchanges, role-playing games, Internet bulletin boards and robots – have broken this tie. The more networked and wired we are, the more seduced and addicted to an 'autistic' world we become, where we expect more from technology and less from each other. Turkle isn't just concerned with the problem of on-line identity, she is disquieted by the banalities of electronic interaction, as a younger generation of Americans' range of expression is constrained by gadgets and platforms, a networked life of loneliness and failed solitude. This implies an even greater separation between generations and cultures than ever before.

At this point, Greenfield's and Turkle's ideas come perversely close, though both are writing from different disciplines and from different sides of the Atlantic. In spite of Facebook and Twitter, our strongest social relationships still tend to be with those people we physically live near. Greenfield's core thesis is that one part of the brain may stimulate an apparently dissociated part in the creation of memories, attitudes and skills. If the brain is like anything, from a social point of view, it is like the distributed internet, not human relations which are enforced by our embodiment in the physical world. One of the most pervasive metaphors in neuroscience is that brains are like computers, whereas Greenfield sees brains as akin to society, and consequently, society's current social and technological troubles must even affect our neurons and synapses.

From Turkle's anxieties about teenagers constantly performing on the digital stage to incipient roboticism, the 'robotic moment' is not a point in history but a threshold in ethics. Ethical questions start to surface when we see robots as having subjectivity. Turkle is concerned about the way we set up such important social, ethical questions, "quandaries" she calls them, such as: "Do you want seniors lonely and bored, or do you want them engaged with a robotic companion?"

She wants to make sure we've considered moral issues not only when setting up a quandary, but also when responding to it. Turkle takes on this task by questioning how we think about our relationship with technology and therein lies the challenge posed by *Alone Together*.

Reconsidering our Relationship towards Technology

As a final provocation we move from focusing predominantly on the dystopic issues addressed within *Alone Together* to considering if they can provide an adaptive framework for the design of and creative engagement with contemporary technologies in ways that might also be affective. Such technologies may involve playing with complicated themes such as loss and forgetting from a creative perspective without trying to hide from or eradicate them.

In *Alone Together* Turkle argued that communication tools such as portable devices and, in general, the internet 'on the go' have created an escape window for people which didn't exist before. This gateway allows users to sidestep whatever reality they are in, creating new realities in their "virtual" world.

Turkle's presentation on TED California in 2012, *Connecting, but alone?*, presents the view that human beings, as users, have always been obsessed with finding new ways of communicating through various computational technologies. We cannot deny that there has been a rapid technological change that allows us - the users - to communicate through alternative ways. However what is not addressed in Turkle's writing is whether social networks or indeed robotics could be designed with these ethical stipulations and concerns in mind, both as speculative art works and as practice-based research [18] or interaction design [Mari Velonaki, panel discussion, ISEA).

As humans continue to develop new technologies and new interfaces that are interconnected within our lives, creating social networks, we might reflect on Marshall McLuhan's predictive statement from 1962 that "the next medium, whatever it is - it may be the extension of consciousness"[19].

We, as creatives and academics, conclude by suggesting that these statements are new challenges for us. As a community we have a changing responsibility that places us at the core of how we might shape our brains and relationships to technology and other people, developing new strategies and ethics to comprehend and interact with contemporary technologies - guided by some of the warnings and speculative futures discussed within Turkle's texts and Greenfield's metaphorical musings.

References and Notes

1. Sherry Turkle: Connected, but alone? | Video on TED.com. [ONLINE] Available at:http://www.ted.com/talks/sherry_turkle_alone_together.html. [Accessed 30 June 2013].

2, Sherry Turkle, 2005. *The Second Self: Computers and the Human Spirit. Twentieth Anniversary Edition Edition*. The MIT Press.

3. Turkle, S. 2011. *Alone Together: Why We Expect More from Technology and Less from Each Other*, Basic Books.

4. Terasem Movement Foundation: Welcome to the TMF, Inc.. 2013. Terasem Movement Foundation: Welcome to the TMF, Inc.. [ONLINE] Available at:http://www.terasemmovementfoundation.com. [Accessed 30 June 2013]

5. Viktor Mayer-Schönberger 2011. *Delete: The Virtue of Forgetting in the Digital Age*, (New in Paper). Edition. Princeton University Press.

6. Introduction to *This Pervasive Day, The Potential and Perils of Pervasive Computing*, ed. Jeremy V.Pitt, London:ImperialCollegePress,2012.

7. Pitt [6] p.1

8. Pitt [6].

9. For this analysis see Suchman (2007) and Barad, K. (2003). "Posthumanist performativity: Toward an understanding of how matter comes to matter", *Signs: Journal of Women in Culture and Society*, 28, 3, pp. 801–831.

10. Suchman, L. (2007). *Human-Machine Reconfigurations: Plans and Situated Actions* (Cambridge University Press).

11. Haraway, D. (1991). A cyborg manifesto: Science, technology, and socialist- feminism in the late twentieth century, in Simians, Cyborgs and Women *The Reinvention of Nature* (Routledge), pp. 149–181.

12. Greenfield, S. (2008). *iD: The Quest for Identity in the 21st Century* (Spectre).

13. Murray. J (1988), "Hamlet on the Holodeck: The Future of Narrative in Cyberspace",(MIT Press). [197:273] and see Suchman (2007) and Barad, K. (2003). "Posthumanist performativity: Toward an understanding of how matter comes to matter", *Signs: Journal of Women in Culture and Society*, 28, 3, pp. 801–831.

14. BBC (2008). Nightwaves, BBC Radio 3, http://www.bbc.co.uk/programmes/ b00b8gxt and Daily, S. (2008). Smart clothes: Textiles that track your health, http://www. sciencedaily.com/releases/2008/03/080329121141.htm.

15. Turkle [3].

16. Mead, M. (1978). *Culture and Commitment: The New Relationships Between the Generations in the 1970s,* Garden City, NY, England: Anchor Press/Doubleday

17. Mead [16] p. 1.

18. James, W. (2003). *Essays in Radical Empiricism, London:* Dover Publications, p. 37.

19. Marshall McLuhan, 1962. *The Gutenberg Galaxy: The Making of Typographic Man. 1 Edition.* University of Toronto Press, Scholarly Publishing Division.

ALL THE WORLD'S A SCREEN

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Abstract

Charlotte Gould and Paul Sermon developed and presented this collaborative new artwork entitled *All the World's a Screen*, a live interactive telecommunications performance, to link public audiences in Manchester and Barcelona. On the evening of Saturday 28th May 2011 participants at MadLab in Manchester's Northern Quarter and Hangar Artist Studios in Poblenou, Barcelona were joined together on screen for the first time to create their very own interactive generative cinema experience, complete with sets, costumes and props. Employing the scenography techniques of Alfred Hitchcock the artists created a miniature film set in which the remote audiences acted and directed their own movie, transporting participants into animated environments and sets where they created unique personalised narratives.

Keywords: Ludics, community, embodiment, telematics, open-systems, telepresence, intervention.

Introduction

Hinting at Shakespeare's assertion that all the world's a stage in his play "As You Like It", this telematic installation entitled *All the World's a Screen* linked audience members at Hangar Artist Studios, a creative arts and media exhibition space in Poblenou, Barcelona with participants at MadLab, a community arts and science lab in Manchester's Northern Quarter; attracting the broadest possible audience to encounter an interactive art project occurring in a wider cultural and public context.

The installation connection was set up as follows. Both the Manchester and Barcelona venues had a chroma-key blue back drop screen and floor installed in their respective exhibition spaces, together with two video monitors, one facing the Blue screen from the front and another from the side (stage-left in Barcelona and stage-right in Manchester). Above the monitor facing the screen was a camera, approximately 2.5 meters from the ground. The two geographically remote installations looked identical. However, much of the technical system was located in Barcelona, where the camera image of a person standing in front of the blue backdrop was fed to a video chroma-key mixer, which replaced the blue area with an image from a MacBook Pro that contained a choice of seven video backgrounds. This part of the installation was referred to as "The seven stages of man" and will be explained in further detail later. The output from the mixer was then passed to a second video chroma-key mixer together with the live incoming videoconference image of a person in front of the other blue screen in Manchester. The final combined image of the participants in Manchester and Barcelona, positioned on the background scene from the MacBook Pro, was then sent directly to the two video monitors around the blue screen in Barcelona and back via the HD Videoconference system to the monitors in Manchester.

Between 4pm and 6pm on the 28th May 2011 the MadLab audience in Manchester joined participants at Hangar in Poblenou, bringing together a mix of eccentric players, creative interventions and surreal improvised performances in spontaneous interactive moments of hilarity, emotional exchanges and thought provoking dialogues. Whilst audience members in Barcelona had the opportunity to construct sets and edit scenes, participants at MadLab in Manchester replied with improvised props and costumes to provoke a juxtaposed montage of impromptu performances and dialogues.

The seven stages of man

Members of the audience in Barcelona were able to decide on the context of this interactive telematic performance by using an iPhone app to select between seven different background sets, which consisted of live webcams scenes and animated environments. The participants in Barcelona could then stand in front of the chroma-key blue screen and position themselves within these stage sets to join the 'players' in Manchester within the dramaturgy of the model set as they journeyed through "The seven stages of man".

This specific part of *All the World's a*

Fig. 1. "All the World's a Screen" at the Museu d'Art Contemporani de Barcelona MACBA Study Centre, May 2011 (© P. Sermon and C. Gould)

Screen offered audiences the opportunity to create the narrative and dramaturgy of the complete installation. "The seven stages of man" consisted of a one-metre square table top 1:25 scale model of a house that included seven ground floor rooms connected by doorways and corridors. Audience members were invited to place a hand directly into any of the rooms in the model to arrange the sets and interact with participants. Four of the rooms contained web cams that were connected to a MacBook Pro via a USB hub. Using custom made software built with Quartz Composer, the MacBook Pro could display a full screen output from up to seven different video sources, which included the four web cams as well as three QuickTime movie animation files. When a participant pressed a key (1 to 7) on an iPhone keyboard App the video output displayed the selected video stream until another key was pressed. The selected video scene then provided the backdrop to the *All the World's a Screen* telematic performance.

Urban Interventions

All the World's a Screen was developed as a practice-based research project to pose the following questions: Can playful environments and ludic interfaces offer opportunities to learn and resolve issues? Can we develop an interactive environment that offers opportunities for the audience to be creative and make real choices? Can the audience use technology as a release, to daydream, or to play, raising awareness and informing us about everyday life? Edward Shanken and Kristine Stiles [1] argue that interactivity per se does not automatically produce works that offer a creative voice, a dynamic role or 'agency'. They suggest that these possibilities can be limited/foreclosed when the artwork is driven by a technical development or commercial requirements, and when artworks do not offer real choice or opportunity for creativity. First and foremost *All the World's a Screen* strove to address these questions whilst remaining mindful of the position posed by Shanken and Stiles et al. This open-system approach to interactivity is a fundamental underpinning of the concept and development of the project.

The locations and associated communities within which the installation took place were also a key focus of the research, and we were able to investigate how the communities responded and interacted with each other. *All the World's a Screen* took place in two similar environments, with a comparable history. "Hangar" is a converted textile mill in Barcelona, and "MadLab" is housed in a building that was previously a retail space in Manchester. This change of use from industrial to creative spaces is a common feature of Manchester and Pobleneu. This textiles heritage connection is also why Pobleneu is referred to locally as Barcelona's Manchester.

The project linked two unique environments with similar attributes; both were media lab spaces that attract a local artistic community and maintain open access to the public. It was interesting to see these artistic and technical communities as well as their associated audiences engaging with each other, and the way that external influences affected the dynamic of the group. This live telematic performance was presented at Hangar as part of their open studio season, which involved inviting local residents to explore and experience artworks and installations from both local and visiting artists. The event also involved live music and coincidentally a screening of the European Championship football final between Barcelona FC and Manchester United, which attracted a unexpected audience and provided further interesting material, both for us as artists to present as part of the set and for the audience as a subject for engagement. *All the world's a Screen* was designed specifically for a studio environment, with its blue screen and model set. The audience members in Barcelona were encouraged to put their hands inside the model and play, move objects and furniture around, and thus have a direct impact on the set itself. Through their playful engagement they were able to develop a filmic montage, edited through the choice of cameras, scenes and action in order to create their own cinematic narrative experience.

An important part of the development process of the piece was our engagement with the environment in Barcelona in order to find inspiration for the development of the set. In this way we provided a framework from which the two communities could engage and develop a dialogue. Grant H. Kester [2] questions the value of the artist as "expert" who imposes their views on communities, seeing this approach as patronizing. He argues that communities should be involved in the art works themselves in a proactive way. *All the World's a Screen* offered a framework from which the audience could literally use their voice, participate in role-play, and proactively create this narrative. Lucy Lippard [3] talks about the importance of the role of the artist in raising awareness around issues, to dissipate preconceptions, question conventions and foster dialogue. The Manchester and Barcelona audiences were representative of a broad cross-section of the local community and they responded not only to the environment but also to each other and were encouraged to improvise with props and costumes that were provided. There were numerous visitors for whom this was not a planned activity, who stumbled upon the work while just passing through. Consequently, those who engaged with the work were not always the traditional art gallery audience, which added to the mix of participants and to the richness of the responses.

Ludics: The Importance Play

During the initial concept development phase we decided that it was very important to recognize that while the installation took place outside a traditional gallery setting, the signifiers were clear that this was not a reality but a fictitious space in which it was 'permitted' and safe to play. We wanted therefore to use references to the stage or set. Pioneering performance artist Allan Kaprow aimed to make "the line between art and life as fluid and perhaps as indistinct as possible" through "Happening" events. Shanken and Stiles [4] warn of the risks that this can trigger, citing an event where one of the performers who suffered an injury was ignored by the audience who thought the accident was part of the act. They argue that Kaprow himself rejected the "Happenings" movement after ten years as he said that audiences were not ready for the creative act of co-creating artworks.

The suggestion might be made that it is important for audiences to distinguish between art and life in order to give them a license to play, not as themselves but in a role. With this in mind, the set or the stage reference in *All the World's a Screen* worked as a trigger for the audience that they could engage in dialogues from the bizarre to the insightful and be uninhibited in the knowledge that they were on screen in a role rather than as themselves. The project's reference to the theatre was also intended to encourage an audience to play. Many of the early modernist art movements were interested in the connection between art and the theatre and opportunities this provided to engage with a proactive audience. For example Filippo Tommaso

Marinetti in the manifesto "Variety Theatre" commented:

"The Variety Theatre is alone in seeking audience's collaboration. It doesn't remain static like a stupid voyeur, but joins noisily in the action, in the singing, accompanying the orchestra, communicating with the actors in bizarre dialogues." [5].

Fluxus, which often took place in stage-like venues and staged "Happenings", took art events out of the traditional gallery and onto the streets, generating a sense of theatre and interplay between audience and performer. Many of the Fluxus Happenings prepared their audiences with scripts or instructions and in this way they asserted the artists' authority over the piece. Sonka Dinkla argues that "Participation is located along a fragile border between emancipatory art and manipulation. The decisive act in judging the situation is how active the unprepared viewer becomes within a certain framework of action and without specific instructions." [6].

Sonka Dinkla suggests there is a fine line in the relationship of control and freedom between user and artist. Cassells argues that this power imbalance should be redressed, highlighting the importance of empowering the audience, and the need to "focus on the experiential, everyday lived experiences of individuals, emphasise collaboration, and attempt to promote the distribution of authority" [7]. Sharon Daniel argues that artworks should offer the opportunity for "self articulation and self- representation" to bring the disenfranchised back to "its particularity, identity, subjectivity, political agency, and power of choice" [8]. This aligns with Slavoj Zizek's ideas that we should not impose our world-view or preconceptions on others, but instead offer a framework whereby the audience can represent themselves [9]. This idea of self representation is explored by Grant Kestler who argues that artistic practice can be used to promote change, offering a voice to the 'other' in a socially inclusive way irrespective of alternative world-views [10].

This installation is an open system where the audience can take the narrative in any direction they choose, but as artists we offer a framework from which to respond. The *title All the World's a Screen* is a direct reference to Shakespeare's "As You Like It", which suggests we are all merely actors playing roles as if on a stage, and the "seven ages of man" refer to different life stages which we all recognise and will experience throughout our lives. In "The seven stages of man" each room represents the different life stages of 'infancy', 'schoolboy/childhood', 'lover', 'soldier/worker', 'justice', 'pantaloon' and 'second childishness'. Our environments were inspired by representing each life stage as a symbolic metaphor through the specific rooms and environments within the house, drawing on the metaphysical and psychological work of artist such as Louise Bourgeoise as well as Ilya and Emilia Kapakov.

Fig. 2. "All the World's a Screen" Audience participants at MadLab Manchester, May 2011. (© P. Sermon and C. Gould)

This is an opportunity for reflection on the themes and stages of life, but also provides a narrative for different ages to interact. At one point a couple in Manchester sat on the bluescreen set with their newborn baby and a participant in Barcelona responded by immediately selecting the infancy room to place the performers in context. Each individual brought their own ideas and experience to the project and were encouraged to improvise with their own props. One participant wearing a hat in the shape of a cat's head used this as part of his interaction, making it into a mask so that he became half cat half human. In this way the narrative is created through shared stories.

Richard Sennett [11] talks about the importance of role-play in society and he argues that the modern being's search for "true" or "authentic" character as a result of capitalism and secularization has led to a "crisis of public life" in the quest for the authentic self and the rise of the charismatic leader and performer. He argues that the twentieth century citizen has become polarized and isolated. From this perspective the constant search for self results in a narcissistic view of the world. Our search for the authentic self, alongside social mores around remaining silent in public, has resulted in a fear of revealing this private self in public. While social mores around silence in the company of strangers in the urban environment remain, in the twenty-first century we have seen the emergence of digital personas in culture through pervasive media. Scott McQuire argues that contrary to the Orwellian fear of a surveillance society, the global success of Big Brother evidences that we have embraced the webcam, projecting a public persona through social networking and reality television [12]. The focus of this television show was on the personality traits of the participants and personal interactions between them, and the dynamics that resulted under stressful conditions. These interest points demonstrate the continued focus in post-industrial society on the 'authentic character' and charismatic leader. Walter Benjamin writes of the shocking character of the industrial city of the nineteenth century, where strangers expect to pass and look into the faces of hundreds of people each day without speaking a word to each other [13]. Installations such as *All the World's a Screen* offer a platform for social interaction, referencing the

idea of a stage or television set, to encourage role-play and to give license to adults to play. Sennett talks about the changes that took place in the nineteenth century around the parameters of play for adults and children, and a division that started to emerge between acceptable adult and child play with delineated social space and the expectation that adults would not play with toys, for example. *All the world's a Screen* offered the opportunity to break with this convention, with children's toys making up part of the set.

All the World's a Screen further offers the opportunity to explore our digital persona and culture as a platform for role play, using social networking technologies such as the web cam and video conferencing to enable new ways of performing role play. The focus is on play, rather than on projecting a 'true' personality, which means the project potentially provides an alternative approach to social networking. Sennett argues that in pre-industrial society, this opportunity was offered by the theatre, where interaction between audiences and players was encouraged. Players and audience members were able to intermingle because seats could be brought on stage. He also points out that the audience responded in a way that would be considered embarrassing to a modern audience with emotional outbursts and raconteur.

Sennett also states "…in a period like the 18th Century, actor and stranger would be judged on the same terms, and what one could learn from the one in the domain of art, one could learn or apply to the other in the special domain of impersonal life. And therefore in a very real sense, art could be a teacher about life; the imaginative limits of a person's consciousness were expanded, just as in an age in which putting other on, posing, and the like seem morally inauthentic, these limits are contracted" [14].

All the World a Screen in this way aims to inform us about how we might find ways of engaging communities. It is an open system aimed at promoting interaction between communities using play. This open system offers participants the opportunity to undertake multiple roles and open dialogue, often relying on body language when language is not shared.

Conventions of play were being reassessed from the eighteenth century and in 1793, Friedrich Schiller, in a letter to his sponsor defined a new meaning for "play". He said that it could express the simplest to most complicated of ideas from"…the aesthetic state", "a state of the highest reality so far as the absence of all limits is concerned" where we can experience a "unity of human nature." [15]

Claus Pias [16] describes this as "…not about games (Spiele) but rather about play (Spiele), about a playful attitude." Jean Jacques Rousseau referred to play as an essential learning tool in *Émile, or On Education* [17] and Richards Sennett [18] reaffirms the importance of play for all ages for the maintenance of a functional and healthy society. It is notable that the German word for 'play' and 'game' is the same, 'spiele'. Hans Scheuerl [19] defines games as having five attributes; (i) "freedom", no goal outside it's self. (ii) "Infinitude" with no preconceived ending, (iii) "closeness of the game" the rules or defined area of play, (iv) "ambivalence", movement between rule and chance, serious and fun, impulse and cognition, immersion and reflection, (v) "virtuality", separate from "real life" and the self.

All the World's a Screen encompasses these attributes as defined by Scheuerl: it offers freedom, with no goal outside it self, it is an open system with no defined finish, there are rules in so far as a defined camera area, and the narrative can move between different states. It aims to encourage interaction through play, encouraging people who would otherwise never have met to interact, talk and role-play. Visitors have the opportunity to engage with both local communities and others globally and engage in "ludic" play. Through our practice based research we gathered data on the audience's response to the environment, and how the different representations of rooms and objects were used to develop stories. The data was gathered through filming the audience on the set. The way that the audience participates with interactive installations can be dependent on various factors and this is reaffirmed by various studies that found that audience interactivity depends on the emotional state of the user [20], and that levels of interaction are dependent on the personality of the user [21].

All the World's a Screen embraces this philosophy and aims to inform us about how we might find ways of engaging communities. It is an open system aimed at promoting interaction between communities using play. This open system offers participants the opportunity to undertake multiple roles and open dialogue, often relying on body language when language is not shared. Opportunities for open interactivity are key to *All the World's a Screen* and there were alternative ways for interacting with the piece at different levels of engagement. The participants in Barcelona had the option of either controlling the camera views and environments in the model set or being on the blue screen, interacting with the set or characters on screen. The audience could place their hand into to the set and on screen it would appear as if the "Hand of God" had intervened in the interaction [22].

Conclusion

Identifiable signifiers, such as the use of a stylized or unreal looking aesthetic or an obvious set, can indicate to the audience that this is something other than reality and potentially could give them a license to role play. They are not playing themselves and therefore they can feel uninhibited to engage. Through this project we were able to research alternative ways of using social media and networked culture, which avoid focusing on the self and instead look to role-play as a way of enhancing interaction between communities. In the large urban cityscape, interactive installations can offer opportunities for people to experience their environment in different ways: talking to strangers, responding creatively, and finding opportunities for autonomous decision making and self-representation. Such installations license people of all ages to play and explore communication in order to cross the boundaries that exist between people on the basis of culture and language. Through *All the Worlds a Screen* we explored the potential for triggering ideas for narrative through this open interactive system in order to identify new forms of engagement and interaction within a globally networked society.

References and Notes

1. Stiles, K. and Shanken, E. *Missing in Action Agency and Meaning* in Interactive Art, in Context Providers: Conditions of Meaning in Media Arts, (2011) (Eds) Lovejoy, M., Paul, C., Vesna, V., (Intellect, Bristol 2011)

2. Kester, G. H. *Conversation Pieces Community and Communication in Modern Art*, (University of California Press, Berkeley 2004)

3. Lippard, L. *The Lure of the Local: Senses of Place in a Multicentered Society*, (The New Press, NY 1997)

4. Stiles, K. and Shanken, E. [1]

Fig. 3. Hangar Studios in Poblenou, Barcelona May 2011 (© P. Sermon and C. Gould)

5. Marinetti, F. T. (1913) *The Variety Theatre*, reprinted, Twentieth Century Theatre: A Sourcebook, (Ed) Richard Drain, (Routledge, London 1995)

6. Dinkla, S. *From Participation to interaction toward the origin of interactive art* in Clicking In, Hot links to a Digital Culture (Ed) Lynn Hershmann Leeson, (Bay Press Seattle 1996)

7. Cassells, J. *Story Telling as a Nexus of change in the relationship between gender and technology* in Mortal Kombat: Gender and Computer Games, (Cambridge: MIT Press 1998)

8. Daniel, S. 2011 in Stiles, K. and Shanken, E. *Missing in Action Agency and Meaning* in Interactive Art, in Context Providers: Conditions of Meaning in Media Arts, (2011) (Eds) Lovejoy, M., Paul, C., Vesna, V., (Intellect, Bristol 2011)

9. Zizek, Slavoj. *Looking Awry: An introduction to Jacques Lacan through Popular Culture*, (Cambridge MIT Press 1991)

10. Kester, G. H. [2]

11. Sennett, R. *The Rise of Public Man*, (Faber and Faber London and Boston 1986)

12. McQuire, S. *The Media City: Media, Architecture and Urban Space*, (Sage Publications, London 2008)

13. Benjamin, W. (first published 1969) *Charles Baudelaire*, (Verso Classics 1997)

14. Sennett, R. [11]

15. Schiller, F. (1962) *Uber die asthetische Erziehung des Menschen, in einer Reine von Briefen* (On the Aesthetic Education of Man, in a Series of Letters), in Samtliche Werke, Vol 5 (Munich: Hanser) p607 in Claus Pits *The game Player's Duty Media Archaeology*, 2011, (Eds) Erkki Huhtamo and Jussi Parikka, University of California Press.

16. Pias, C. (2011) *The game Player's Duty*, in Media Archaeology, (Eds). Erkki Huhtamo and Jussi Parikka, University of California Press, Berkeley.

17. Rousseau, J. J. Émile, (1762) or On Education translated Alan Bloom, (1979) Basic Books USA.

18. Sennett, R. [11]

19. Scheuerl, H. (1965) *Das Spiel: Untersuchungen uber sein Wesen, seine padagogischenMoglichkeiten und Grenzen* 1954, 5, (Ed) Weinhiem et al, Betlz, referenced by Katja Karastek "Opus Ludens-Towards an Aesthetic of Interactivity in "Interface Cultures" (Eds) Christa Sommerer, Laurent Migonneau and Dorothee King, p153.

20. McCarthy, J., Wright, P. (2004) *Technology as Experience*, MIT Press: Cambridge, MA.

21. Huhtamo, E., Parikka, J. (Eds) *Media Archaeology*, (University of California Press, Berkeley 2011)

22. Brave, S., Nass C. (2012) *Emotion in computer interaction* in Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications (Ed) Julie A. Jacko, CRC Press.

Project Web Sites

http://alltheworldsascreen.tumblr.com/ (25/04/2013)

http://www.paulsermon.org/screen/ (25/04/2013)

POST-DIGITAL AESTHETICS AND THE FUNCTION OF PROCESS

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Abstract

The theorisation of post-digital aesthetics in music and sound art seems to be split in two contradictory directions. One direction emphasises the foregrounding of digital processes through the use of process-based procedures, while the other tends toward a neo-modernist, sound-in-itself tendency that would seek to obscure the role of process in the work. This paper argues for a re-evaluation of post-digital music and sound art practices from the perspective of non-subjective modes of composition and making, where aesthetic intentions are suspended.

Keywords: post-digital, aesthetics, audio, neo-modernism, sound-in-itself, music, non-intention, glitch

In the process of researching the notion of post-digital aesthetics for ISEA2013, Florian Kramer stumbled across my 2002 paper "Post-digital Aesthetics and the Return to Modernism," [1] and kindly asked me to participate in a panel discussion. Florian was curious to know how I would characterise post-digital aesthetics in 2013. While the phenomenon of post-digital aesthetics (at least in music) clearly lacks the momentum it had in the 1990s and early 2000s, there are still a substantial amount of creative practices that would fall into this category. In the 2002 essay I had taken an inside rather than an outside critical position, since I was (and still am) a great admirer of the work in this field. If anything has changed in my thinking it would be that I no longer believe that post-digital practices and conceptual art practices can come together (at least not in any simple way).

Post-digital Aesthetics: a recap

In 2002, in response to Kim Cascone's introduction of the term 'post-digital,' [2] I argued that (i) a post-digital aesthetics represented a reaction to digital transparency through the act of emphasising or 'foregrounding' the flaws in digital processes, and (ii) that such an aesthetic direction is often characterised by a reductive practice often verging towards a form of minimalism. In the 1990s we had already witnessed a reaction among musicians, and within the recording industry, against digital technology. This reaction took the form of a return to analogue technologies such as multi-track tape recorders and analogue synthesisers. Here, the impure 'warm' sound of analogue is favoured over the 'cold' clean sound of digital. However, it must be emphasised that the aesthetic characteristics of this move are decidedly analogue in character. The post-digital reaction, on the other hand, instead of retreating from digital technology, finds beauty in the flaws inherent in *digital* processes. Thus, as I argued in 2002, post-digital music has developed a distinctly 'digital' aesthetic. In its aesthetic sense, the term covers a plethora of practices ranging from 'glitch,' 'clicks & cuts,' 'microsound,' and minimal techno (in music) to glitch art, audio visual art (AV) and net.art. It is characterised by an aesthetic made up of minuscule stabs of sound, clicks, glitches, pops, buzzes, hisses, and anechoic digital shards assembled into stripped-down molecular structures. In 2002 artists associated with this tendency included: Oval, Ryoji Ikeda, Carsten Nicolai, Mika Vainio, Christian Fennesz, Frank Bretschneider, Pimmon, Taylor Deupree, and Richard Chartier, to name only a few.

If we are to consider what post-digital aesthetics might mean a decade later, I think one of the most important ideas to consider is that within the post-digital tendency we see a move away from a certain idea of transparency. Rather than emulating the model of perfect transmission of a sonic idea in the artist's/composer's mind, post-digital refers to the acceptance and exploration of the flaws and artefacts inherent in digital technologies. In this sense, it encapsulates the kind of shift in attention advocated by the composer John Cage. Rather than wishing to transparently reproduce a pre-known and preconceived idea, the post-digital composer sets processes in motion to arrive at the unforeseen, and make aesthetic use of what would normally be regarded as deficiencies and errors in digital processes. In other words, what I think is at stake here is a methodology by which the composer/artist can, as Dick Higgins says, 'place the material at one remove… [from their own subjectivity] by allowing it to be determined by a system he determined' [3]. Such a practice becomes less concerned with 'expression' and more concerned with discovery.

The theorisation around post-digital art/music seems to be split in two directions. On the one hand, post-digital practices tend toward a non-subjective, process based model that moves towards non-intentionality and a phenomenological imperative to bring forward the contingencies of the worldly background (assuming that 'world' here relates as much to the virtual as the physical). On the other hand, within the post-digital tendency there exists a strong neo-modernist reductivism that adheres to a sound-in-itself ideology. What is important for this latter tendency is not the foregrounding of process but the immediacy of sense perception and sound as form for its own sake.

Process

In the 2002 essay I observed that one of the hallmarks of post-digital aesthetics seemed to be a concern with processes. Post-digital processes include: altering the header information on different digital file types (text, pictures, etc.) in order to make their data audible, iterative bit rate and depth reduction and compression processes, and overloading software applications to create unexpected results. But does such attention to process constitute a form of process art, where expression and improvisation are displaced by letting the processes run their course to determine the form that the work will take? For example, as Sol LeWitt writes in "Paragraphs on Conceptual Art" (1967):

> To work with a plan that is pre-set is one way of avoiding subjectivity. The plan would design the work…. In each case, however, the artist would select the basic form and rules that would govern the solution of the problem. After that the fewer decisions made in the course of completing the work, the better [4].

LeWitt's paragraphs reflect a trend in art since World War II where, as Robert Morris observes, 'artists have increasingly sought to remove the arbitrary from working by finding a system according to which they could work' [5]. Morris cites Cage's use of chance operations as an example of this thread that has run from Duchamp through to Jasper Johns and Frank Stella and to Conceptual Art. Alongside this, Morris observes the continuance of another systematising thread of methodologies that he refers to as bearing towards a 'phenomenological direction,' where the system that orders the work is derived from 'the "tendencies" inherent in a materials/process interaction,' [6] rather than from a prior and external logical system. In other

words, forms are discovered in the activity of interacting with material properties. Considering the rather prevalent *ad hoc* approach that utilises a variety of processes, I would argue that a great deal of post-digital sound art or music finds itself in this category. In this way of working, epitomised for Morris by the work of Pollock, the material, in a certain way, determines the working process and, more importantly for Morris, the process is made manifest in the work. This is exemplified, quite literally, in Morris' 1961 work, *Box with the Sound of its Own Making*: a ten inch cube that plays back, from a tape player concealed within it, the recorded sounds of its own construction. In other words, encountering the process in the work effects the way we read the work.

In a similar way the minimalist composer Steve Reich argues for perceptible processes that can be heard in the music as it is performed, in fact 'pieces of music that are, literally, processes' [7]. In 1968 Reich composed a process piece entitled: *Pendulum Music: For Microphones, Amplifiers and Speakers*, which consists of three or more microphones suspended from their cables directly above speakers. The microphones are pulled back by the performers, and then let go in unison, allowing them to swing over the speakers, thus creating pulsed feedback according to changing phase relations. The piece ends shortly after the microphones come to rest. We are able to *hear* the process in such events, Reich contends, because they occur gradually and thus invite 'sustained attention' [8]. But, at the same time, according to Reich, the sound that one hears moves away from intentions, and what is distinctive of such processes is that they determine all aesthetic outcomes, making improvisation impossible. As Robert Morris puts it, this kind of work breaks with the arbitrary and the formalistic and, instead, lets the world in, and tends to provide its audience with an 'ends-means hookup' [9].

Neo-Modernism

In "Post-digital Aesthetics and the Return to Modernism" I coined the term *neo-modernism* to describe what I saw as a naïve return to an ideal of purity in art; a tendency observed by Lev Manovich in his "Generation Flash" (published also in 2002). Manovich rallies against the secondariness of post-modernism, advocating a return to modernism as the first step towards a new aesthetic comprised of 'data visualizations, vector nets, pixel-thin grids and arrows' [10]. In 2003 the term *neo-modernism* was utilised by Christoph Cox to describe recent examples of 'sound art' where he observed a 'revival of modernist strategies of abstraction, Reduction, self-referentiality, and attention to the perceptual act itself' [11]. However, unlike my rather cautious approach to this new modernist direction, Cox's article celebrates it as an essential experience of 'sound-in-itself.'

Sound-in-Itself

As Seth Kim-Cohen points out, the sound-in-itself tendency is very much associated with a prevalent 'phenomenological' direction typified by many musicians and sound artists influenced by the ideas of Pierre Schaeffer. The aim of Schaeffer's sonic research and *Musique Concrète* was to establish a systematic methodology of listening in order to arrive at the fundamental structures of musicality. In order to achieve this it is necessary, according to Schaeffer, to radically displace the grid of visuality that normally determines our perceptual response to the sonic environment. This shift is achieved by a form of reduced listening which involves, for Schaeffer, an *acousmatic* abstention: where any concern with the spatio-temporal existence of a sound's source is suspended, and hence all reference, or context, is actively disregarded, in order to concentrate on sound as a purely aural experience. According to this position, we have no need to encounter the cause of a sound. Any extraneous information picked up by the other senses, or received outside of the *hic-et-nunc* of the performance/event, comes to be seen as an impediment to experiencing sound-in-itself. Morris' notion of the ends-means hookup is precisely what is eschewed by the Schaefferian imperative that is followed by many musicians and sound artists. The effect of this rejection of any causal connection or reference is to render attention to process opaque.

While Cox regards the sound-in-itself tendency in a positive light, the same cannot be said of Kim-Cohen, who sees it as a function of Greenbergian formalism and Husserlian phenomenology. He contrasts this to 'the conceptual turn' initiated by Duchamp. As far as Kim-Cohen is concerned, the discourses around sound art seemed to have missed the conceptual turn that occurred in the visual arts. He proposes instead, a rethinking of the conception of sound art on decidedly non-essentialist terms involving a 'non-cochlear sonic art,' which, rather than celebrating the immediacy of sound as presence, addressing itself exclusively to the senses, takes, instead, a inter-textual and conceptual direction [12]. The rather unwieldy term 'non-cochlear sonic art,' is, of course, the aural equivalent to Duchamp's notion of 'non-retinal' painting. It signifies a turn to an intellectual encounter rather than visceral plastic celebration. Just as non-retinal painting does not occur at the site of the look, a non-cochlear sound art, for Kim-Cohen, transcends the space of listening. But this does not mean that sound and vision are disqualified from the work of art.

The most notorious exponent of the Schaefferian acousmatic tradition would certainly be Francisco López, who—with the intention of prohibiting access to all visual stimuli in his performances—insists on his audience wearing blindfolds that he provides at each performance. López produces recordings of both natural and urban environments that involve minimal processing and editing. Kim-Cohen, who regards López's transcendental practice as an extreme form of essentialism, argues that: 'Although López's sound-in-itself tendencies are not an isolated incident in contemporary sound practice, the fundamentalism of his approach and his written justifications render his work uniquely unavailable to non-cochlear recuperation' [13].

But we must be careful here. After all, we do seem to speaking about music rather than art, or 'sound art.' Surely there is a case for considering music (in its absolute form, without lyric or concept), whether traditional or expanded, as purely autonomous and formalistic? However, I would be careful not to extend such a model into the realm of what might be called sound art. Music and sound art, as I see it, are radically distinct disciplines. A shift in the site of reception from concert venue to art gallery does not automatically imply the rebadging of music as sound art. Here I find myself in agreement with Cox when he insists on a clear distinction between music and sound art. However, where Cox considers sound art to constitute a turn in listening toward the 'transcendental or virtual dimension of sound,' [14] I would contend that sound art is, rather, *relational* in the sense that it refers not simply to a practice that utilises sound as its material, but names a practice which

addresses sound in relation to something else: a space, place, environment, object, world, text, image, etcetera.

Conceptuality, Intention, and Non-intention

Process based practices can fit (in very different ways) into both sound art and music. We might say that in sound art the processes become explicit (where the work might be more *about* the process). But this does not mean that such work becomes automatically conceptual. Moreover, if post-digital 'glitch art' practices can be said to carry out a form of 'techno-critique' [15] or 'critical media aesthetics,' [16] where the technological apparatus reveals itself through the interruption of transparent normative operation, we must ask: to what extent are these 'self-critiques' merely metaphorical or symbolic? For the spectator/audience, is any ingrained 'habitus' truly displaced by the glitch? The process based procedural methodologies of post-digital practices rarely constitute a conceptual end in themselves. At the site of reception the processes yield largely aesthetic and formalistic outcomes. Yet the imposition of processes and constraints, outside of authorial control, performs the important function of displacing subjective values of taste, and explicitly shattering the idea of expression—as the idea of the transmission of feeling from within a sensitive subject (of genius) to an equally sensitive receiving subject. In terms of this operation, the more explicitly the work foregrounds its own processes the better.

A common objection, however, to the idea of non-intentionality in art is that the process of making art can never be entirely non-intentional, since there is always the decision to begin the work in the first place. Thus, many commentators have pointed to what they see as an irresolvable paradox of non-intention, where the desire to erase intention must surely be considered to be an intention itself. However, it would be wrongheaded to describe the non-intentional practices of Cage, and others, as an attempt to erase intention. The use of aleatory procedures does not prescribe, nor necessitate, the negation of intention. Rather, it proscribes its displacement. This displacement is achieved not directly through an act of willing, but indirectly through the imposition of a constraining system, procedure, or process. In the formulation of the chance operation decisions must be made. But after a certain point in these operations all decision-making tends to be suspended. The artist does not directly put intention out of action. Rather, the artist formulates a predetermined process, or set of rules, which then put intention out of action. The artist is always at least one step removed from the operation. This requires not a negation of will but a displacement from central to secondary: from the idea of creator-author-origin to that of enabler. Intention and agency come into the work in different ways, where intention and non-intention occur at different moments of the working process, and in different strata of the work. It is, perhaps, due to such misconceptions regarding the place of intention in process based art that the role of non-intention in post-digital practices has been largely neglected. Post-digital practices—rather than issuing a techno-critical challenge to the transparency of media information flows (by way of the figurative interruption of the glitch), or functioning solely in terms of formalistic aesthetic experience—take part in the displacement of the metaphysical notion of creative expression by foregrounding the processes that put authorial intention into question.

References and Notes

1. Ian Andrews, "Post-digital Aesthetics and the Return to Modernism," (2002) <ian-andrews.org/texts/post-dig.html>.

2. Kim Cascone "The Aesthetics of Failure: 'Post-Digital' Tendencies in Contemporary Computer Music," *Computer Music Journal*, **24**, No. 4 (Winter 2000), pp. 12-18.

3. Dick Higgins, *A Dialectic of Centuries: Notes Towards a Theory of the New Arts* (New York: Printed Editions, 1978), p. 30.

4. Sol LeWitt, "Paragraphs on Conceptual Art," *Artforum* **5**, No. 10, (Summer 1967), pp. 79-83, reproduced in Alberro and Stimson, *Conceptual Art: A Critical Anthology*, (Cambridge Ma.; London: MIT Press, 1999), p.13.

5. Robert Morris, "Some Notes on the Phenomenology of Making," *Artforum* **8**, No. 8, (April 1970), pp. 62-66, reproduced in Robert Morris, *Continuous Project Altered Daily: Writings of Robert Morris*, New ed. (Cambridge Ma.: MIT Press, 1995), p. 75.

6. Morris [5], p. 77.

7. Steve Reich, *Writings About Music* (Halifax: The Press of Nova Scotia College of Art and Design, 1974), p. 9.

8. Reich [7], p. 11.

9. Morris [5], p. 83.

10. Lev Manovich, "Generation Flash" <www.manovich.net/DOCS/generation_flash.doc>.

11. Christoph Cox, "Return to Form: Christoph Cox on neo-modernist sound art," *Artforum* **42**, No. 3 (November, 2003), p. 87.

12. Seth Kim-Cohen, *In the Blink of an Ear: Towards a Non-Cochlear Sonic Art* (New York: Continuum, 2009), xxi.

13. Kim-Cohen [12], p. 128.

14. Christoph Cox, "Sound Art and the Sonic Unconscious" *Organised Sound* **14**, No. 1 (2009), pp. 19-26, p. 22.

15. Torben Sangild, "Glitch—the beauty of malfunction," C.J. Washburn and M. Derno (eds.) *Bad Music: The Music We Love to Hate* (London: Routledge, 2004), 258.

16. Rosa Menkman, *The Glitch Moment(um)* (Amsterdam: Colophon, 2011).

CINE-INSTALLATION *METABOOK.1: THE BOOK OF LUNA*

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Abstract

The *MetaBook* is a transmedia concept that bridges the analog and the digital by introducing a cinematic and interactive dimension to the physical object of the book. *MetaBook.1: The Book of Luna* is the first realization of this concept. Across a series of embedded media technologies, this artwork explores texts written and inspired by some of history's great philosophers and scientists by navigating a map of the Moon's craters that have been named after them. The reader is free to navigate between these craters on page and screen, or just fly between them in a constant orbit.

Keywords: expanded cinema, electronic literature, immersion, hybrid media, interactive, video installation, structural montage, dynamic montage.

The Poetics of Space

In *The Poetics of Space* (1958), Gaston Bachelard traces a profound homology between our perception of space, our way of being-at-space, and poetic thought: "…the great function of poetry is to give us back the situations of our dreams. The house, the bedroom, the garret in which we were alone, furnished the framework for an interminable dream, one that poetry alone, through the creation of a poetic work, could succeed in achieving completely" [1]. Spaces are psychological resonating chambers, exterior sanctuaries for our interior states, in much the same way that poetry is a sensate linguistic structure for expressing daydreams. To apprehend space as poetic text entails following the a-logic of the daydream – accompanying the peregrinations of a mobile mind as it pulls in many signifying threads, pictures and words. The project at hand, *MetaBook.1: The Book of Luna* by Clea T. Waite and Lauren Fenton (2013), is an expanded cinema installation, an electronic cabinet of curiosities crossed with an illuminated manuscript, that formally examines how structural and dynamic montage can be employed in counterpoint to create experimental narratives and immersive experiences. Interpreting these techniques as spatial metaphors, our work specifically explores how the topographical architecture that a film occupies can be used as an external signifier of the film's internal logic.

Fig. 1. *MetaBook.1: The Book of Luna*, multimedia object (prototype), © Clea T. Waite & Lauren Fenton, 2013. Photo © Clea T. Waite

The Book of Luna narrates a poetic essay about the Moon's place in the historical imagination that unfolds across a series of projections and nested spaces. In the spirit of Bachelard's daydreams, *The Book of Luna* treats the Moon both as a poetic concept and as a concrete, navigable place, effectively presenting a topological metaphor that superimposes a fictional with an actual, selenographic space. The result is an immersive experience that combines the dynamic, recombinant possibilities of the digital database with the familiar intuitiveness of the book and the perceptual engagement of cinema.

MetaBook.1: The Book of Luna investigates this poetics of space by creating an individual polymedia experience with responsive content. In the encyclopedic catalogue that accompanied the Getty Museum's 2001 exhibition of techno-artistic artifacts, *Devices of Wonder: From the World in a Box to Images on a Screen*, Barbara Stafford evokes an entire lineage of 'gadget-furniture', objects for the home such as perspective boxes and toy theatres that functioned as 'socio-poetic kits'; simple machines that enfolded platforms for the imagination within their imbricate space. Stafford states: "... objects, too, are not eternally fixed within their utilitarian or commodity function but, like the dynamic consciousness itself, are seen to be metamorphic and performative"[2]. Building upon the interactive, exploratory possibilities of these Baroque domestic objects, *The Book of Luna* is a single participant object combining the experiential qualities of text, sculpture, interactive devices, and cinema within the enclosed architecture of a tabletop cabinet. The piece takes the form of a wooden cabinet measuring 24.5 x 9.5 x 24.5 inches with multiple compartments. Contained within these compartments are miniature projections on both a curved screen and a glass globe, a Pepper's Ghost illusory mirror effect, interactive electro-mechanical devices such as joysticks and tuning knobs to allow user control of the projected material, and a collection of evocative objects (Fig. 1). Within one compartment of the cabinet, a three-dimensional model of the Moon is layered with the stunning film recordings, made from orbit by the Apollo and Kaguya/Selene missions, of the Moon's surface, archival space-flight footage, and animated fantasy characters from the stories being told to form a three-dimensional, dynamic collage. The orbital footage, drawing attention to the lunar surface textures and irregularities whose revolutionary discovery was made possible by the telescope, is manipulated to simulate the primitive optics of Galileo's original telescope from 1609 (Fig. 2). The lunar imagery is composited in real time and projected onto a translucent glass globe using a fish-eye lens and image mapping techniques like those currently em-

ployed in state-of-the-art, digital full-dome planetaria. The resulting 3D model of the Moon that is projected creates a luminous, interactive orb. This orb floats collocated with the characters from the archival space flight footage and fantasy that augment the narrative of the craters. These characters and other figures float in space using the Pepper's Ghost technique, creating a hologram-like effect, giving the impression that the animated images are moving through and around the globe within the compartment, generally making it impossible to distinguish between background and foreground, projected material and solid objects (Fig 3).

The composition of the work reflects the Moon's own history as a palimpsest of humanity's philosophical and literary imagination. The nature of love, madness, the unknown, and our capacity for the sublime are amongst the intellectual passions that have crystallized around this mysterious object. There are as many perspectives of the Moon—poems, fantasies, myths, and scientific data — from the beginnings of culture to the Space Age and the memories of the Cold-War generation — as there are craters on its surface. Recipient of prayers, myths, and dreams since the beginning of human consciousness, it inspires love poems and lunacy, influences werewolves and the tides.

> *For what is the moon, that it haunts us,*
> *this impudent companion immigrated*
> *from the system's less fortunate margins,*
> *the realm of dust collected in orbs?[3]*

John Updike incisively dubs our planet's singular satellite an impudent companion; "no star but in the zodiac of stars, a stranger there too" [3]. Queries into the Moon's nature, its place in the cosmos and in our lives have reflected and diverted the trajectory of Western art and science. *The Book of Luna* remixes selenological aphorisms, musings, and observations from some of the philosophers, poets and scientists after whom the Moon's craters were named: Ariosto, Aristotle, Aristarchus of Samos, Copernicus, Cyrano de Bergerac, Leonardo da Vinci, Gagarin, Galileo, Hippocrates, Kepler, Lucian of Samosata, Plutarch, Plato, Ptolemy, Pythagoras, Tereschkova, Tycho, Jules Verne and H.G. Wells. *The Book of Luna* allows the reader to visit these craters and experience the quotations either by interactively navigating through the map of the Moon that is projected onto the globe, or by scrolling through the associated texts that are projected in another compartment of the box. The text is a non-linear, cut-up poem combining quotations from the lunar philosophers with original writings. The interactive text allows the reader to select and combine quotations. Once a crater is selected from the text scroll or the Moon map, more cinematic material is unlocked. When selected, portions of the text transform and fly across the book to take the reader to the corresponding crater on the globe. In a *MetaBook*, the viewer chooses which pages (here, map or text) to engage with, and how.

Miniature video monitors and lunar memorabilia housed in smaller compartments of the cabinet complete the experience of *The Book of Luna*, adding to the layers of storytelling that play out within the electronic assemblage. The back-and-forth between the text, the globe, the 'ghosts', and the digital and material memorabilia enact

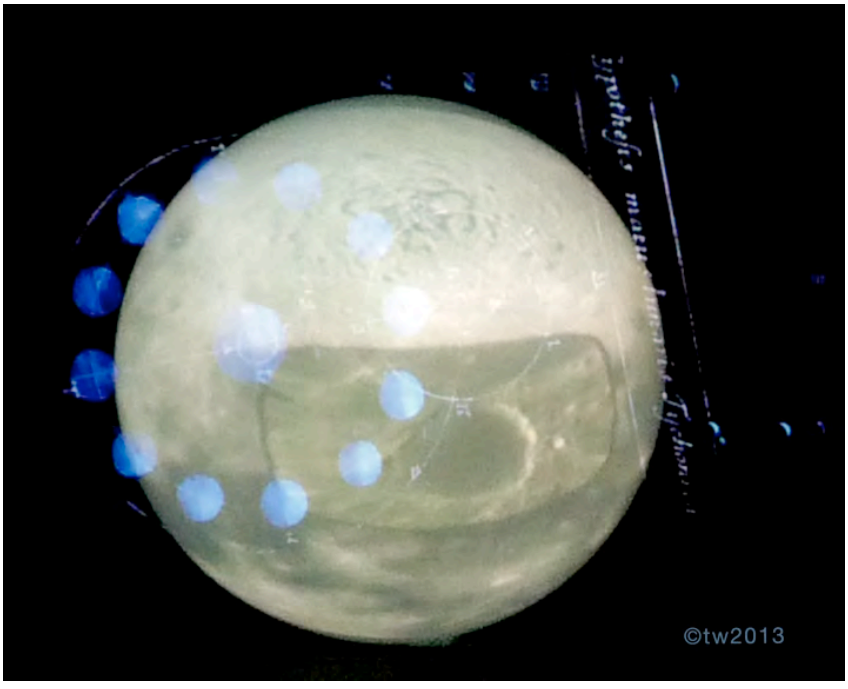

Fig. 3. *MetaBook.1: The Book of Luna*, detail of Moon map projection onto a glass globe and Pepper's Ghost illusion, © Clea T. Waite & Lauren Fenton, 2013. Photo © Clea T. Waite

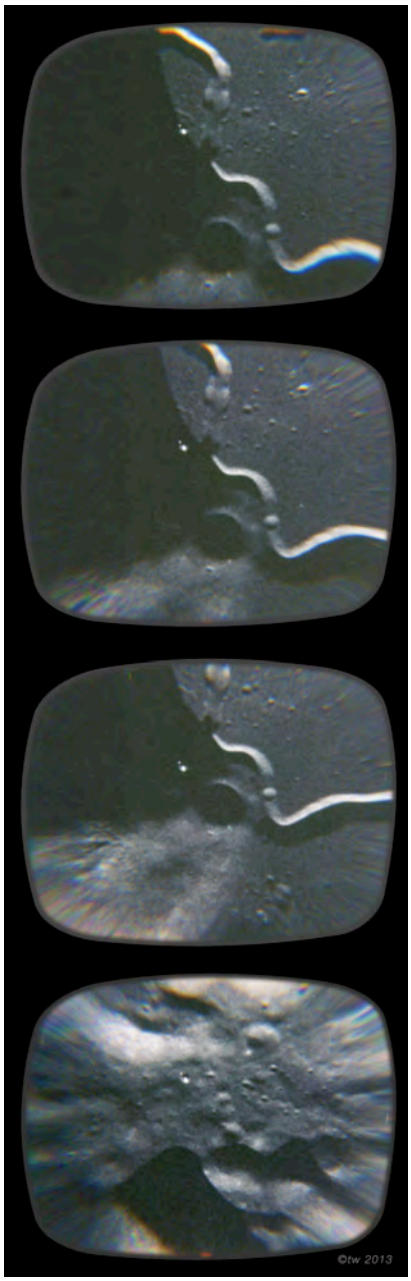

Fig. 2. Archival Apollo Mission orbital footage digitally processed to evoke Galileo's telescope view, from *MetaBook.1: The Book of Luna*. © Clea T. Waite & Lauren Fenton 2013. Photo: © Clea T. Waite

the larger metaphor of the lunar orbit, both as a literary device and as a distinctive model for interface design. The aim of this design is to allow the user to effortlessly explore content, to 'float' through a narrative and through different media, launching her on a reading journey that draws her ever more deeply into an imaginative space. The somatic traversal of a topographical space is transposed and compressed into an intimate, personal topology of navigation within the *MetaBook.* The written word becomes a voice, another actor, in the film's unfolding.

The Wunderkammer and the Baroque

Through its exploratory poetics and personal architecture, *The Book of Luna* draws a contemporary connection between the 17th century cabinet of curiosities, the *Wunderkammer*, and Gilles Deleuze's analysis of the Baroque as the folding of imaginary space. Cabinets of curiosities were ornate pieces of furniture devoted to the juxtaposition of curios and artifacts, which created in the cabinet owner's mind a structural chain of sensuous and symbolic associations (Fig. 4). These cabinets were used by the wealthy as systems for organizing facts and artifacts, and are the precursors to the travel documentary and the natural history museum. The cabinet of curiosities as a whole evoked a vast imaginary space whose extensive proportions were collapsed into the comparatively diminutive physical space of the piece of furniture itself. A historical connection between cabinets of curiosity and the book can also be found in the form of the xylotheque, a collection of books made of wood and other elements of various kinds of trees, exemplified by the encyclopedic creations of Carl Schildbach (1730-1817) and displayed by artist Mark Dion in his contribution to *Documenta 13* in Kassel, Germany, *Xylotheque* (2012) (Fig. 5). Similarly, the *MetaBook* re-invents expanded cinema according to a neo-baroque logic of serial miniaturization that unlocks proportionally vast sensorial and imaginary realms, conjuring an experience in which "matter…offers an infinitely porous, spongy, or cavernous texture without emptiness, caverns endlessly contained in other caverns: no matter how small, each body contains a world pierced with irregular passages" [4]. The more our perception unfolds the object before us, laying out its inexhaustible wealth of detail for our consumption, the more we 'fold' ourselves into it, until the object seems to balloon, to grow beyond us into a world in which we are then immersed, and which becomes our stage. In *The Book of Luna*, this Baroque exercise of the perceptual imagination results in designing the work's topological form as an extension of the film's internal narrative. The subject of the piece, the Moon, fuses its topographical signifiers – the sphere and the craters – with the architectural structure of the cinema-installation, the freely navigable globe. Motivating movement and focus through interface design becomes an element of composition and meaning in which the attention of the viewer composes the linear flow of information. It demonstrates how somatic immersion and active navigation impact upon the compositional flow of a piece. This form of experimental cinematic montage harkens back to the artwork of Joseph Cornell, whose compositions hinge on the manner in which the meanings of the objects ricochet off each other, creating an immersive and powerfully evocative web of material signifiers. Through his boxes Cornell conjured closed, self-sufficient worlds of thought and feeling. In *The Book of Luna,* we pay homage to Cornell's penchant for evocative dime store knick-knacks and toys.

The cinematic composition of the *MetaBook* relies upon the concept of structural montage, one which transposes the linear-sequential progression of the narrative, one scene after the next, into a multivalent, non-linear presentation of the 'scenes' using spatial distribution. This system of elements relates back to Eisenstein's concepts of juxtaposition and collision of cells in montage: "The montage method is obvious: the play of juxtaposed detail-shots, which in themselves are immutable and even unrelated, but from which is created the desired image of the whole" [5]. Within the *MetaBook*, physical space and form are used to supplement sequentiality in the construction of a cohesive, poetic narrative.

The use of multiple projections in an architectural cinematic space recalls the rich history of theatrical lighting effects from the Baroque era onward, known as magic lantern shows or phantasmagorias. The most spectacular of these stage illusions is perhaps the Pepper's Ghost, invented by John Pepper and Henry Dircks in 1863. The effect creates the impression of a hovering, translucent figure, popularized today by theme park attractions such as Disneyland's Haunted Mansion. For *The Book of Luna*, we created our own miniature Pepper's Ghost effect through a reflective projection mechanism hidden inside the cabinet, resulting in hologram-like, translucent animations of historical figures, lunar illustrations, and dia-

Fig. 4. Trompe l'oeil painting of a cabinet of curiosity by Domenico Remps (1690s, Museo dell' Opificio delle Pietre Dure, Florence) [7]

grams. By confounding the viewer's sense of foreground and background and making them interchangeable, Pepper's Ghost participates in a powerful form of spatial montage that extends the narrative into ambiguous spaces where flights of the imagination become possible. Our use of the Pepper's Ghost effect was also inspired by medieval illuminated manuscripts' practice of weaving graphic illustration into the body of a text. Like illuminations, our translucent animations continuously emerge from, and melt back into, the audio and textual narrative, intersecting with the lunar projection on the globe.

Finally, why have we chosen the metaphor of the book? As the common book progressively moves into the virtual, it leaves the functionality of the physical book in a minor role of impracticality – and hence perfectly suited to the role of art. As an ancient interface, the book reconnects with the non-linearity of contemporary digital media. Lev Manovitch memorably describes the book as a "perfect random-access medium" [6], a versatile platform equally suited to exploring databases and becoming absorbed in narratives. Skipping across imaginary spaces and moments in time is as simple as flipping through its pages. In *The Book of Luna*, the turn of a page becomes an edit in the film or the beginning of a new line in the poem, revealing a new cell in the montage. In a *MetaBook*, the multi-channel space of an immersive architecture is transformed into an intimate installation within the book's pages. The medial space of immersion is re-internalized, just as literature has always immersed the mind of the reader. The *MetaBook* is a film to be read as well as viewed, activated as well as experienced.

Conclusion

Our artistic research addresses topics at the intersection of art and science via physical, cinematic works examining immersion, structural montage, and dynamic montage, and the effect of these formal elements on meaning, creative process and reception. How decisive is form on the quality of content? What new metaphors arise from new technologies, from crossbreeding disciplines and media to create new forms and meanings? The *MetaBook.1: Book of Luna* reinvents expanded cinema according to a neo-baroque logic of serial miniaturization, while extending the concept of cinematic montage beyond Eisenstein's juxtaposition of cells, to the juxtaposition of evocative materialities. This recombinant assemblage of tangible surfaces which also correspond to narrative units points us back to the origin of media and the book, a platform we metaphorically allude to in our title. As a polymedia book, the *MetaBook* articulates how immersive spaces and an active form of spectatorship can orchestrate the piece's composition. By mapping its selenographical subject, the Moon, to the architectural structure of a cinema-installation, *The Book of Luna* addresses the challenge of creating an external form which functions as an extension of the work's internal logic; in the context of expanded cinema, this means unpacking or unfolding the narrative in a spatial dimension. As a hybrid, neo-baroque artifact that brings together illusion and science, aesthetics and apparatus, *The Book of Luna* investigates the possibility of experimenting with technologies as epistemological mechanisms which can, within an artistic framework, open up new avenues of perceptual and affective experience.

Fig. 5. The Schildbach Xylotheque of the Ottoneum in Kassel, Germany, a collection created by Carl Schildbach from 1771 to 1799. Each 'book' is made of the wood of the tree that is documented within it, with wax three-dimensional replicas of significant elements of the tree. Since 2012 the Xylotheque has been shown inside the display designed by Mark Dion for dOCUMENTA (13) [8].

References

1] G. Bachelard, *La poétique de l'espace*. Paris: Presses Universitaires de France, 1958.

[2]B. M. Stafford, F. Terpak, and I. Poggi, *Devices of wonder: from the world in a box to images on a screen*. Los Angeles: Getty Research Institute, 2001.

[3]J. Updike, 'Half Moon, Small Cloud', *Americana*, 2001.

[4]G. Deleuze, *The Fold*. Continuum, 2006.

[5]S. Eisenstein, 'Dickens, Griffith and the Film Today', in *Film Form: Essays in Film Theory*, New York: Harcourt Brace, 1949, pp. 195–256.

[6]L. Manovitch, 'Database as Symbolic Form', in *Database Aesthetics: Art in the Age of Information Overflow*, V. Vesna, Ed. Minneapolis London: University of Minnesota Press, 2007.

[7]J. Sheely, *Cabinet of Curiosities (trompe-l'œil) REMPS, Domenico (c. 1620-c. 1699)*. 2009. http://www.flickr.com/photos/ojimbo/4992678667/

[8]D. G. Fontanills, *Documenta 13 Kassel 2012*. 2012..http://commons.wikimedia.org/wiki/File:Xylotheque_Ottoneum_2.JPG

CODE SWITCHING IN MIXED REALITIES

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Abstract

The codes used in augmented reality (AR) systems may act as signifiers of an alternative reality in themselves, prior to any technological reading. Mixed realities in urban settings are complex media ecologies that are often traversed in a transmedial manner by players and participants. Making AR markers a significant part of the urban landscape, by aestheticising them, results in an intervention into public space that signifies the presence of an alternative world situated within the real. Recent projects such as *Urban Codemakers* and *noemaflux* explore connections between formal abstraction, street art, pervasive gaming and virtual art, creating mixed realities with hybrid aesthetics, and multiple layers of meaning.

Keywords: mixed realities, code switching, media arts, pervasive gaming, colonisation, Ludea

ing in augmented reality (AR) markers in previous projects (© Troy Innocent)

The codes used in augmented reality (AR) systems may act as signifiers of an alternative reality in themselves, prior to any technological reading. Mixed realities in urban settings are complex media ecologies that are often traversed in a transmedial manner by players and participants. Making AR markers a significant part of the urban landscape, by aestheticising them, results in an intervention into public space that signifies the presence of an alternative world situated within the real.

The term 'code switching' comes from linguistics [1]. It describes the process that speakers of multiple languages engage in when they mix those languages together to communicate. By way of example, in Singapore 'Singlish' blends various Chinese dialects, Malay, and American and Australian slang words into a hybrid language. Speakers use the most familiar or appropriate word to express what they wish to say, mixing both syntax and grammar in single sentences. Code switching is most common in spoken communication, but for popular forms such as Singlish, written expressions also emerge. Code switching also refers to changes in modes of communication, however this discussion is most concerned with the term's association with the concept of mixing languages.

In this form of code switching, language elements are often chosen for impact in communication, that is, according to which words are perceived to express the message most effectively. When combined, the hybrid result shifts the meaning again through context. This idea may be applied to mixed realities. They are spaces and experiences, often augmented by digital technologies, that blend different information systems and data in a shared multiuser world embedded in our immediate environment [2]. This paper looks at recent examples from my experimental arts practice (Fig.1) which connect code switching to the multiplicity of audiovisual communication methods used in mixed realities.

It explores this idea by looking at the multiplicity of codes in a street game that was integrated into the city of Sydney during *ISEA2013*, and in the two months prior to the symposium. Urban codes were embedded into streets in Darlinghurst, Newtown and Chatswood, to function as game tokens in a competition over territory between three clans. This reflection on the game is situated within the context generated by a set of relations between dynamic ideography and pervasive iconography.

Pierre Lévy introduced the idea of 'dynamic ideography' [3] in the early 90s to articulate the shift from a static to a dynamic medium – that of computation. Central to the concept is the idea of moving beyond the distinction between text and image to generate a more dynamic representation of thought models. The game designer creates a system for interaction that engages the player in the process of communication – playing the role of reader, actor and creator simultaneously. It is a language that uses animated, interactive images, rather than words, to express mental models more directly.

The game draws upon the pervasive iconography that is possible in mixed realities – environments that blend actual and virtual elements in a continuous narrative or game space. During the digital revolution of the last century, ideographic forms of communication thrived in the audiovisual world of the computer, using movement, icons, colors, gestures and sounds. Inscribed into reality, these languages now have an evolved aesthetic that is shaped by their materiality: glyphs carved into rocks, adapted to woodblock and metal type, drawn as pixels and vectors, and hybridised in mixed realities. In mixed realities iconography can be actuated on many levels, in crossmedia ecologies that interact with the materiality of the world.

A city is made of signs. Contemporary cities are complex urban ecologies generated by relations between signs, a collection of readymade sites for play. Finding ways to decode the networks of people, technology and societies [4], and the politics that shape them, opens up new ways to perceive this hypermediated reality. More recently these have included machine codes (our experience within which is shaped by machine vision, language, and digital iconography), zoning laws, architectural space, street art, and social codes. Games are also made up of codes; in game theory [5] the 'magic circle' describes the space inhabited by

the player while following these codes. Mixed realities return the magic circle [6] back to the real world, in a post-digital scenario in which the codes of virtual spaces take on meaning in actual space. This project aims to involve the audience in urban processes via play. The role of the work is to involve players in the process of colonisation, and the ways in which it shapes the past, present and future of a city.

The multiplicity of code in mixed realities

This game has been developed in the context of an experimental arts practice which mobilises the game as a tool for exploring urban ecologies. The game model provides rules of engagement, and a tangible world that frames the experience. *noemaflux* is a related work that employs an augmented reality experience in which multiple roles of the AR markers are explored. Rather than being hidden or embedded in their environment, these markers are made overt through their presentation as aesthetic objects; they are therefore framed with coded colour, incorporated into site specific installations or created with materials such as acrylic and wood. Furthermore, they are made both human-readable (as symbols) and machine-readable (as codes). Their presence on the street as portals into an artificial world reflects their third role, as signifiers of this additional layer to reality.

The Melbourne precursor to the game staged at ISEA in Sydney was *Urban Codemakers*, in which three guilds presented competing plans to redevelop the city applying strategies from game design [7] to urban planning. This game involved the tagging of sites in the city, and revolved around a narrative based on the 'Hoddle Grid', and a set of laneways that emerged within the grid. This grid motif, introduced by Robert Russell, was appropriated by Robert Hoddle into the current Melbourne city plan. In these works the multiplicity of code in mixed realities is explored, for example, through the different faces of an AR marker as human-readable, machine-readable, and as a signifier.

The city, games, street art

In the two months leading up to *ISEA2013*, an ambient street game was lurking around the streets of Sydney (or, in the language of this game, *Zydnei*). The game mixes street art, pervasive gaming and dynamic ideography into a mixed reality that explores colonisation

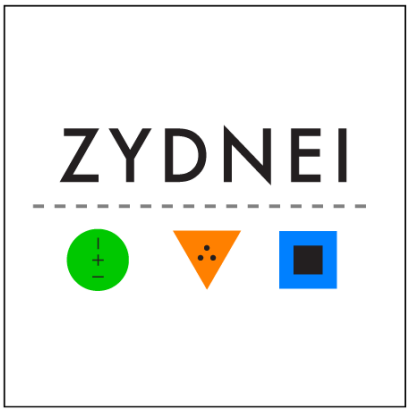

Fig. 2. Zydnei visual identity (© Troy Innocent)Fig 1. Code switch-

on the streets of Sydney. The linguistic origins of code switching, in terms of mixed societies, for example, parallel these processes of colonisation in cities. This highlights the nature of the city space, shared between humans, machines, systems and infrastructure.

This project is an expression of Australia's unique history; a dichotomous understanding of our spaces as the product of invasion and renewal. With their city under threat, players are able to 'take over' the streets of Sydney and join a clan to revert to the past, renew their present, or completely remake their city – as either New Albion, Sydney, or Zydnei; game mechanics engage players with the city through processes of urban coding that remap and rename these fictional territories.

Cities have played host to experimental art practice for decades. More recently the public space of the city has been augmented via ubiquitous media and mobile screens, creating dynamic, interactive playgrounds that interrogate the relationships among reality, symbols and society. Pervasive games combine theatre, art and play to create participatory interventions in urban public space.

The code switching in *Zydnei* is based on a contemporary re-imagining of the links between human, material and digital interventions into urban spaces. To initiate this process, players begin the game with the following call to action:

> "Governor Arthur Phillip arrived in Botany Bay with the First Fleet in 1788 to found a new colony. Finding this site unsuitable, he proceeded to Sydney Cove on Sydney Harbour, where he named the colony 'New Albion'. For reasons unknown it was later changed to 'Sydney'. At this time it was home to the Eora people of the Cadigal clan; over 200 years later it has become one of the world's ten 'alpha cities'. Its value has not gone unnoticed to other clans.
>
> In 2013 the people of Sydney are under threat. Another once dormant invasion is now stirring in the city. Traces of a recolonisation have emerged, pointing to a future city named ' Zydnei'. This is the work of one of the most pervasive forces since the first invasion in 1788. Will you join the invaders? Or will you fight?
>
> The second wave is coming.
>
> Be prepared.
>
> Know your city."

Thus the narrative begins with a glitch in the history of Sydney – originally named 'New Albion' by Governor Arthur Philip, and later renamed 'Sydney' for reasons unknown. Transmedia storytelling situates this narrative directly within the city. The central concept is the practice of urban codemaking – a system for decoding and questioning urban space.

Three clans

To reinforce these themes, at the start of the game, players chose a clan; each aligned with a different philosophy on the city – REVERT, RENEW or REMAKE.

CODEX ::: REVERT

Return to the start; revert to the green earth of the pre-technological age. The lost shores of New Albion, the unspoiled promise of Terra Incognita: the verdant haven of Terra Australis.

Begin again at runtime. Hello, world.

OEKOS ::: RENEW

Keep the three sides in balance at the junction of debate; remain in the present, the orange glow of dawn, with full view of the past and future. Sydney is the now. Within its arches and towers are the reflections and foreshadowings of every possible Sydney there has been, and every possibly Sydney to come.

DÆMON ::: REMAKE

The crossroads; the blue sky of the future beyond. The positive charge of permanent change; it is not about where we have been, but where we are going, the synthesis of man and machine, the real and the digital. Parallel evolution leads to a single reality: Zydnei.

These philosophies were each aligned with a conflicting view on the future of the city – to revert to the past, to renew the present, or remake a future city. This embeds players in the primary narrative of the game, and their participation strengthens both their own status in the community, and also that of their clan via a cumulative score. The clan who claims the most territory wins, and renames the city as New Albion, Sydney, or Zydnei.

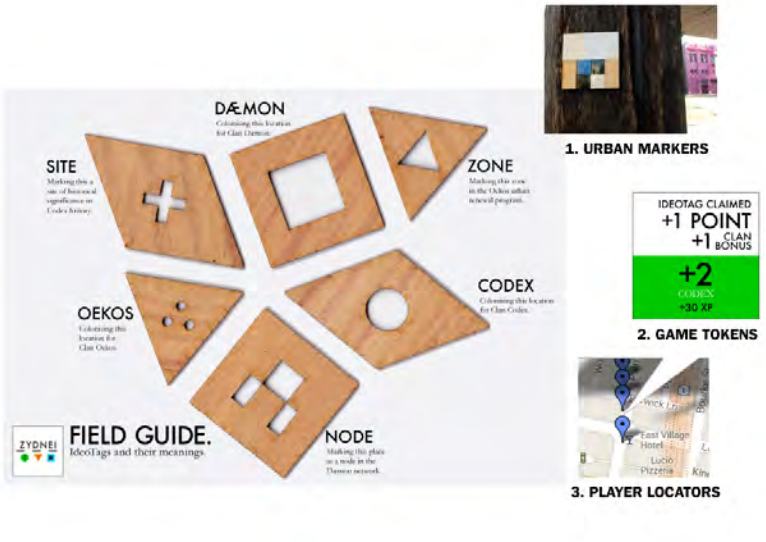

Fig. 3. IdeoTags and their meanings (© Troy Innocent)

How to play

As the game progresses, IdeoTags appear around the city in targeted zones, identified on the game website and in social media feeds. These zones are parts of the city undergoing the process of urban codemaking – sites and locations are marked using the IdeoTags and then photographed. These photographs are posted online, on twitter and instagram as clues for the players.

Ostensibly, you do not need any device or technology to begin playing the game. The IdeoTags that players collect are deliberately simple – they are physical objects removed from the street and kept by the player. At the same time – or later – the code imprinted on the back of the tag can be claimed at the game website.

Each time a player claims a tag they score points for themselves and their clan. A leaderboard showing the top ten players is featured on the game website. The IdeoTags are not all the same – they have different meanings, and are aligned with different clans. Additional mechanics in the game design include: (a) claiming an IdeoTag that matches the clan of the player scores double points; (b) claiming 5 IdeoTags within 24 hours scores bonus points; (c) 4 of a kind scores bonus points ; and (c) rare tags that feature a coloured mosaic pattern score quadruple points.

These rare coloured tags revealed story fragments on thematic pages on the game website. The page includes images of the tags to be found, and as each is located its image is replaced with a short piece of text. Each of these pages tell the story of an entity or character from the game world – such as the story of Algernon Sidney [8], a seventeenth century English politician who has been linked to the naming of Sydney.

IdeoTags

In *Zydnei* the IdeoTags (Fig. 3) are like ideograms with locative data; they are not AR markers but collectable objects similar to puzzle pieces, scattered across the city. Volunteers acting as urban planners tagged sites in Darlinghurst, Newtown and Chatswood to mark the territory of the game, turning found locations into readymade game spaces.

The IdeoTags served as urban markers, game tokens and player locators. *Zydnei* explores connections between formal abstraction, street art, pervasive gaming and virtual art, creating mixed realities with hybrid aesthetics and multiple layers of meaning. This is iconographic code switching in action – meaning is generated within the fictional game via interaction between players, urban space and code. These roles are defined as follows:

1. *Urban Marker:* the shape and/or colour of each IdeoTag indicates which clan it belonged to. The symbol within indicates its role, simply marking territory, or tagging a site to revert, renew or remake. Coloured tags have unique patterns that render them visible to machine vision systems, and also distinguish them as unique artifacts to the player.
2. *Game Token:* each IdeoTag is worth a certain number of points in the game. When a player collects a tag from their clan they earn bonus points. Coloured tags unlock story fragments, and are worth four times the number of points of regular tags. Their appearance on the street also signifies the presence of the game; this presence is duplicated via image feeds of tags to social media such as instagram and twitter.
3. *Player Locator:* the claiming of each IdeoTag connects the player to that tag by logging when they collected it. This is cross-referenced with GPS data embedded in the photographic record of the tag to trace the actions and paths of players. More informally, players also post images of their collected tags and activities via both the facebook page connected to the project, and other social media.

This project is part of a larger exploration of a family of digital media languages that have been constructed or evolved in artificial worlds, and adapted for expression in a range of material forms, such as urban art, laser cut signs, installation, stencils and handheld objects. These forms – expressed in paper, aluminium, acrylic and light – translate digital media aesthetics into tangible, spatial, immediate experiences. They are imprinted onto, and into, reality.

The languages undergoing this transfer out of the virtual are a form of multimedia, audiovisual iconography, referred to here as 'dynamic ideography', as noted earlier. In pre-linguistic cultures, visual languages were the primary means of communication, carved into rock, sculpted from wood, and painted onto clothing [9].

Alternate Reality Game

Via the mixed reality of *Zydnei* over the two months leading up to *ISEA2013* and the 10 days of play during the festival, players interacted with the city, the game and the fiction to generate an alternative reality (Fig. 4). During *ISEA2013* volunteers appeared at various sites in the uniform of 'Urban Codemakers', to reinforce the fictional world of the game. Over this period, additional IdeoTags connected to short stories thematically linked to the three clans also began to appear. These had a game function, being worth additional points, and a narrative function, unlocking different parts of the story. Live events were promoted as part of the *ISEA2013* festival, and announced via social media and on the game website. These games were limited time events in which IdeoTags were present and valid for 90 minutes only. One of these, a game staged in the northern Sydney suburb of Chatswood, claimed that territory for Clan Codex, renaming it Zhatswud. A collective of four Urban Codemakers, identified by their coloured overalls and helmets, set up base in Chatswood to facilitate and run the event. This was the first event in the turning of the tide for the game; from day one Clan Dæmon was the winning clan, although by game end the coalition of Codex and Oekos won the city, leaving its final name undecided. This shift occurred with the arrival of the *ISEA2013* delegates as invaders to the established game community, merging two clans to claim back territory won by Dæmon. This collective activity is recorded and mapped via twitter, instagram and facebook, and also through GPS data connected to player activity.

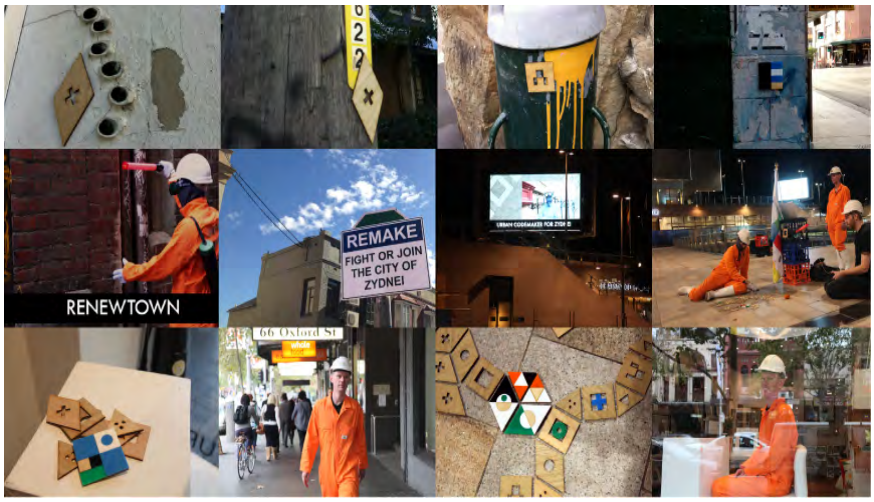

Fig. 4. Zydnei as Alternative Reality Game (ARG) (© Troy Innocent)

Fig. 5. Territories of Zydnei (© Troy Innocent)

During the game, most players fell into one of three categories: (a) spectators, who watched the game online; (b) casual players, who played sporadically or for a few days; and (c) regular players, who played consistently on a daily basis. Many of these regular players were profiled in social media, and have their name listed on the game leaderboard. Overall, 114 people registered to play, 165 liked the facebook page, and there were 10 regular players involved on a daily basis. Several players attended the final game, and spoke about the experience as 'addictive' and 'altering their perception of reality'. They also suggested that the competitive nature of the game was a motivation to play, especially when friends were in an opposing clan. Three of these players have been interviewed more formally about their

experience; their comments will be published in a short video documenting the project.

IdeoTag location data

The game generates a database of photographic, GPS and player data that reveals patterns in the city – this is central to the process of urban codemaking. Each IdeoTag is photographed, its location logged, and the name of the player and when they collected it recorded (Fig. 6). This process generates data that persists after the completion of the game, a collection of traces and flows of IdeoTags and players through the streets of the host city. Individual players may be tracked, and site activity logged via raw GPS coordinates or the collection of photographs, these images providing a survey of the city at the time of the game.

The IdeoTags have a similar role to the marks made by hobos during the depression in the USA last century – a secret code that maps their experiences of urban space. This practice involved a set of specific codes that were carved or marked with chalk to identify opportunities for casual work, friendly versus dishonest people, and so on. Similarly, the city streets already have many other more formal codes embedded within them – locations of electrical services, water, navigational signage. Urban codes from the game overlap with this data, absorbing them into the mixed reality of *Zydnei*.

The ongoing process of recolonisation

The emergent narrative of *Zydnei* points to the ongoing process of recolonisation that is integral to global cities. It is a playful exploration of these themes, both literally as a game, and metaphorically as an alternative reality that changes the language of the city, with *Sydney* comprising of three main territories: Zalinhast, Renewtown and Zhatswud, that reinvent existing suburbs of the city. This experience is created on several levels via the analog, lo-tech IdeoTag system that engages with the mixed reality of the game space.

The catalyst for the player experience in the mixed reality of Zydnei was the code switching embedded within the IdeoTags. As outlined earlier, these codes functioned on multiple levels in the mixed reality, switching as required dependent on their relationship to the city, the game or the player.

Their role in linking the layers of the mixed reality is analogous to the process of code switching – different aspects of their nature are foregrounded dependent on their context. This type of ideographic code switching plays an integral role in the function of the IdeoTags as portals in the mixed reality, allowing for traversal of different paths: portals into the fictional game world from the actual world of the city, and into the ludic dimension of the game via their collectability as objects. Via their locative function, they both transform existing locations into sites of play, and also connect these sites to the players.

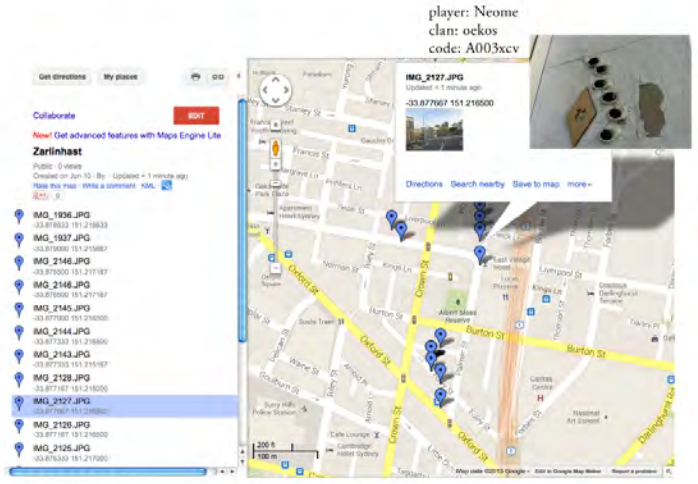

Fig. 6. Logging of IdeoTag data (© Troy Innocent)

References and Notes

1. John J. Gumperz, *Discourse strategies* (Cambridge: Cambridge University Press, 1982).

2. Adam Greenfield, *Everyware: the dawning age of ubiquitous computing* (Berkeley, CA: New Riders, 2006).

3. Pierre Lévy, *Dynamic Ideography. Towards an Artificial Imagination* (Paris: La Découverte, 1991).

4. Manuel Castells, *The Informational City* (Oxford: Basil Blackwell, 1989).

5. Katie Salen & Eric Zimmerman, *Rules of play: game design fundamentals* (Cambridge: MIT Press, 2004).

6. Johan Huizinga, *Homo Ludens* (UK: Routledge, 1949).

7. Jesse Schell, *The Art of Game Design: A book of lenses* (USA: CRC Press, 2008).

8. Andrew Tink, *Lord Sydney: the life and times of Tommy Townshend* (Australia: Australian Scholarly, 2011).

9. Troy Innocent, 'Digital Media Aesthetics & Materiality: imprinting into and out of the virtual across the real', in Luke Morgan (ed.), *Intersections and Counterpoints Proceedings of Impact 7, an International Multi-Disciplinary Printmaking Conference* (Australia: Monash Art and Design Series, 2013).

CINEMATIC EXPERIENCES AND THE DIGITAL MOVING IMAGE

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Abstract

If the introduction of the digital into moving image production does not alter the cinematographic device, nor change any of the essential features of the cinema, then the production of digital moving images will not affect the essence of cinema. If any of the essential features of cinema are, in fact, superseded by the digital features of the moving image, they should be named as *cinematic experiences*, which are defined as *moving image production, digitally mediated, that looks for its essence in the consciousness of movement and visual rhythms.*

Keywords: cinematic, experience, cinema, digital, moving image, production, interaction, spectator, actor.

Fig. 1. OP_ERA. (©Rejane Cantoni and Daniela Kutschat. Photo © João Caldas.)

Figure 1 is a photograph from OP_ERA, of the Brazilian artists Rejane Cantoni and Daniela Kutschat. This is a work that has been evolving in its format and has been presented in various places in the world. Inside OP_ERA [1], a luminous cube with lines and forms can be moved in real time with the finger or the attitude of the participants. The question here is: Is OP_ERA a new form of cinema? Cantoni, one of its creators, confirms that it is cinema in four dimensions and Jorge La Ferla in his book *Cinema (and) Digital* describes this work as "cinema that appeals to sensorial experiences and exceeds the audio-visual perception" [2]. OP_ERA isn't the only case that raises this question. In his book *The Language of the New Media*, Lev Manovich talks about the interactive CD-ROM, videogames and the experiences of net-art as new forms of cinema [3]. The theoretical trend seems to move in that direction. In universities around the world, seminars are given that respond to names of "New Cinema", "Intelligent Spaces", "Interactive Cinema" or, as in the case of the ISEA2013 panel, "Transformative Cinema". What needs to be asked is whether the concept of cinema depends on film (in the physical sense) as a fundamental support of its existence, and how the digital production of the moving image intervenes with the very nature of cinema.

The cinema finds its foundation, its birth, its essence, in the possibility of producing moving images. But, when was cinema born? The history of moving image production goes back at least 2.500 years, when Plato used *Allegory of the Cave* as an example of this. [4].

Historically, there were three different aspects which led to a good ending for the moving image production:

1) The research about the production itself of the moving image and its projection;

2) The research about the theory of persistence of vision;

3) The application of the invention of photography, that is, of the means to capture reality, and its specific application in the chronophotography [5].

These three areas of research began to converge until the Lumière Brothers assembled the cinematograph. For the first time, moving images of reality were publicly projected in the darkness of a cafe in Paris, with a paying audience. Through the use of film, they were able to copy and distribute their work with the purpose of presenting the show afterward in another room. Cinema, as a general consensus, was born there, on the 28th of December 1895 [6].

However, for some, cinema wasn't born there, only the first implementation of cinematography. Morin [7] affirms that cinema was born when Méliès understood the real effect of the device he was handling which gave him the power to perform magic tricks. Another perspective is that of Deleuze [8], who argues that cinema conquered its own originality when it found editing, the moving camera and the emancipation of the projection of a shot; that is, when cinematography transcended as a mental image. In that case, when was cinema really born? In the year 1895 with the cinematograph? Or was it in 1897, when Méliès consciously incorporated editing? Or was it still later, in 1911, when Griffith laid the foundations of the North American school? Or was it in 1925, when Eisenstein formalized his theories?

Defining the founding of cinema becomes very important for this research because the characteristics of analog moving image production were also configured at that moment, which is the basis of cinema. That said, given that without the production of the moving image there would be no cinematography, and without cinematography there would be no cinema, we find in the Lumière's projection the founding moment that configured the cinematographic device. From the rigorous analysis of that founding moment and its period, we identify in this research a definition of cinema: *moving images of the reality projected on a screen in a dark room with simultaneous audience that may be reproduced in films and distributed in a number of rooms*.

The definition of the founding moment is used here to identify the essential features of the cinema, which are:

1) To be an index or trace of reality [9] and

2) moving image projection [10]. Let's remember that cinema was born as a direct consequence of the historical search for the capturing of reality and its representation in movement.

3) At least one member of the audience is required since it's he/she who completes the movie [11];

4) The fascination of the big picture: both Bazin and Machado, through Dubois and Deleuze, found the spectacular and breathtaking moving images project-

ed on a large screen to be fundamental [12], a feature which is complemented by the fifth attribute;

5) The dark room, a mythical space that besides allowing the cinematographic experience, also makes it possible for the spectacle to make sense;

6) The sixth place is the immobility of the spectator: it is exactly because the spectator is immobile that cinema has been able to improve the way that it has [13]; and

7) The intention of explaining a discourse; the moving image is the support through which the ideas, sensations or feelings of a given historical moment are immortalized.

Several observations can be made by reviewing OP_ERA through these criteria. Let's compare it with the essential features of the cinema: although there is a fascination by the great image and this happens in a dark room, in OP_ERA, there is no shooting, the post-production is live; the spectator is released from his immobility and intervenes in the work; the discourse explained would transform here in an invitation to a sensorial experimentation; and there are no traces of reality in the moving image detached from back projections. Even so, is it cinema? Would we be able to make the arguments that it is not cinema?

The only thing we can affirm with certainty at this moment is that the construction of the moving image that OP_ERA provides, entirely mediated by the digital, is generated at the very moment when the work occurs, which doesn't happen with the moving image produced by the cinematograph. Does this mean that the digital is able to produce a moving image different from the one the cinema has produced until now?

The moving image as product of cinema is an illusion: it is the sum of immobilities; it is, as appreciated by Oubiña, “the typical example of the false movement” [14]. When investigating this construction of the moving image, the frame appears as the basic, primary element. The frame is a concrete fact, is there, with its translucent image captured from reality which is crossed by the light. That makes us wonder: where are the frames of OP_ERA?

Today, it's a fact that the digital cycle of moving image production is complete: capture, processing, post-production, distribution, exhibition and projection; they are all already digital. But in essence, how does this affect the digital production of the moving image?

When we *digitalize* something, what we are doing is taking signs of reality at intervals, equal to what happens with the frames of cinema. But after doing so, these intervals become pieces of information and are in turn entered into a mathematical function, which, among other things, has the ability to predict and reproduce any point between two given intervals. In this way, if one wants to get the interval 2A, that non-existent frame that would be between the frame 2 and the frame 3, the mathematical function would be able to generate it.

At this point, we can already identify two elements of the digital that make an impact on the production of the moving image: first, it requires an algorithm generating the mathematical function to be able to get the moving image that no longer depends only on the succession of immobilities. Second, the support of the image is no longer the frame and becomes a code. The potential transformation of cinema doesn't happen simply because it has become digital or because it is working with pieces of information discreetly. The real transformation happens because the support that bears the moving image has changed: it has moved from the photographic picture printed on film, to the code executed by mathematical equations.

In theoretically developing the potentiality of this kind of support and comparing it with our analysis of multiple works, we are able to identify the characteristics of the moving image digitally produced. These characteristics are outlined below:

1) It is no longer an index or trace of reality. The digitally produced moving image could be constructed just by using code and mathematical equations, or even signals from sensors. It doesn’t need moving or still pre-recorded images by a camera to exist;

2) It allows for the simulation of reality based on mathematical equations;

3) Besides becoming separate from the capture of reality, the digitally produced moving image has the potential of being continuous: it is simply a matter of time before the mathematical formula can be developed that shows the result continuously, instead of extracting the frame from the time vector.

4) It opens up creative possibilities in the dialogue with the machine.

5) The notion of authorship becomes vague. Who is the author of a digitally produced moving image? The one who conceptualize it, the one who made the programming, the one who alters machines to get the expected result? The user? The algorithm?

6) The immateriality of the support doesn't imply nor guarantee its visibility in time, that is, it is tied to its interpretation by a device.

7) It is a numerical representation;

8) It can be produced, recognized and indexed by automated processes;

9) Its intrinsic variability allows it to be interactive. Maybe this is its greatest potential and with no doubt, its greatest difference from the analogous cinematographic image: To be a numerical representation allows the digital moving image to respond to the action of an actor in a given environment. Finally,

10) The digitally produced moving image has been able to permeate the cultural layer [15]. Only the arrival of the digital in the production of the moving image allowed us to create cities of light. This wouldn't be possible without moving images generated by codes and equations that respond in a singular way to the environment and people who live there.

At this point, the first conclusion can already be outlined: *The digitally produced moving image is different from the image produced by the cinematograph. The digital alters the production of the moving image when modifying its support, which was the frame or photographic picture, to become the conjunction of code and equations. This also alters the representation of the moving image when modifying its ways to show the image, and broadens its possibilities in the representation.*

Having said that, from the point of view of the moving image, what is the difference between going to the movies today or a hundred years ago? In truth there is no difference. While as we outlined the digitally produced moving image is different, its very nature allows it to *simulate* the one produced by the cinematograph [16]. Therefore, there is a second conclusion: *cinema will not disappear nor will it be transformed in an essential way with the digital production of the moving image if it keeps the* ***simulation*** *of the cinematographic image as much in its production as in its representation.*

The question that arises is obligatory: If this **simulation** is superseded, what happens? Returning to OP_ERA, let's appreciate its aesthetic of light and colour, of visual rhythms. When analysing cinema and the experience it produces in the audience at a deeper level, and comparing it with this work, we perceive that

OP_ERA doesn't seem to match the "cinema" category. But if it isn't cinema, then what is it?

We can find another kind of moving image that is digitally produced, like an augmented reality (AR) application that looks to create a new kind of narrative. This is the case in Michael Cohen's research [17], which has involved the creation of an AR application where a person follows the road shown by some bubbles in the screen of his device. The bubbles respond to the actions of the person to warn him if his road is right or not. The moving image produced is digitally mediated and mixes virtual image with reality. In the end, the "movie" leads him to find a treasure. Tensions are set out here with the cinematographic: this sequence is digitally treated in real time, so the question arises: where is the index of reality? Where is the immobility of the audience? And the dark room? And the projection of moving images? Where is the frame? So, does this lived experience belong to cinema or does it get away from it?

As more works were observed during the research, it became more difficult to relate each of the concepts to those of cinema. Then, it was necessary to identify a new category which better fits these works. Taking the meaning of the words into account, the context which has been used and its relationship with this research, we call this new category *cinematic experience*.

A cinematic experience is a moving image production, digitally mediated, potentially requiring an action and that looks for its essence in the consciousness of movement and visual rhythms.

This definition consists of four parts: in principle it considers that the moving images must be *produced*, that is, behind them must be an exercise of preparation that gives life to the moving image. It also considers that the production process, or staging, or the waited result, is *digitally mediated*, which implies that its support is code and this is executed through algorithms. This digitally mediated moving image production potentially *requires an action*, which means that it can allow the audience to be involved with the moving image produced in the surrounding environment. Finally, this digital moving image looks for its essence *in the consciousness of movements and visual rhythms*, which implies that the image production affects vision and exalts the *consciousness* of the movement caused by the light.

This definition distinguishes *cinematic experiences* from *movies, expanded cinema* and *installation art*.

This research also explored different milestones in the production of the moving image to determine which of them could be considered the birth of cinematic experiences. Research was undertaken into the prehistory of cinema and the birth of cinema, and it was found that digital technologies were not involved and the action of the spectator was not required. It was not until 1958 with *Laterna Magika* of Svoboda and *Kinoautomat* of Çinçera that all characteristics of digital moving image were found together, but there is no evidence of the use of digital technologies for its exhibition. It was Youngblood who documented the first use of digital technologies by artists in the 1960s [18]. In analysing these works, this investigation determined the birth of cinematic experiences on March 19, 1963 with the first exhibition of Nam June Paik [19].

Once this new category was identified, we decided in this research to do the exercise of comparing the different results obtained with the intention of identifying the new aesthetic, result of the cinematic experiences. For this, we compared the characteristics of digitally produced moving images with the essential features of cinema, in the light of the categories that Greenaway proposes for rethinking a cinema of the future [20], with these results:

1) The camera is not essential to produce the digital moving image. Besides, the concepts detached from the use of the camera, such as the frame, the point of view and the editing, in the strict sense of cinema, aren't transferable to the cinematic experiences.

2) The issue of the digital disputes the legitimacy of the cinema screen being the ideal space to see moving images. The use of digital tools contributes to the breaking up of the traditional frame of representation, mainly with the computer, projections and unconventional interfaces.

3) The digital nature of moving image production distorts the necessity of the linear organization of the moving image flow. In its place, these will respond to pre-programmed algorithms and to the intervention of some other agent or at random. From this perspective, there is no equivalent to the text as an organizer of the audio-visual story in the cinematic experience, and databases will appear as a new cultural form, which together with the algorithm and the very intention of the audience, make it easier to take new unpredicted directions.

4) In the cinematic experience the concept of actor is modified according to three approaches: a) the possibility of creating digital actors that may exist by default or be created when the cinematic experience is in progress; b) The transformation of the spectator is potentially becoming the spectator-actor: what makes the big difference with cinema is the ability to allow the members of the audience to react in front of the cinematic experience and intervene in its development; c) The geographical distribution of spectators-actors related with the same cinematic experience at a given moment, thanks to tele-presence tools.

As we can see, the aesthetics of the cinematic experience differ widely from cinema, which allows us to outline the third and last conclusion of this work: *when a digital moving image is produced by creatively exploring one or several of its characteristics, and exceeds one or several of the essential features of cinema, the result is a cinematic experience.*

Cinematic experiences are a conjunction of knowledge, techniques and aesthetics gathered at a crucial point and evolving the arts towards a new form without a name. As La Ferla knew intuitively, much of what is seen in the cinematic experience was imagined first by cinema. Maybe that's why it is difficult to think that what the cinema imagined, when it becomes reality, is not cinema. When we understand that the cinematic experiences go beyond the cinema and installation art, a new panorama arises for the moving image which is immense, not only for the production, but also for theoretical reflection along the following lines: the subjects of image and light representation in the cinematic experiences; the exploration of the poetics of the cinematic experiences; the relationship of the spectator-actor as a postmodern person with digital cultural creations; the development of cinema; the creative act which depends on the digital; the role of the human perception in a world where communication between machines takes priority over the communication between humans.

When our children grow up, maybe the fundamental question raised here will be irrelevant, since the digital will already be the only support in their world. Even so, the concern about the moving image production will continue to prevail. They must be very attentive to find the way to get away from the surrounding prison of datum and light.

* Translation: Maria Helena González and Aaron Brakke

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References and Notes

1. Rejane Cantoni, Daniela Kutschat, *OP_ERA* (2001-2005) Installation. <http://www.op-era.com/video2.htm>, accessed 8 July 2013.

2. Jorge La Ferla, *Cine (y) Digital* (Buenos Aires: Manantial, 2009).

3. Lev Manovich, *El lenguaje de los nuevos medios de comunicación* (Barcelona: Paidós, 2006).

4. Platón, "La República o de lo justo - Libro VII" in *Obras completas de Platón*. Azcárate, trans. (Madrid: Medina y Navarro, 1872).

5. CFR: C. Ceram, *Arqueología del cine.* (London: Ediciones Destino, 1965); David Oubiña, *Una juguetería filosófica.* (Buenos Aires: Manantial 2009); Manovich [3].

6. Ceram [5] p. 149.

7. E. Morin, *El cine o el hombre imaginario.* (Barcelona: Paidós, 2011)

8. G. Deleuze, *La imagen-tiempo. Estudios sobre cine 2.* (Barcelona: Paidós, 1987).

9. Manovich [3] pp. 368; A. Bazin, "Will Cinema-Scope Save the Film Industry?" in *Future Cinema: The Cinematic Imaginary after Film*. (Cambridge, Mass.: MIT Press, 2003)

10. La Ferla [2] p. 186.

11. CFR: C. Metz. *El significante imaginario (*1977); P. Dubois, *Cine y arte contemporáneo: de la migración de imágenes a la migración de dispositivos*. (R. Rivera Berrío, interview, 2011)

12. CFR: P. Dubois, *Fotografía y cine en el arte contemporáneo*. (R. Rivera Berrío, interview, 2010); Bazin [9], pp. 82; A. Machado, *El sujeto en la pantalla.* (Barcelona: Gedisa, 2009); R. Hamilton, "Glorious Technicolor, Breathtaking Cinema-Scope and Stereophonic Sound" in *Future Cinema: The Cinematic Imaginary after Film* (Cambridge, Mass: MIT Press, 2003).

13. Manovich [3] pp. 155-164.

14. Oubiña [5] p. 76.

15. Manovich [3] p. 93.

16. La Ferla [2] p. 64.

17. M, Cohen, *Core Tools for Augmented Reality* (2009), film. <http://www.youtube.com/watch?v=KBEXxW3qAMg>, accessed 8 July 2013.

18. G. Youngblood, *Expanded Cinema*. (New York: Dutton, 1970).

19. Nam Jun Paik, *Exposition of Music – Electronic Television (1963)*. <http://www.medienkunstnetz.de/works/exposition-of-music/>, accessed 27 September 2013.

20. P. Greenaway, "Cinema is dead, long live cinema?", *Caderno SESC_Videobrasil 03* (2007) pp. 98-103.

DÉRIVE IN THE DIGITAL GRID, BREAKING THE SEARCH TO GET LOST

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Abstract

This paper seeks to explore whether the psychogeographic technique of dérive can be used to break out of the directed pattern of 'search to find' in the online space following from Lev Manovich's concept of the Poetics of Navigation [1].
An online psychogeographical dérive could be a form of digital resistance to the various ways information is being dictated to us from contemporary authoritarian rules and search engines.

Key words: derive, text, psychogeographies, digital technologies, grid.

Introducing: walking practice and dérive in the real city

Throughout the twentieth century, urban walking has been regarded as an aesthetic practice and critical tool for exploration, critique and immersion in the ever-changing city. Two great concepts that have been associated with the former are the flaneur and psychogeographical dérive. Both walking concepts and the city have also been grasped through metaphorical schemas from time to time. Metaphor will constitute a significant approach throughout this paper to delineate further interconnections between the physical and the virtual.

Returning to "real" life, a series of artists, poets and cultural theorists have practiced flanerie in one way or another. Examples include George Simmel, the Surrealists, Walter Benjamin, the Situationists International, Michel de Certeau and contemporary walking artists. In every case, it was the city that constituted the main platform for expression and an influential space for exploration or even actual or symbolic resistance. Walter Benjamin practiced flanerie in the city by producing significant cultural texts on the experiences and reflections he had. His metaphorical expression of the flaneur who 'goes botanizing on the asphalt' [2] reveals the interrelation of the urban walking practice with a variety of social, sensorial and spatial encounters. However, the Benjaminian flaneur was characterized by a kind of melancholia – a condition triggered by the city that is no longer a "fruitful" labyrinth of chance encounters for him.

Drawing from the former, the Haussmannization [3] of Paris brought an electrification and illumination of the streets as well as a regeneration of them. The Parisian boulevards became not only dynamic sites of transience but also sites of spectacle [4]. The concept of the flaneur came to be interrogated by the coming of Situationists International [5]. Guy Debord – among other members – called for a critique of the society of the spectacle, which is something that goes hand in hand with the multiparametric character of the city. Situationists International continued the walking practice within the city but their approach was far more active than the flanerie practiced by previous practitioners such as Benjamin and the Surrealists. Situationists International's central aim was the 'construction of momentary ambiances of life' [6] and the main tool for this accomplishment was the walking technique of psychogeographical dérive [7].

Dérive's main goal was the construction of situations through a 'rapid changing of ambiances' [8] by focusing on a real pleasure of movement and not on the 'manufactured desire of spectacle' [9]. However, the methodological backbone of dérive was not based totally on random factors but on simple directional algorithms. An example of such an algorithm could be: "Go left, go left, go right", which interacted with urban randomness but without other motivations. Psychogeographical dérive can be grasped as a resistive practice – totally willing to detach itself from the everyday spectacle of the city and the further conditions it entailed such as boredom and alienation. This resistive quality in urban walking is apparent in the words of Michel de Certeau, as he describes everyday urban walking as a spatial process able to affirm, transgress, suspect and respect [10].

Setting the metaphors: the city as Internet and walking as virtual navigation

As the intention of this paper is to interrogate the potential application of dérive in the virtual environment of Internet networks, it is tempting to initiate such an interrogation through a set of metaphors. The ever-changing complex character of the twentieth and twenty-first century city renders it a landscape of spatial, social, economic and emotional encounters and as such - flows. The urban landscape is no longer a material space to be traversed and lived, as aspects of it have been augmented through what it has been described as the data cloud. We could suggest that the Benjaminian flaneur of the early twentieth century city does not only go 'botanizing on the asphalt' [11] but has been altered a hybrid flaneur of the twenty-first century city who also practices a 'botanizing on the urban data' [12].

The city and the Internet seem to have commonalities in the way they are experienced by the moving subject or the online navigator-user. Both the city and the Internet can be physical or virtual platforms of an atomized behavior/use or a fruitful interaction. What is more, both the city and Internet can consist of vast and complex highways of traffic or information exchange, and offer different levels and intensities of stimulation. If their structure can be suggested as a vague cloud of social or web connections characterized by real or virtual anonymity, then a gamma of potential distractions has to be also taken into consideration. However, mobile geospatial technologies of everyday life have impacted on the way pedestrians experience the city – resulting on an elimination of "getting lost". The change on the experience of the city due to such geo-locative technologies resembles to what Benjamin also saw on the decline of flanerie during the Haussmannization of Paris. The possibility of getting lost entails an avoidance of directions; smart phone digital maps as well as the consideration of possible public space constraints (CCTV, semi-privatized spaces) [13]. Thus, it is very likely for the urban walker to face a level of difficulty while trying to let him/herself be exposed to a randomness of urban stimuli.

If we pass from the physical landscape of the city to the virtual landscape of the Internet, we arrive at the central questions proposed by this paper. Can someone break the rules of online information searching in order to make his/her navigation more spontaneous? Also, can the online navigator (user) trespass the engine's suggestions, which function as informational distractions?

Lev Manovich uses the same metaphor of navigation to present links between physical and virtual space as well as highlighting correlations between the

flaneur and an online ‘data cowboy’ [14]. Indeed the practice of walking in the city and the encounter with a gamma of stimuli and situations may often resemble an online navigation through an informational landscape. Such navigation can be defined through a rhythmical relationship (e.g. number of clicks, right click to edit a found result). Elias argues that an equivalent approach of psychogeographical dérive in the virtual space of the Internet could be net.art, which ‘aimed at defamiliarising [online] space and reconnecting it to human desire’ [15]. Net.art works are often produced and presented online – mostly based on multimedia and data from other Internet materials. The viewer accesses them through the screen and the use of the mouse. Such works reveal traces of online psychogeography, such as when cyber-artists make use of code to undermine authoritarian codification systems that pertain the Internet.

In the current online environment, which is characterized by authoritarian informational frameworks, recommendations and “data messiahs”, the user’s choice for personal and new informational paths seems restricted. The latter calls for an online dérive tactic, which could form a potential of digital resistance against such online authoritarian systems. In other words, the randomness of the encounter that Situationists International sought to achieve through dérive seems to be a significant starting point for an online dérive. As while walking in the city through buildings and street names, the online dérive seems to be deployed through online addresses and hyperlinks. The random encounter is defined by clicks and links, where the starting point (link) is what the user enters to initiate an online wandering. Departing from the metaphors of walking in the city and navigating the Internet, randomness constitutes a potential platform for such online dérive. However, how exactly can an online dérive be constructed through arts and computational design methods?

The randomness: deconstructing the digital grid

In her book *How We Became Post human: Virtual Bodies in Cybernetics, Literature and Informatics* Katherine Hayles discusses how we must begin to move beyond defining our society in terms of either absence or presence and must instead explore the new kinds of relationships formed between randomness and pattern, where randomness is seen as a productive space and not merely as determined by the absence of pattern. For example, randomness within genetics causes mutations, which may aid the continuing survival of a species [16]. In contrast to Hayles argument, currently the Internet users tend to view randomness, as a failure in the code. Contemporary society has developed methods for controlling and limiting our Internet exploration by making the system more efficient. This efficiency derives not only from technological developments but also the financial drive of corporations to manipulate the user. Within this paper navigation should be seen instead, as the vehicle to explore how acts of randomness, can manifest as a productive methodology within computational arts.

The idea of using patterns as a means to navigate data stems from Vannevar Bush’s writings which have undoubtedly had a profound impact on the way we research through data today. His concept of the memex—a combination of "memory" and "index"—has inspired the way that we currently use Internet navigation. This was first mentioned within his seminal paper *As We May Think* (1945), which discusses and predicts how scientists may use and connect technologically to a vast array of archives in order to gain a better overview of an ever-complicating world of research. However, despite Bush’s technophilia, in 1945 he was already critical of the progression of science and its inability to provide scientists with better tools for handling the massive external records of data they were creating. In his paper he laments: “so much for the manipulation of ideas and their insertion into the record. Thus far we seem to be worse off than before - for we can enormously extend the record; yet even in its present bulk we can hardly consult it” [17]. This type of thinking has influenced the field of computing to prioritise the creation of better algorithms (patterns) as opposed to considering the possibilities of serendipitous discovery and randomness.

In order to understand these patterns in relation to the digital grid, we can return briefly to the example of the city and compare the fixed grid system of New York to that of London, which, due to the historical development of the city, has a more organic and permeable structure. This structure is not only enhanced by the materials it is been made from, the name, size and form of the street, but is also connected to the historical, cultural and economical data of the city, that prompts you to further investigate and explore alternative destinations and non-linear routes. As a result of this there is an enhanced possibility of getting lost and finding unexpected outcomes. Further to that emerges the question of whether any aspects of the Internet can be used and fed back into a digital practice of Dérive.

The randomness: exploring practices

“If I have no room nor space for further critical thinking

If I am not questioning the data nor the information shown to me

If I am always given directly what “I really want”

…then am I any different from The Machine?” [18].

To begin to penetrate current practices around information retrieval we must look into the most common method of Internet navigation: the Search Engines. In its emptiness, the search box on the browser suggests a reaction, which creates the presence of information through pattern. The very name “search engine” implies that the “search” actually happens through the machine and you are merely the catalyst of its action. The word “search” also implies an active approach to navigation - in the same way that when you are looking on the bookshelf for a book, what you may find instead is another piece of information that triggers you from a memory, nostalgia or personal cognition. This may capture your attention and lead to new investigation. Through the semantic web particularly through social media, the practice of searching is changing, allowing us to find a balance between the information retrieval techniques of search engines and a tacit exploration of looking for “the” book, as described above. This semantic web approach to the information produced in social media is informed by our choices, for example by the action of selecting people you want to “listen” to, rather than being driven by the machine.

An example of this could be Twitter whereby you expect to discover, depending on who you follow, unexpected information. This information will only be revealed to you through the gaze [19] and your own personal interpretation of what tweets attract your focus and engage your pilgrimage.

~~Database~~ is an exhibition that explores

navigation and memory, in conjunction with opposing words being selected and displayed [20]. In this context your expectations of data navigation are inverted when you click a keyword within a text on the screen and expect to travel through a hypertext to information about that word, but are instead confronted with its antonym on the projector. This alternative response challenges the passive user to become active and to question the relationship between the word on the screen and what is being projected. This questioning leads to a psychological search that moves between personal experience, cultural understanding and memory to form a response. You are then advised to print the text on screen and this time your navigation is the direct cause of the erasure of text, as each of the words you have clicked has been blacked out. This loss of documentation (of the words that most interested you) forces the formation of a memory, of your understanding of the words on screen and the projected antonyms.

Rosa Menkman [21] also discusses the use of loss, through the Glitch or error as opposed to deliberate erasure, as a productive space for artistic practice. She suggests that rather then the Glitch being viewed as a negative or 'failure of the software', this unexpected loss of data allows the randomness of the machine to be exposed which creates unpredictable opportunities for exploration. This breakdown of the grid allows Menkman to create poetic and thoughtful audio-visuals (see for example The Collapse of PAL: http://vimeo.com/12199201), which through crafted video manipulation and sections of narrative, presents philosophical statements about technology and society.

Another example of how technology can be used to break the implicit qualities of the search took place in Delphus under the IP research collaboration programme "*From Real to Virtual*" which exposed the imperfections of the grid for artistic merit. A series of translation performances was created through using Google Translate to translate one English sentence through thirteen different languages and then back to English. The outcome of the experiment was a manuscript of nonsensical content. By amplifying the error through multiple translations, this "performance" taps into the poetics of the text rather than the literal content you expect when you are translating text [22].

Final Thoughts

The aim of this paper has been to briefly discuss the ideas of spatial navigation in relation to the online information in our role as human beings in that practice [23]. Search engines and the Hypertext have created the illusion of having more control over specific data. Digital technologies have created the illusion of having more control of navigation through search engines, the hypertext, GPS technologies, online maps and so on. From our personal physical navigation of the world, to the way that we find and use information, our tolerance of 'getting lost' seemed to have been impacted as we find ourselves getting irritated when the map leads us the wrong way or when we end up with information we had not meant to find.

These practices inform our understanding of the world and our environment. Although it may be more effective and pleasurable to have the "world at our fingertips" we must critically question what it is we want and who we will become if we always find immediately what we seek, as it is the human aversion to being "out of control" that drives and arouses these innovations. This is not a critique of technology per se, but a critical questioning of our understanding and role as active users, as opposed to passive consumers of information, including the way we build layers of information through cognition that enhance rather then diminish our imagination. This paper proposes that one way of actively stimulating our imagination is through the unexpected use of the glitch, error and getting lost.

References and Notes

1. Manovich, L. (2001) The Language of New Media, Cambridge, MA: The MIT Press. [2000:223]

2. Benjamin, W. (1973) Walter Benjamin: Charles Baudelaire: A Lyric Poet in the Era of High Capitalism, trans Zohn, H. NLB, London 1973, Online Resource, Monash University Library. [1973:35-36]

3. "Baron Georges-Eugene Haussmann, chosen by Napoleon III to lead the project, created new roads, public parks, public monuments, as well as installing new sewers and changing the architectural façade of the city." For more information http://www.arthistoryarchive.com/arthistory/architecture/Haussmanns-Architectural-Paris.html (Accessed 25 May 2013)

4. Sennett, R. (1977) The Fall of Public Man. London; New York: Penguin Group

5. From now on, the authors will be referring to the Situationists International with the S.I. abbreviation.

6. Debord, G. (1957) 'Report on the Construction of Situations and on the International Situationist Tendency's Conditions of Organization and Action' trans. Ken Knabb at Situationist International Online. Available at: http://www.cddc.vt.edu/sionline/si/report.html [Accessed 19 April 2013].

7. Psychogeography is the theoretical framework that is being realized through its critical dérive. In other words, psychogeography constitutes the meeting point of art, psychology and geography.

8. Debord, G. (1957) 'Report on the Construction of Situations and on the International Situationist Tendency's Conditions of Organization and Action' trans. Ken Knabb at Situationist International Online. Available at: http://www.cddc.vt.edu/sionline/si/report.html [Accessed 19 April 2013].

9. Elias, A. J. (2010) 'Psychogeography, Detournement, Cyberspace', New Literary History, Volume 41:4, Autumn 2010, pp. 821-845.

10. De Certeau, M. (1984) The Practice of Everyday Life, Berkeley: University of California. [1984:99]

11. Benjamin, [1973: 35-36]

12. Psarras, Bill. (2013) 'Hybrid Walking as Art: Art Practices and Approaches on Revealing the Emotional Geographies of Tube Stations', Proceedings of 2nd Hybrid City 'Subtle Revolutions' International Conference, 23-25 May 2013, (eds.) Charitos, D., Theona, I., Dragona, D. Rizopoulos, H. and Meimaris, M. The University of Research Institute of Applied Communication, Athens, Greece. pp. 415-422. ISBN 978-960-99791-1-5

13. For more information http://blasttheory.co.uk/bt/work_cysmn.html (accessed 25 may 2013)

14. Gibson in Manovich, [2001: 217].

15. Elias, [2010: 827]

16. N. Katherine Hayles, 1999. How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics. 1 Edition. University Of Chicago Press., [1999: 285-286]

17. Bush, [1945:12]

18. *Desktop* Psychogeographies | *ISEA2013*. [ONLINE] Available at:http://www.isea2013.org/events/desktop-psychogeographies/. [Accessed 30 June 2013].

19. Lev Manovich | Essays : An Archeology of a Computer Screen. 2013. Lev Manovich | Essays : An Archeology of a Computer Screen. [ONLINE] Available at: http://manovich.net/TEXT/digital_nature.html. [Accessed 25 May 2013].

20. Hayles. 2013. Hayles. [ONLINE] Available at:http://www.culturemachine.net/index.php/cm/article/view/245/241. [Accessed 30 June 2013]

21. Glitch - Benchmarking the deranged: Rosa Menkman at TEDxUtrecht - YouTube. 2013. Glitch - Benchmarking the deranged: Rosa Menkman at TEDxUtrecht - YouTube. [ONLINE] Available at:http://www.youtube.com/watch?v=64V-nkVpnes. [Accessed 25 May 2013].

22. Maragiannis, Anastasios (2011) How to be creative: collaboration in Web 2.0 community with or without text. In: XIV Generative Art: Proceedings of GA2011 International Conference. Domus Argenia Publisher, Milan, Italy, pp. 57-67. ISBN 978-88-96610-14-5

23. Margaret Wertheim, 2000. The Pearly Gates of Cyberspace: A History of Space from Dante to the Internet. Edition. W. W. Norton & Company. [2000: 37]

24. Haussmann's Architectural Paris - Architecture in the Era of Napoleon III - The Art History Archive. 2013. Haussmann's Architectural Paris - Architecture in the Era of Napoleon III - The Art History Archive. [ONLINE] Available at:http://www.arthistoryarchive.com/arthistory/architecture/Haussmanns-Architectural-Paris.html. [Accessed 25 May 2013].

25. Blast Theory | Can You See Me Now?. 2013. Blast Theory | Can You See Me Now?. [ONLINE] Available at:http://blasttheory.co.uk/bt/work_cysmn.html. [Accessed 25 May 2013].

SANITY AND MENTAL HEALTH IN AN AGE OF AUGMENTED AND VIRTUAL REALITIES

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Abstract

In this paper I discuss an approach to examining the boundary and border crossings and breakdown between the real and the virtual. To address questions like "How do gamers and inhabitants of virtual worlds manage these transitions? What are the short and long term effects of these border crossings?" I report on the development of two survey instruments to begin to investigate these questions. The results of these studies have implications concerning how virtual realities may induce dissociative experiences or lead to a blurring of boundaries of the real, of the virtual, of dreams and even identity.

keywords: Augmented, Mixed, Virtual Reality, Border, Boundary Dissociation, PTSD.

Today we engage in border crossings between the real and the virtual. Through social networking software, immersive games or augmented realities we transition from one electronic domain to another and then back. Done quickly and easily, these new technologies blur the boundaries of the real and virtual. How do gamers and inhabitants of virtual worlds manage these transitions? What are the short and long term effects of these border crossings? How do game players easily distinguish the real and not real? Will we some day be unable to tell or not even care? How do we achieve a consensus about the manufacture of reality and of mental health?

I developed two survey instruments to begin to investigate these questions. The results of these studies have implications concerning how virtual realities may induce dissociative experiences or lead to a blurring of boundaries of the real, of the virtual, of dreams and even identity. Along with the confusion of the real and the virtual there may be an accompanying erosion of a consensus regarding where we place those boundaries.

Edward Castronova [1] argues that there is a competition between the real and the virtual: "Simple economic theory predicts that in this competition the real world is going to lose." For Castronova it is a competition for people's time and attention.

Attention is determined by where you are looking. It is a finite and time dependent resource. "Gaze is location. Gaze migration is attention migration." Today we gaze at our screens at least as much as we gaze at the 'real' world. According to Castronova, virtual worlds and games offer more positive experiences than the real world. Fun is hard-wired in the brain. Games are fun, induce flow [2] and activate the brain's neuro-chemical reward system. While money can satisfy basic needs, fun is a higher order 'need' that is consistent with Maslow's idea of self-actualization [3]. People will 'migrate' to where they have those experiences. Castronova argues that "People will move if it better for them to do so," and suggests that 'fungineers', that is, game designers, are engineering a mass migration to the virtual. This will remake the real world. Where-as the cost of moving is high in the real world, the cost of crossing the border between the real and the virtual is low and nearly instantaneous.

The cultural world is a human made construct. It is as real as the physical things of the world. Castronova points out that virtual society and 'real society' share many of the same structures and patterns of behavior. Virtual reality and games are other 'real' places where human behavior plays out and can make life more exciting, rewarding, heroic and meaningful. It is rational to spend as much time as possible in virtual reality. A generation has grown up socialized in both the real and the virtual. Castronova suggests that one day a new generation will demand of the 'real' world what they experience in the virtual.

Framing the Problem

Terminology referencing conceptual places, frames, boundaries and borders has an extensive history of usage across various disciplines. Erving Goffman [4] introduced the concept of the frame and used "strip" to refer to "any arbitrary slice or cut from the stream of ongoing activity, including here sequences of happenings, real or fictive, as seen from the perspective of those subjectively involved in sustaining an interest in them." Zerubavel [5] suggests that we erect "mental fences" which delimit "geographical areas, historical events, people, ideas, and so on that appear to be contiguous, similar, functionally related, or otherwise associated."

For boundary theory, daily life is "sliced" and partitioned into discrete domains where one concentrates on what is more salient [6]. Similarly, border theory [7] addresses work-life balance and studies conflicts between work, family and "third places." Both theories employ concepts such as boundaries, borders, domains, roles, transitions and behavioral scripts. Roles can have flexible borders. Behavior can spill over from one domain into another. Permeability [8], a key concept in both theories, "is the degree to which a role allows one to be physically located in the role's domain but psychologically and/or behaviorally involved in another role."

Conventional border/boundary theory accounts only for domains of work, family and "third places." The domains of games or virtual reality constitute arguably a fourth place. Mixed augmented realities could also be treated as logically separate domains. Information itself can be thought of as another domain supported today by cloud computing. In international affairs, Vlahos describes information as representing a 'place' or domain [9]: "Communication networks established by advances in informational technology create a 'place,' called the info-sphere, in which people form new social, political and employment arrangements. The creation of this place amounts to a major change in human history."

Squaring the Circle

For Salen and Zimmerman [10] play is "a cognitive frame." It is "a way of looking at the world" and "affects how we make sense of things." They write that "As a player steps in and out of a game, he/she crosses the boundary (frame) which defines the game in time and space. The cognitive frame establishes the 'reality' of the game and the relationship between the artificial world of the game and the 'real life' contexts it intersects." Gregory Bateson [11], writing from the perspective of cultural anthropology, also invokes the use of the concept of the frame: "play occurs within a delimited psychological frame, a spatial and temporal bounding of a set of interactive messages." The concept of the frame is consistent with Huizinga's notion of the magic circle [12]:

"All play moves and has its being within a play-ground marked off beforehand either materially or ideally, deliberately or as a matter of course. Just as there is no formal difference between play and ritual, so the 'consecrated spot' cannot be formally distinguished from the playground. The arena, the card-table, the magic circle, the temple, the stage, the screen, the tennis court, the

court of justice, etc, are all in form and function play-grounds, i.e. forbidden spots, isolated, hedged round, hallowed, within which special rules obtain. All are temporary worlds within the ordinary world, dedicated to the performance of an act apart." Yet border/boundary theories do not account for such concepts as the magic circle.

Permeations

Drone Pilots for the United States Air Force are on the front lines of a mixed reality between the real and virtual. Piloting unmanned aerial vehicles far removed from the battlefield, they work an 8-hour day in an environment not unlike some video game flight simulators. After a day's work they return home to their loved ones. The contrast between work and family life could not be greater. Anecdotal accounts indicate some of these pilots experience higher levels of stress and conflict. To use the terminology of border/boundary theories, the permeable boundaries between workplace and home may lead to spillover effects such as Post Traumatic Stress Disorder (PTSD).

A former Predator drone pilot remains haunted by the accidental killing of a child when he was ordered to launch a Hellfire missile at a targeted building in Afghanistan [13]. He was unable to sleep and broke up with his girl friend. At one point he collapsed and coughed blood. He was eventually diagnosed with PTSD.

Many of these pilots live and work in the continental United States. A drone pilot is physically present in one domain, however he or she must be psychologically and perceptually in another domain (the virtual representation of the battlefield). When they leave work they must immediately transition back to everyday life. Many have young children of their own. Some are unable to maintain the boundary between work and family life. PTSD is a possible result of the permeations and spillover from the virtual to the real. Additional research is required to tease out the permeations and conflicts between the domains of family, workplace and the mixed reality of the remote, virtual battlefield.

Google Glass promises yet another brave new world of mixed realities. This technology offers the exciting vista of wearable computing for anywhere, anytime access. Instead of transitioning back and forth between the real and the virtual, Google Glass allows permits one to experience the virtual and the real at the same time. The user can mix reality by viewing photos or videos or even augment the real with a computer generated overlay.

The walls between the real and virtual will continue to erode with ever more intrusive interface technologies. Critic Steven Rosenbaum [14] points to the logic of increasingly intrusive user interfaces:

"The next step for game designers is to introduce psycho-emotional inputs measuring anything from heart rate, facial analysis, voice measurement, skin conductance, eye tracking, pupil dilation, brain activity, and your ever-changing emotional profile. These games will know the user at a subconscious level and deliver an experience that could forever blur the line between virtual and reality."

There is a longstanding debate over the lasting psychological effects of violent video games. At best, the evidence points to correlations but no causal effects. Yet 'permeations' have had real impacts on real lives. For Devin Moore [15], the boundary between the real and the virtual completely collapsed when he acted out a script straight from Grand Theft Auto Vice City. Moore shot dead three policemen. When apprehended Moore purportedly said, "Life is a video game. You've got to die sometime." Moore's lawyers invoked the 'GTA' defense claiming excessive game play of GTA 'programmed' him to enact a GTA scenario. His defense lawyers also claimed Moore suffered PTSD from a history of child abuse. Devin Moore was convicted of murder and sentenced to death on October 9, 2005.

In the Diagnostic and Statistical Manual of Mental Disorders abbreviated as DSM-5 [16], PTSD is classified as a trauma and stress related disorder. A striking characteristic of PTSD is persistent re-experiencing of the traumatic event. This suggests that given the right conditions there can be confusion between real life and past events.

Virtual reality therapy (VRT) or virtual reality immersion therapy is designed to recreate or replay virtual scenes, which allows patients to re-experience a trigger event without the real world risks. By repeated exposures, a patient habituates to the trigger event and no longer re-experiences the psychological trauma and stress. The efficacy of VRT has been validated as a treatment for PTSD [17]. VRT has already moved in the direction of Rosenbaum's prediction. VR-based therapy can allow clinicians to add and adjust the intensity of sound, smells or and vibrations in order to discover what triggers a subject's reactions.

Dissociation

Individuals who suffer from PTSD are also more likely to have a dissociative disorder. One study of a population of women diagnosed with dissociative disorders showed that seven percent also suffered from PTSD [18]. In other words, those with a diagnosis of PTSD all suffered from a dissociative disorder. The DSM-V [19] defines dissociation as: "the disruption in the usually integrated functions of consciousness, memory, identity, or perception of the environment."

Dissociation is not always considered pathological. It can be a sought-after experience as part of religious rituals, self-induced trance and altered perceptual states. The diagnostic criteria for dissociative disorders from the Diagnostic and Statistical Manual of Mental Disorders Fourth Edition, Text Revision (DSM-IV-TR) [20] could easily be used to characterize the experience of immersion in virtual worlds and games. The diagnostic criteria for depersonalization disorder, as outlined in the manual, describes a "Persistent or recurrent feelings of being detached from one's mental processes or body; as if an observer." This fits the relationship of the player to the playable character in a game or the user to his or her avatar. Similarly, the DSM-IV-TR emphasizes that when an individual experiences depersonalization, "reality testing is intact."

Depersonalization can be accompanied by derealization (sometimes linked with descriptions of out-of-body experiences). The DSM-IV-TR describes symptoms of derealization as "The perception or experience of the external world so that it seems strange or unreal" and "feeling as though one's environment is lacking in spontaneity, emotional coloring and depth." Subjects may experience an alteration in the perception of object size or shape. People may seem unfamiliar or mechanical. Derealization has been described as an immaterial substance that separates a person from the outside world like a fog, a pane of glass, or a veil. Feelings of déjà vu or jamais vu are common. Familiar places may look alien, bizarre, and surreal. The same

could be said of the virtual worlds of games.

In games the player takes on another personality by enacting the role of a playable character, be it Master Chief in Halo or Tommy Vercetti in Grand Theft Auto: Vice City. In virtual worlds like Second Life, 'residents' may have multiple avatars having different genders through which they enact very different personalities. Such role-playing fits with the description of Dissociative identity disorder in the DSM-V:

"The primary feature is the presence of two or more distinct personalities, self-reported or observed by others, resulting in failure to recall everyday events and/or important autobiographical information, and impairing continuity in the sense of self. The 'experience of possession' is included as a 'personality'."

Such comparisons to the diagnostic criteria used for dissociative disorders suggest that 'users' of Second Life have experiences akin to depersonalization, derealization or even dissociative identity disorder. To test this conjecture a new survey instrument was developed and administered by Social Research Foundation [21] to a population of 59 self-identified as female and 51 self-identified as male (total 110) users of the virtual world Second Life. Respondents completed the survey online anonymously. The survey was modeled on a subset of questions from the Structured Clinical Interview for Depersonalization – Derealization Spectrum (SCI-DER) [22]. This was chosen as a model because it is a reliable and validated survey instrument and it includes questions that correlate to the DSM-IV criteria for dissociative disorders exploring the 'presence' or 'absence' of symptoms. Responses are binary (yes/no). Scores are obtained by counting the total of positive answers.

In the new survey instrument [23], question #17, which indicates the presence of depersonalization, asks: "While in Second Life have you ever experienced just for a few seconds or for a longer period of time…that you were a 'detached observer'?" 51% of the male subjects responded yes while only 47.5% of the female subjects responded yes.

Question #23 corresponds to Dissociative Identity Disorder: "While in Second Life have you ever experienced just for a few seconds or for a longer period of time…that you use two or more distinct avatars having different personalities?" 49% of the male subjects responded yes while 47.50% of the female subjects responded yes.

As scoring is based on the total number of positive answers, results [22] showed that a significant number of subjects self-reported yes to each of the questions in the survey. A parsimonious interpretation is that subjects appear to have dissociative experiences in virtual worlds. Yet these findings raise more questions. For a given population will respondents report having similar experiences in the real world? Would a survey focusing on Augmented reality produced similar or different results?

Boundaries Matter

The Boundary Questionnaire (BQ), developed by Ernest Hartmann and collaborators [24], use the notion of boundaries as an investigative tool to gain insights on how we navigate back and forth between the real and the virtual. The BQ is a 138-item survey instrument that covers 12 categories of boundaries. It yields a numeric measure for the 'thinness' or 'thickness' of "perceptual boundaries, boundaries related to thoughts and feelings, boundaries between states of awareness or consciousness, sleep-dream-wake boundaries, boundaries related to memory, body boundaries, interpersonal boundaries, boundaries related to sexual identity and other forms of identity, group boundaries, and boundaries in opinions and judgments."

Hartmann's theory of dreams utilizes a "wake-dreaming continuum" that begins at one end with "focused waking thought" having thick boundaries characterized by "solid, divisions, categorizations," while at the other end is "dreaming" having "thin boundaries" and characterized as "merging, condensation, loosening of categories."

The Boundary Questionnaire is available online in a shortened form [25]. The instructions for the Short-Form Boundary Questionnaire may be modified as follows to be administered to a population of users of the World of Warcraft: "Please rate each of the statements from 0 to 4 (0 indicates 'not at all true of me when logged into World of Warcraft;' 4 indicates 'very true of me when logged into World of Warcraft'). Try to respond to all of the statements as quickly as you can."

Hartmann writes that "women score consistently thinner than men," and that older subjects tend to have thicker boundaries than younger subjects. Artists have "thinner" boundaries while those who have higher thickness scores are "naval officers, salespersons, and lawyers." It remains to be seen what frequent players of World of Warcraft report.

Mending Fences

Simon Baron-Cohen [26] reminds us that psychiatric diagnoses are "man made" and that "how we think about mental disorders" changes with successive generations of experts. He continues: "Part of the reason the diagnostic manual can move the boundaries and add or remove "mental disorders" so easily is that it focuses on surface appearances or behavior (symptoms) and is silent about causes."

We look to further research to provide certainty. Yet Baron-Cohen's assertions suggest we can have at best tentative and provisional answers as we seek to establish the boundaries of mental disorders. Karl Popper [27] warns us the scientific method only offers provisional answers: "The old scientific ideal episteme–of absolutely certain, demonstrable knowledge–has proved to be an idol. The demand for scientific objectivity makes it inevitable that every scientific statement must remain tentative forever. It may be corroborated, but every corroboration is relative to other statements, which, again, are tentative. Only in our subjective experiences of conviction, in our subjective faith, can we be absolutely certain."

It should be acknowledged that the framework of border/boundary theories, the diagnostic criteria of the DSM-IV-TR, and the categories of the Boundary Questionnaire are at best human made constructs that yield answers both tentative and provisional but not certain. The survey results suggest users and players of virtual worlds and digital games do indeed experience dissociation. But rather than being considered pathological, dissociation is here shown to be a sought after experience. With the advent of mixed, augmented and virtual realities this blurring of boundaries is already a part of daily experience. In turn we may need to reconsider our basic notions of mental health and mental disorders.

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References and Notes

1. Edward Castronova, *Exodus to the Virtual World* (New York, NY: Palgrave Macmillan, 2008).

2. Mihaly Csikszentmihalyi, *Flow: The Psychology of Optimal Experience* (New York, NY: Harper and Row, 1990).

3. Abraham H. Maslow, "A theory of human motivation," *Psychological Review* **50**, No. 4 (1943) pp. 370–96.

4. Erving Goffman, *Frame Analysis: An Essay on the Organization of Experience* (Boston: Northeastern University Press, 1974).

5. Eviatar Zerubavel, *The fine line: Making distinctions in everyday life.* (New York: Free Press, 1991).

6. Blake E. Ashforth, Glen E. Kreiner and Mel Fugate, "All in a day's work: Boundaries and micro role transitions," *The Academy of Management Review* **25,** No. 3 (2000) pp. 472-491.

7. Sue Campbell Clark, "Work/family border theory: A new theory of work/family balance," *Human Relations* **53,** No. 6 (June 2000) pp. 747-771.

8. Joseph H. Pleck, The work-family role system. *Social Problems, 24* (1977) pp. 417-427.

9. Michael Vlahos, "Entering the Inforsphere: Communication Network as Social and Political Space," *Journal of International Affairs* **51,** No. 2 (Spring 1998) pp. 497-526.

10. Katie Salen and Eric Zimmerman, *Rules of Play: Game Design Fundamentals.* (Cambridge: MIT Press, 2003).

11. Bateson, G., "A Theory of Play and Fantasy," in *Steps to an Ecology of Mind* (Chicago: The University of Chicago Press, 1972).

12. Johan Huizinga, *Homo Ludens; a study of the play-element in culture.* (Boston: Beacon Press 1955).

13. Staff Writer (December 17, 2012) <http://politix.topix.com/homepage/3813-drone-pilot-had-to-quit-after-killing-a-child>, accessed 1 July 2013.

14. Steven Rosenbaum (June 9, 2013), <http://www.forbes.com/sites/stevenrosenbaum/2013/06/09/can-you-really-ban-google-glass/>, accessed 1 July 2013.

15. Juan Ignacio Blanco (n.d.) <http://murderpedia.org/male.M/m/moore-devin.htm>, accessed 1 July 2013.

16. American Psychiatric Association (2013). *Diagnostic and Statistical Manual of Mental Disorders* (Fifth ed.). Arlington, VA: American Psychiatric Publishing.

17. Robert N. McLay, Ken Graap, James Spira, Karen Perlman, Scott Johnston, Barbara Rothbaum, JoAnn Difede, William Deal, David Oliver, Alicia Baird, Patrick Bordnick, Josh Spitalnick, Jeffrey M. Pyne and Albert A. Rizzo, "Development and Testing of Virtual Reality Exposure Therapy for Post-Traumatic Stress Disorder in Active Duty Service Members Who Served in Iraq and Afghanistan," *Military Medicine* **177** (June 2012) pp. 635-642.

18. Vedit Sar, Gamze Akyuz and Orphan Dogan, "Prevalence of dissociative disorders among women in the general population," *Psychiatry Research,* **149**, No. 1-3 (January 2007) pp. 169-176.

19. American Psychiatric Association [15].

20. American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders*: DSM_IV_TR, (Fourth Ed.), Text Revision. Washington, DC: American Psychiatric Association.

21. Social Research Foundation. 2011 June. <http://www.socialresearchfoundation.org/> accessed June 2011.

22. Marco Mula, Stefano Pini, Simona Calugi, Matteo Preve, Matteo Masini, Ilaria Giovannini, Ciro Conversano, Paola Rucci and Giovanni B. Cassano, "Validity and reliability of the Structured Clinical Interview for Depersonalization–Derealization Spectrum (SCI-DER)," *Neuropsychiatric Disease and Treatment* **4**, No. 5 (2008) pp. 977–986.

23. Gregory P. Garvey, "The Boundaries and Borders of Dissociation in Virtual Worlds and Games," in Jane Gackenbach, ed., *Video Games and Consciousness* (Hauppauge NY: Nova Science Publishers, 2012).

24. Ernest Hartmann, Robert Harrison, Michael J. Zborowski, Boundaries in the Mind: Past Research and Future Directions. *North American Journal of Psychology* **3**, (2001) pp. 347-368.

25. Michael Jawer and Marc Micozzi (2011), <http://www.youremotionaltype.com/boundaries/quiz.html>, accessed 1 July 2013.

26. Simon Baron-Cohen (November 10, 2009), *The Short Life of a Diagnosis,* The New York Times.

27. Karl Popper, *The Logic of Scientific Discovery* (London & New York: Routledge 2005).

FROM SOUND TO WAVES TO TERRITORIES

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Abstract

This paper explores the debate around environmental humanities through the lens of sound and recent examples of sound art. Taking the emergence of ecocriticism as a point of departure, it discusses sound as a conceptual interface in our technologically mediated relationship with the environment. The notion of "shared sonic spaces" is employed to address the shift that is occurring from a "poetic of authenticity" to a "poetic of responsibility" at the intersection of culture, technology and ecology.

Keywords: Shared sonic space, radio, dolphins, ecocriticism, sound art, poetics, ecology, electronic media

In the era of the Anthropocene and globally connected ecological challenges, we clearly depend on science driven models and simulating systems that allow us to make a picture of what is happening around us. In his discussion of current affairs in eco-criticism, the literature scholar Greg Garrad draws the following distinction in regards to our contemporary "lebenswelt" and their associated poetics: "The poetics of authenticity assumes, against the evidence of ecology, that there is a fixed eternal standard we ought to try and meet. The poetics of responsibility recognises that every inflection of Earth is our inflection, every standard our standard, and we should not disguise political decisions about the kind of world we want in either the discredited objectivity of natural order nor the subjective mystification of spiritual intuition"[1]. Garrad's weighting of a "poetics of responsibility" over a "poetics of authenticity" points to the core of the question about the technologically mediated nature of our relationship with our environment. In this article I want to approach the debate presented here by Garrad through the lens of art and in particular of sound art practice.

As the title of this article indicates, I am interested in sound and its territorial transitioning, and in how we position ourselves in these territories through sound. The waves in my title not only refer to the movement of sound in space through media, like air or water, or via media technology like radio. The term also points to a political dimension, alluding to social waves and their group dynamics, and the way in which we respond to the challenges we face and the existential territories we shape for ourselves. Here I refer to philosopher Félix Guattari's concept of the existential territory. In Chaosmosis, Guattari foregrounds subjectivity over the subject and argues for a "heterogenetic image of being". Instead of speaking about instances of the self and of transference, Guattari prefers to talk about existential territory as a relational process that produces subjectivity at the nexus of milieu, socius and incorporeal ecological dimensions, including media [2]. Existential territories for Guattari allow emerging forms of subjectivity to become detached from the subject or the person and ultimately could lead to new forms of subjectivity detached from the exclusively human[3].

The current environmental debates around, for instance, the rapid decline of biodiversity or global warming stress the fact that the problem does not only pertain to existence in a human subjective way but is more explicitly about co-existence within an ecological system which includes non-humans. In these debates we often hear about responsibility – let it be our individual responsibility, for instance, as a consumer in a market society, or responsibility imagined more globally that applies to us a species in an ecological sense. If we look at the etymological root of the word responsibility, it derives from the Latin word respondere, as in "answer to, promise in return." It stresses the notion to be in response to someone or something, however this does not necessarily only suggest the direct response, as in a verbal exchange. To me it also opens up a notion of a terrain or space in which this is happening. This correlates with the spatial quality of sound and its need for space within which to resonate to be perceivable, as well as the sensorial quality of listening and how it positions us in the world, which differs from our sense of vision.

Moving on to contemporary art practice, in Conversation Pieces art historian Grant Kester addresses recent developments in socially engaged contemporary art practice, which he calls dialogical art. For Kester, one of its main characteristics is to sensitise us to the social fabric of interpersonal encounters. Dialogical art expands here the philosophical concept that, for instance, Habermas outlines of dialogical encounter and the public sphere as discursive contest. Interestingly, while Kester remains focussed in his elaborations on the domain of human dialog, he refers to Gemma Corradi Fiumara, who stresses "the long-suppressed role of listening as a creative practice"[4]. Kester integrates this into what he calls a procedural form of knowledge or connected knowing, which he defines in the following terms: "First, it is concerned with recognising the social context from which others speak, judge and act. … The second characteristic of connected knowing involves the redefinition of the discursive interaction in terms of empathetic identification" [5]. In Speaking into the Air: A History of the Idea of Communication, the media scholar John Durham Peters observes that media technology in the twentieth century has already opened up the social circle of our communication routines by inviting not only machines and animals but even the dead to join the conversation [6].

Taking Kester's concept of dialogical art and connected knowing and Peter's notion of a technologically expanded arena for interaction, I am interested in the role of sound as interface in the technological mediation of our relationship with our environment, and in asking what it can contribute to Garrad's call for a poetics of responsibility in the wider environmental discussion instigated by ecocriticism. I am particularly interested in the domain of sound because when we talk about environmental issues and in particular on a global scale the metaphors being used are mostly invested in the visual domain. To counterbalance this I want to explore the notion of what I call shared sonic spaces.

Sound: Resonance with the World

In Nature, Sound Art, and the Sacred the composer David Dunn writes: "When we look at the world, our sense of vision emphasizes the distinct boundaries between phenomena. … In contrast, the sounds that things make are often not as distinct, and the experience of listening is often one of perceiving the inseparability of phenomena. While we often see something as distinct in its environment, we hear how it relates to other things"[7]. He offers, as an example, the sounds of ocean surf or the rush of wind in trees. When talking about techno-interventions, simulation and the realm of sound, one of the first things that comes to my mind is Murray Schafer's critique of the schizophonic, which in his view entails a disconnect from nature [8]. Once sound is being recorded, it gets split from its environment and once it is played back, it looses its reference system and therefore its environmental information value. Schafer, who was clear-

ly not in favour of this loss of "authentic" information, nevertheless engaged with electronic media, as his radical radio project shows. Here microphones were placed in nature in order to have nature broadcast its sounds back – ideally with as little programming and formatting interventions as possible from the radio station[9]. According to Dunn, the deep ecology philosopher Arne Naess takes a more pragmatic stance on this matter. For Naess, the increasing fragility of the ecosphere no longer allows for any kind of extensive human encounter with nature and therefore new media will have to play a crucial role in providing ecological representations to engage with the wider public, while reducing the pressure on our actual environment[10]. Dunn concludes that "technology must be seen as a logical consequence of a co-evolutionary dance"[11]. Technology needs a critical engagement however, according to Dunn, it serves an ecological perspective in two beneficial ways: Firstly, "it can be a means for ecological self-correction by eliminating errors in our relationship to specific ecologies"[12]. Dunn refers, for instance, to the work of artist Paul Ryan [13] and his ecochannel design proposal for a community TV station in New York [14]. Secondly, it can provide "an expansion of human language into the domain of the non-human"[15]. In his own compositions and performances, Dunn uses technology to create sound driven systems that are nested in bigger environmental contexts: "My belief is there is an important role for the evolution of an art form that can address the phenomenon of sound as a prime integrating factor in the understanding of our place within the biosphere's fabric of mind"[16].

Ecocriticism: Remembering the Earth and Renegotiating Reality

In contrast to that, eco-criticism emerged in the early 1990s as a field of critical literature studies [17]. As Heise describes, eco-criticism has a "triple allegiance to the scientific study of nature, the scholarly analysis of cultural representations, and the political struggle for more sustainable ways of inhabiting the natural world"[18]. It arrived in literature studies strangely delayed, when environmentalism had already turned into a vast field of converging and conflicting projects and given rise to two other subdisciplines in the humanities: environmental philosophy and history. Having entered the humanities, ecocriticism critiqued the humanities' preoccupation with race, gender and nation while neglecting the fact that there is something like a planet and an environment upon which we depend to live. It also critiqued the dominating discourse of language and deconstruction in humanities.

The philosopher Kate Soper in What is Nature? put it this way: "It is not language that has a hole in its ozone layer"[19]. In light of the fact that this is a neat way for Soper to illustrate her point, and that it has been quoted widely, Garrad points out that hole and layer are themselves in this case strictly metaphorical and cultural and scientific constructions[20]. Philosopher Freya Mathews stresses that in the time of the current environmental crisis "the science of ecology, … has defined the first phase of the re-negotiation of our relationship with reality" but that this must be followed by a second phase "of what can no longer be termed merely an environment movement, but must be revisioned as a revolution in the very context of meaning for human cultures"[21]. An interesting case in the wider ecocritical discussion is the work of the Worldwatch Institute, which generates environment related computer models and alternative future scenarios, informed by a vast array of sources, including satellite feeds, which monitor ecological developments on a global scale to. In the view of the political scientist Timothy Lukes, Worldwatch's quest for sustainable modernisation deprives Earth of its character as a wild, mysterious place. It rather turns it into "an ensemble of ecological systems, requiring human managerial oversight, administrative intervention, and organizational containment"[22]. In addition, he notes that no critique of global capitalism as such and its "basic logic of commodification and exchange that causes ecological destruction" is being pursued [23]. By summarising this discussion Garrad agrees that it is crucial to consider systemic critique as articulated by Lukes but at the same time this discussion shows at a fundamental level the "failed promise of authenticity"[24] in our conception of the planet in ecological and political terms. Or, in the words of geographer David Harvey: "The final victory of modernity ... is not the disappearance of the non-modern world, but its artificial preservation and reconstruction"[25]. Garrad continues to argue that, "the inflection of Earth as a static, fixed image is shown to be terribly misleading. Perhaps the Earth is better seen as a process rather than an object. … The irony is that a future Earth-oriented system of values and tropes will have to acknowledge contingency and indeterminacy at a fundamental level, but this only increases the scope of our liability as the most powerful species on the planet"[26]. According to literature theorist Timothy Morton "[re]framing our world, our problems and ourselves is part of the ecological project"[27]. In The Ecological Thought Morton seeks to provide intellectual tools to come to terms with the impermanence of evolution apart from fixed and stereotypical notions of nature[28].

Art and the Poetic of Responsibility

Coming back to the earlier raised question of which role does an art practice play in this discussion, it occurs to me that one of the pressing challenges in the current time of ecological crisis is "to renegotiate our relationship with reality", and that this involves, according to Garrad, a conceptual shift from a "poetic of authenticity" to a "poetic of responsibility." It is obvious that contemporary art production plays a pivotal role in creating a discursive public space to address, in Mathews' terms, the "revolution in the very context of meaning for human cultures", which has to happen in order for us to adapt to our current environmental situation. Within this discursive space, art should also be to negotiate the boundaries of technological intervention and sensual capacities and explore modes of "connected knowing" in wider ecological constellations.

John Cage neatly summed up the relationship between art and technology in a conversation with Daniel Charles, pointing at an ashtray: "It's in a state of vibration. ... But we can't hear those vibrations. ... I'm going to listen to its inner life thanks to a suitable technology, which surely will not have been designed for that purpose"[29]. Matthew Fuller takes this way of thinking a bit further, when in Art for Animals he departs from an anecdote about philosopher Deleuze and the intellectual pleasure he had describing the sensorial world of a spider. Even if a juicy fly were to be placed right in front of it, it wouldn't care. It would only be interested in a "few small twitches on the far reaches of the web"[30]. For Fuller, art practices that, for instance, engages with animals does exactly this, it sends "a tingle along the edges of what we take for granted as our

current capacities. It suggests that we search out and test the discontinuities and overlaps between our sensual and intelligent capacities and those of others. … They are paths of becoming, gravitational lodes of traction which pull the human out of its skin, and pull the singular animal into the multiplicity of packs, of evolution and of ecology”[31]. Looking at it from this angle, Dunn reflects about his electro-acoustic composition practice: “Perhaps music is a conservation strategy for keeping something alive that we now need to make more conscious, a way of making sense of the world from which we might refashion our relationship to nonhuman living systems”[32].

Two brief Examples: Shared Sonic Spaces

Following from Dunn's notion of sound as a factor in “understanding our place within the biosphere's fabric of mind,” and the idea that sound is a conceptual interface for a techno-environmental mode of communication as well as intellectual curiosity, I want to conclude this article with two brief examples of what I like to term shared sonic spaces. The examples are interrelated but are sitting at the retro end of the current technology spectrum. The first case would be the radiophonic space. Marconi is meant to have believed until he died that sound actually never dies – in the sense that it diminishes endlessly. Curtis Roads wrote in Micro-Sound: “Perhaps the last traces of human existence will be radio waves beamed into space, travelling distances before they dissolve into noise”[33]. I am not aiming at the apocalyptic spin that can be read into Road's statement, especially from a current environmental perspective, but rather wish to emphasise certain technical idiosyncrasies that come with terrestrial radio. In addition to the one already mentioned I want to draw attention to two additional qualities that interest me in the discussion of shared sonic spaces.

Radio waves have the longest wavelengths in the electromagnetic spectrum. Having said that, objects in space, such as planets and comets, giant clouds of gas and dust, and stars and galaxies, emit light at many different wavelengths. Some of the light they emit has very large wavelengths. These long waves are in the radio region of the electromagnetic spectrum. Many astronomical objects emit radio waves, so by tuning into the radio dial we actually can hear the Universe moving. When discovered, this fact, led astronomers to develop sophisticated systems that allow them to make pictures from the radio waves emitted by astronomical objects otherwise know as radio telescopes.

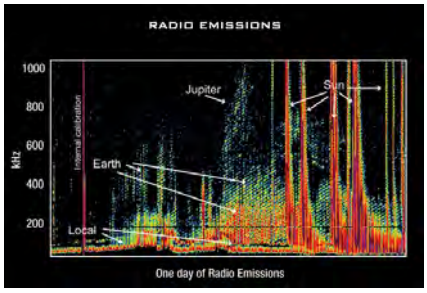

Fig. 1. Source: http://missionscience.nasa.gov/ems/05_radiowaves.html]

The other quality that I see in terrestrial radio technology is that it provides an open standard and communication protocol in comparison to most current digital standards. A similar take is chosen by the SETI institute, which is dedicated to the search for extraterrestrial intelligence and the study of life in the universe. SETI is interested in broadcast radio as a means to detect “evidence of technological civilizations.” Its website states: “In terrestrial radio practice, narrow-band signals are often called “carriers.” They pack a lot of energy into a small amount of spectral space, and consequently are the easiest type of signal to find for any given power level. If E.T. is a decent (or at least competent) engineer, he'll use narrow-band signals as beacons to get our attention”[34].
The SETI initiative goes back to the research work of radio astronomer Frank Drake and his Drake Equation, which sought to calculate the number of civilisations in our galaxy that could potentially communicate with us. In 1961 a number of scientists gathered at the Green Bank Observatory to discuss specific factors thought to play a role in the development of “technological civilizations” or at least to stimulate “intellectual curiosity about the universe around us”[35]. Among those scientists was John C. Lilly, who is renowned for his communication research with dolphins and with the tursiops truncatus in particular. At the height of the Cold War Lilly belonged to a generation of scientists deeply concerned with human world affairs and he decided to focus on interspecies communication with the hope that any success in this field might have an impact on human communication globally and beyond, as in the case of SETI. Lilly chose the tursiops truncatus for several reasons: Firstly he observed a complex form of communication behaviour among themselves as well as an interest in exchanges with humans. Secondly, they possess a brain that in mass is only a little bit bigger than the human one. Lilly hypothesised that inter-species communication could be achieved but it would need to happen as equals among equals. He concluded that because of the rather small acoustic frequency range humans share with dolphins, it would be easier to teach a dolphin to speak English than a human to speak Dolphinese. And given that dolphins can use the two channels of their blowhole independently from each other, which allows them to communicate to each other in stereo – so to speak – when human communication in comparison is in mono. So far there is no breakthrough reported on this end and current research have shifted towards the study of the complex communication behaviour among dolphins. Other researchers like Diana Reiss, a former stage designer who has become one of the leading scientists in this area, recalls Lilly as a very inspiring person although she remarks that some of his projects might have lacked long-term scientific rigour[36]. My interest in Lilly's research work lies less in the scientific legacy and more in the cultural practice, which presents a concrete and fascinating architectural manifestation of a shared sonic space.

Fig. 2 Source: John C. Lilly, "Lilly on Dolphins" (Garden City, N.Y.: Anchor Books Edition, 1975)

Figures 2 and 3 show the experimental setting for one of his experiments. For 10 weeks in 1965, Lilly's female research associate, Margaret Howe, lived with a dolphin named Peter at the Communication Research Institute, Virgin Islands, US. The two shared a partially flooded, two-room house and a connected deep water pool. In the flooded rooms the water was just shallow enough for Margaret to wade through and just deep enough for Peter to swim. Microphones and hydrophones were installed, which allowed a two-way communication from air to water. Margaret and Peter were constantly interacting with each other, eating, sleeping, working, and playing together. Margaret slept on a bed swimming in saltwater and worked on a floating desk, so that Peter was free to come and go. The imagined ideal long-term scenario was never realised. It would have provided free access from the sea for the dolphin and more of a wider family life situation for the human in the house.

Fig. 3 Source: John C. Lilly, "Lilly on Dolphins" (Garden City, NY: Anchor Books Edition, 1975)

Conclusions

In his fourth Gifford Lecture The Anthropocene and the Destruction of the Image of the Globe, Latour states that the unique situation of the Anthropocene has made it very obvious that while we can't do without science and its model simulations, science on the other hand has not become the final authority in the discussion. It is instead about to provide means to renders us "sensitive" to what is happening around us. Becoming responsible, then, for Latour means "to cocoon ourselves within a great many loops so that progressively, thread after thread, the knowledge of where we reside and on what we depend for our atmospheric condition can gain greater relevance and feel more urgent"[37]. He refers to Sloterdijk, who points out that it is only once humans see pollution coming back at them that they begin to really feel that the Earth is indeed round. Sensitivity then applies for Latour to all the agencies able to spread their loops further and to feel the consequences of what they do come back to haunt them. For him aesthetics according to the old meaning of the word means "being able to 'perceive' and to be 'concerned,' that is, a capacity to render oneself sensitive, a capacity that precedes any distinction between the instruments of science, of art and of politics"[38]. Latour stresses that such responsible aesthetics can only truly be a "post-global" one as the image of the globe is for him misleading to say the least, as it suggests, "that the world has been unified once and for all." But the public debate around climate change shows that this has clearly not yet happened. In conclusion, I would like to state that in this "new cosmo-political situation" artistic explorations into sound -amongst other endeavours- do provide engaging angles to further explore these new modes of sensitivity, and to steer towards existential territories that provide a more "hetereogenic image of being" than a narrow anthropocentric and rather short-term perspective. Lao Tzu is meant to have said to know and not to act is not to know. And keep listening to "those vibrations" ...

References and Notes

1. Greg Garrad, Ecocriticism (New York: Routledge, 2004) p.179, emphasis mine

2. Felix Guattari, Chaosmosis (Sydney, Australia: Power Publications, 1995) pp.8-9.

3. Erich Hoerl, "A Thousand Ecologies," in Diedrich Diedrichsen & Anselm Franke (eds.) The Whole Earth. California and the Disappearance of the Outside (Berlin: Sternberg, 2013). pp.128-9.

4. Kester, Conversation Pieces (Berkely: University of California Press, 2004) p.107.

5. Kester [4] pp.113-4, emphasis mine.

6. John Durheim Peter, Speaking into the Air (Chicago: University of Chicago Press, 1999).

7. David Dunn, "Nature, Sound Art, and the Sacred," Terra Nova 2, No 3 (Summer 1997) pp. 61-71.

8. R. Murray Schafer, "The Music of the Environment," in C. Cox, C. and D. Warner, eds., Audio Culture: readings in Modern Music (New York: Continuum, 2004) p.36.

9. R Murray Schafer "Radical Radio," in N. Strauss, ed., Radiotext(e) (New York: Semiotext(e) #16) p.291.

10. David Dunn, "Wilderness as reentrant Form: thoughts on the future of electronic art and nature," Leonardo 21, No.4 (1988) p.2 http://www.davidddunn.com/~david/writings/wilder.pdf

11. Dunn [10] p.6.

12. David Dunn [9] p.10.

13. Other artists to mention here are: Louis Bec, Leif Brush, Bill Fontana, Natalie Jeremijenko aside others.

14. Paul Ryan (2001), <http://threeing.org/pdf/ac_ecochannel_design.pdf> accessed 28 June 2013

15. David Dunn [10] p. 9.

16. David Dunn [7] pp. 63-4, emphasis mine.

17. Earlier works, such as Joseph Meeker's The Comedy of Survival (1972) and even Raymond Williams' The Country and the City (1973) are to be understood as precursors.

18. Ursula Heise, "The Hitchhiker's Guide to Ecocriticism," PMLA 121 (2006) pp. 503-16.

19. Kate Soper, What is Nature (Oxford: Blackwell, 1998) p. 151.

20. Garrad [1] p.151.

21. Freya Mathews, "On Desiring Nature,"Indian Journal of Ecocriticism. 3 (2010) p.8.

22. Timothy Lukes, Ecocritique: Contesting the Politics of Nature (Minneapolis: University of Minneapolis Press, 1997) p.90 .

23. Lukes [21] p.91.

24. Garrad [1] p.172.

25. David Harvey, Justice, Nature and the Geography of Difference (Oxford: Blackwell, 1996) pp. 301-2.

26. Garrad [1] pp.178-9, emphasis mine.

27. Timothy Morton, The Ecological Thought (London: Harvard University Press, 2012) p. 9

28. Instead of referring to nature, Morton prefers attributes like "dark ecology" or "the mesh" and when it comes to human-animal relationship he instead speaks of non-human beings as "strange stranger" and of a "radical intimacy" with them.

29. John Cage (in conversation with Daniel Charles), For the Birds (London: Marion Boyars, 1981) pp. 220-221. emphasis mine.

30. Matthew Fuller, "Art for Animals," in B. Herzogenrath, ed., Deleuze/Guattari & ecology (New York: Palgrave Mcmillan, 2009) p. 270

31. Fuller [30] p. 270.

32. David Dunn [7] p.62.

33. Curtis Roads, Micro-Sound (Cambridge, Mass: MIT Press, 2001) p.10.

34. Seti website: <http://www.seti.org/faq>, accessed 27 June 2013.

35. Seti website: <http://www.seti.org/drakeequation>, accessed 27 June 2013.

36. Diana Reiss, The Dolphin in the Mirror (Boston: Houghton Mifflin Harcourt, 2011) p.92.

37. Youtube: https://www.youtube.com/watch?v=4-l6FQN4P1c, accessed 4 september 2013.

38. Youtube: https://www.youtube.com/watch?v=4-l6FQN4P1c, accessed 4 september 2013.

HACKING THE BODY

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Abstract

Hacking the Body is a proposed collaborative research project that explores using the concept of 'hacking' to re-purpose and re-imagine internal signals from the body through DIY biosensors and soft circuits. This paper outlines definitions of hacking and how these apply to workshops exploring how to create these sensors.

Key words: hacking, DIY, biosensors, soft circuits

Hacking the Body

This paper discusses the emerging project *Hacking the Body*, a collaborative research project that uses the concept of hacking to create artworks with technology. It will explore definitions and methods of hacking and then look to examine how these ideas may adhere to the first Hacking the Body workshop which took place in Sydney at ISEA 2012 [1].

The possibilities for 'hacking' for more expressive, live and performative artworks have given artists with the flexibility to learn or teach themselves programming a huge advantage and 'canvas' for art making in the digital and electronic domain. Many artists are now finding new ways to create their work using open-source tools to make custom software and apps for performative, generative or database projects that take advantage of emerging technological affordances.

Hacking the Body is a proposed collaborative research project that explores the use of the concept of 'hacking' to repurpose and re-imagine internal biofeedback signals from the body. The project is two-fold: (1) it explores how internal physiological data can be gathered and harnessed to understand the experiential states of the body, and then (2) it explores how we as artists will 'hack' to discover new methods for creating artworks, using sensing systems and audiovisual technology. This aims to result in works such as site-specific performances, mobile installations, and participatory performance experiences. The first portion of this research is exploring DIY sensors and the collaborative ethos found within hacking by sharing crafting methods through workshops. The first of these workshops will be discussed later in this paper.

Hacking as a Dialogical Methodology

Hacking is a much-misused term [2] [3], typically associated with controversial technical practices of 'cracking' into systems and causing damage or stealing financial or sensitive information. However, as one looks further beyond this representation, many other definitions of hacking begin to emerge. Key themes of repurposing, DIY and open source, and collaboration become important, and it is these concepts we aim to utilise within the *Hacking the Body* project.

Jordan defines hacking as "a material practice that produces differences in computer, network and communications technologies" [4]. In a similar vein Jordan defines hacking in the following terms: "As part of this practical capacity, the very nature of hacking – turning a system against itself – is the processing of using existing code, comments, and technology for more than what the original authors intended" [5]. However, these ideas of repurposing, subverting, and re-understanding what is possible or intended, do not only apply to technology. von Busch and Palmås [6] argue that hacking is also applicable to culture and social systems. Wark states, "Whatever the code we hack, be it programming language, poetic language, math or music, curves or colorings, we are the abstracters of new worlds. Whether we come to represent ourselves as researchers or authors, artists or biologists, chemists or musicians, philosophers or programmers, each of these subjectivities is but a fragment of a class still becoming, bit by bit, aware of itself as such" [7]. Therefore hacking is not a form applicable just to technology, but extends to a transdisciplinary discourse around methods for achieving change.

Once hacking is considered beyond the domain of technology, it can start to be considered as a methodology for changing or repurposing using a low level approach, in contrast to a top down rewrite or remake of a system. *Hacking the Body* uses an open, solution-driven, hands-on ethos as its main driving principle for authoring creative works. von Busch and Palmås discuss how hacking can change data or a system, and state "As I see them they are operating at a low level, using existing infrastructure and power of a system to tinker, twist and modulate it after their own will. Building on the existing system with local patches and modifications. Adding small operational programs to the toolbox and presenting them with a journey of the same stream. Bending flows of power, but keeping the current on" [8]. The information may not change but instead the intention or use of this information is developed, subverted or reconceptualised. Data drives new concepts, objects or possibilities that were not originally intended. *Hacking the Body* asks how the data of the body can be developed into new artworks or new possibilities.

It is this bending and flowing that not only is repurposed when hacking, but also provides a space for dialogue. The dialogue emerges between the previous system, technology or object and a new purpose, understanding or use: "Hacking is in a dialogic form, not in dialetic opposition. Not to operate with its object as an opponent or foe, but as a field of gravity. Not regarding a system of belief as opium, but as a path of liberation, using it as a trampoline, as a line of flight and a force of gravity" [9]. A hack evolves from one reference point and this point is recognisable throughout the hacking process. The analogy of the trampoline is useful when considering *Hacking the Body*. We are not changing the body physically within our hacks. We are taking information from the inside body and creating a trajectory outwards (or in some cases back to the body) in the form of artworks. The biofeedback data is the gravity that brings us back to the body and grounds the hack in a biotechnological system. We are not creating new bodies by hacking, but new artworks by using information from the body that is usually implicated for measuring well-being or health.

Another dialogue that occurs in hacking is with peers: "Hacker knowledge implies, in its practice, a politic of free information, free learning, the gift of the result in a peer-to-peer network" [10]. Hacking is not a solo practice. There is an open culture and sharing ethos. Hackers build their new creations based upon previous work and keep this open for new developments by others. Hacking involves sharing skills, techniques and knowledge as well as considering the freedom of these to be fostered by others. Hacking becomes a dialogue between hackers where new approaches are born and this collaborative ethos is part of the methodology of hacking.

Beyond the practicalities of redirecting the functionality of technology, some hacking is also underpinned a transdisciplinary ethos. As Coleman suggests "Hackers have constituted an expansive pragmatic practice of instrumental yet playful experimentation and production. In these activities the lines between play, exploration, pedagogy and work are rarely rigidly drawn" [11]. This is key to the methodology in *Hacking the Body*, where participatory performance and exploration 'user workshops' are key to working with technology and the body. For example, at ISEA 2013, workshops in DIY biosensors using soft circuit electronics were conducted where artists made their own sensors from crafting techniques. There was a sharing of knowledge across disciplines where experimenting and playing were encouraged.

We use the term hack to represent the ideas of repurposing and collaborating, and the use of DIY and open source technologies within art practice. A hack uses an existing system or technology but aims to produce something different within that system, producing a dialogical methodology where the past is in conversation with the new. The idea of hacking the body uses these concepts to make digital art that utilises these concepts as well as data from the body.

Previous Approaches to Hacking the Body and Biofeedback Artworks

There are many other examples of artworks that may be considered to have utilised hacking and biofeedback data. Thomas [12] has explored the term 'hacking the body', but unlike our dialogical approach outlined above, Thomas sees this concept in terms of by opposing forces. By arguing that the body and performance are in constant change and that code is static, Thomas claims that there is a binary presented and that the body presents a site of resistance for hacking. This approach to hacking the body is in conflict with the dialogical methodology within our work. It sees hacking as a way of transgressing the codes of the body, whereas in our proposal the codes of the body can work with DIY technologies to create new artworks.

Within artistic practice, *Hacking the Body* draws on existing performance and electronic arts endeavors that engage with biosensors and the body. Many of these focus on performativity and making work which draws on biofeedback. For example Donnarumma [13] uses a magnification of muscle signals to produce live sound compositions, very much drawing of the tradition of artists such Tanaka [14]. Other projects look to more participatory performance methods. Schiphorst [15] and Kozel [16] used wearable technologies in the WHISPERS project to capture participants' breath and heart rate within performative installations and participatory artworks. Khut [17] has developed various artistic applications for working with different biosensors, including making games that require participants to focus on their breath to control visualisations. Baker [18] also used various biofeedback sensors within MINDtouch, a participatory performance work that worked with people online and in-person wearing biofeedback sensors. The project focused on trying to uncover any new understandings of the sensations of 'liveness' and 'presence' that may emerge in participatory networked performance, using mobile phones and physiological wearable devices. It attempted to link diverging areas of media art with performance practices through its approach of using biofeedback sensors as the interface to mobile video technologies. Baker's research very much indicates where we aim to bring *Hacking the Body*, and further developments for our research may include interfacing the sensors with mobile technologies and creating participatory events.

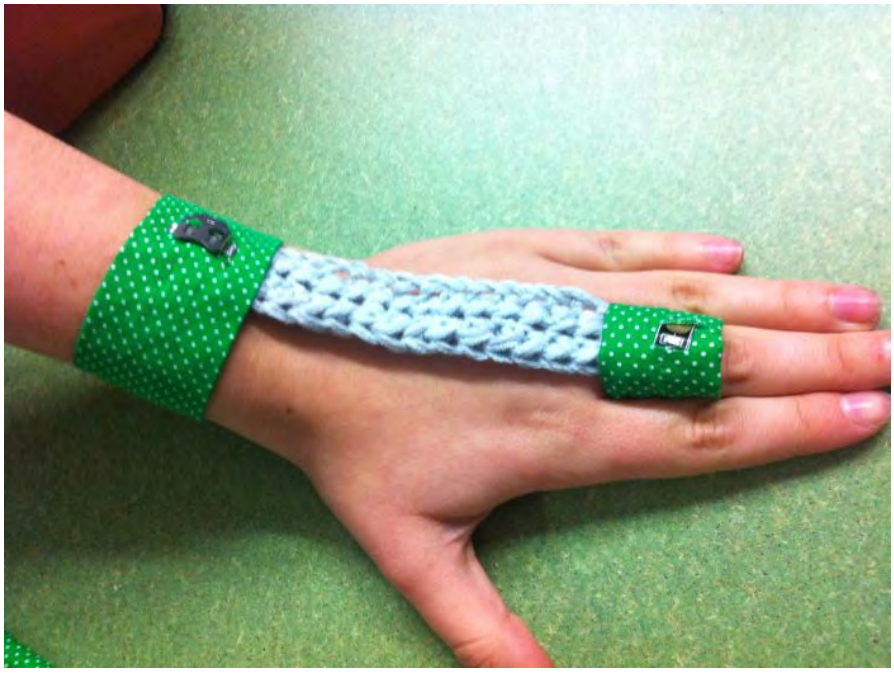

Figure 1: Stretch sensor made by participant in Hacking the Body Workshop at ISEA 2013, Sydney, June 9, 2013. © Kate Sicchio & Camille Baker

Workshop @ ISEA2013

Our approach to *Hacking the Body* involves using DIY methods to create biofeedback sensors that will then read different information from the human body, reflecting the dialogue between systems (such as the code of the body) and repurposing to create new artworks. This was explored within the *Hacking the Body* workshop conducted in Sydney, June 9, 2013. This day long workshop had twelve participants who were interested in a range of media art practices. The workshop aimed to create a soft circuit sensor that could be utilised within a performative setting and could respond to biofeedback. The workshop had two main parts – brainstorming and conceptualising interactions with soft circuits and then constructing the sensors from crafting techniques. Three examples of sensors were proposed as starting points for participants: a crochet stretch sensor, a thread stoke sensor, or a fabric press sensor. The stroke and press sensor focused on touch and movement of the body, while the stretch sensor could be worn around the ribs to measure breath through movement of the rib cage. Within this workshop the movement was simply translated to LEDs to demonstrate a transfer of information from the physical body to an electronic object. This was done with the use of conductive fabrics and threads and small button batteries. For example, the stretch sensor was created by using conductive yarn

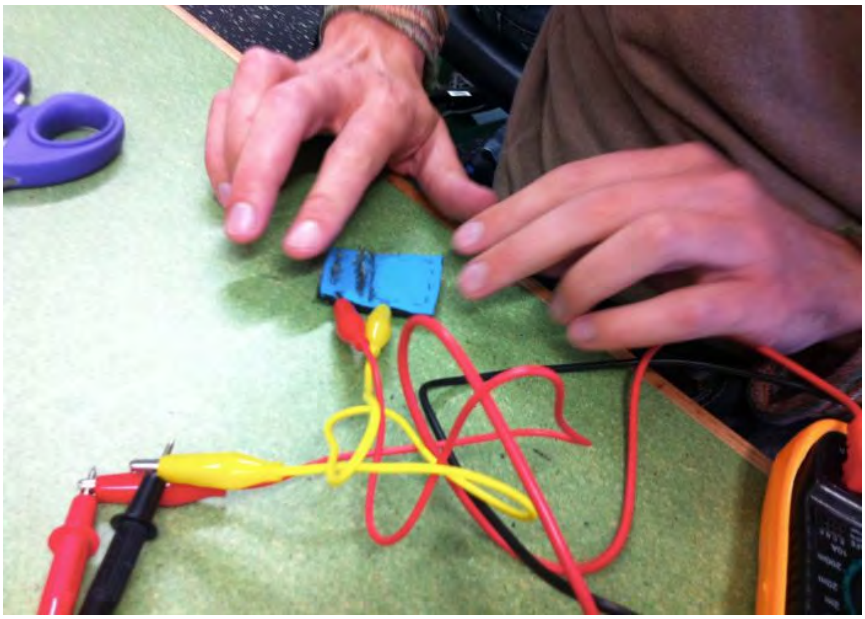

Figure 2: Press sensor made by participant in Hacking the Body Workshop at ISEA 2013, Sydney, June 9, 2013. © Kate Sicchio & Camille Baker

and cotton yarn. The resistance of the conductive yarn changed when stretched to light up the LED.

The stroke and press sensors acted as switches. The stroke sensor consisted of a mixture of conductive thread and normal thread sewn to two different patches of conductive fabrics. When the conductive threads touched the circuit was closed and the LED turned on. The press sensor used neoprene with a small hole as a way of separating two piece of conductive fabric that would then touch when pressed. These sensors were simple approaches and comprised low level technology that could translate information from the body.

This first workshop explored the ideas from the definitions of hacking including ideas of repurposing, collaborating, and the use of DIY and open source technologies, as discussed earlier, whilst presenting work that is in the lineage of artwork with bio-sensing. The workshop used the ideas of repurposing in several ways including the repurposing of biofeedback, such as breath, and also the repurposing of crafting techniques within working with electronics. The techniques used were DIY, such as crochet and sewing, and the technology was open source and shared within the group.

The dialogical aspect of hacking was presented through the sharing of skills with participants, but also by creating low level technologies that would interface with the body. For example, the stretch sensor could be used to detect breath if worn on the ribs, and a function of the body therefore controlled the resistance of the sensor. The use of the sensor could be further developed to create a visualisation that may have an impact on the use of breath of the body wearing the sensor. This potential is opened up in the *Hacking the Body* workshop.

The collaborative part of hacking existed within the sharing of skills and the knitting/sewing circle that emerged during the workshop. Everyone sat around, helping each other learn and build their new sensor, using techniques not associated with technology. The hope of a workshop like this, that participants will continue working with these skills in new contexts, reflects the open and free nature of hacking. An example of this happened during the workshop in Sydney where one participant took the initiative to not only use the conductive materials provided to create a soft circuit, but also utilised a piece of ham from a sandwich. She introduced a new material into the system and brought the project to a new place that we had not intended. This mean that not only did she create her own hack of the workshop, but also it demonstrated the openness of the work and how there is still places for this work to be developed.

Since ISEA, workshops for *Hacking the Body* have developed the soft circuit crafting to include ardunio based Lilypads or Flora micro-controllers. This allows for more possibilities for dialogue and repurposing of the information gathered through the sensors from the body. New artworks using this data to create visualisations on mobile devices are the next stage in this emerging project.

Summary

Hacking the Body aims to provide a vision for hacking in reference to participatory and process driven works, while expanding the use of emerging biosensing and wearable technology. *Hacking the Body* explores the concept, ethos and practices associated with computer hacking in the context of repurposing, collaborating and using open-source approaches. Exposing the human form and physiological states in more scintillating and engaging ways will connect the inner body network to the wider global communications network, by hacking to create a dialogical 'code'. By not only creating artworks but also sharing in an open way through workshops, we aim to demonstrate how our DIY bio-sensing is hacking the body.

References and Notes

1. 19th International Symposium on Electronic Art (ISEA), 7-16 June 2013, Sydney, Australia.

2. Jordan, T., Hacking: *Digital Media and Technological Determinism* (Polity, Cambridge, UK, 2008).

3. Levy, S., *Hackers Heroes of the computer revolution.* (O'Reilly, Cambridge, UK, 2010).

4. Jordan [2] p12.

5. Coleman, E. G., *Coding Freedom: The Ethics and Aesthetics of Hacking.* (Princeton University Press, Princeton and Oxford. 2013) p 98.

6. von Busch, O. and Palmås, K., *Abstract Hacktivism: The making of a hacker culture.* (Openmute.org, London and Instanbul, 2006)

7. Wark, M., *A Hacker Manifesto*. (Harvard University Press, London, UK, 2004) p1.

8. von Busch and Palmås [6] p 28-29.

9. von Busch and Palmås [6] p 59.

10. Wark [7] p 28.

11. Coleman [5] p 99.

12. Thomas, D., "Hacking the body: code, performance and corporeality" in *New Media Society* 7: 647. (Sage, London, UK, 2005) p 647-662.

13. Donnarumma, M., "Biotechnological Performance Practice / Pratiques de performance biotechnologique", *eContact!* Vol 14.2 (2012).

14. Tanaka, A., http://www.ataut.net/site <accessed Sept 21, 2013>.

15. Schiphorst, T., *The Varieties of User Experience: Bridging Embodied Methodologies from Somatics and Performance to Human Computer Interaction* (PhD Dissertation, Plymouth, United Kingdom: CAiiA Star at the University of Plymouth. 2007)

16. Kozel, S., Closer: *Performance,Technologies, Phenomenology* (MIT Press, Cambridge, Massachusetts, 2007).

17. Khut, G., *Development and Evaluation of Participant-centred Biofeedback Artworks* (Doctoral thesis. University of Western Sydney, Australia. 2006)

18. Baker, C. C. *MINDtouch - Ephemeral Transference: Liveness* in Networked Performance with Mobile Devices" (PhD Thesis, University of East London, London, 2010).

INTERACTIVE DRAMA IN REAL AND VIRTUAL WORLDS

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Abstract

How do we resolve the paradox of computer-supported interactive drama – that the human participant requires the very freedom to interact that the authored narrative structure denies them? This paper reports work around the concept of Emergent Narrative – the development of narrative structure through interaction itself. We cover both systems using a virtual world and those using a virtually-augmented real world, exploring how far reworking narrative structure as a loop between the causal (plot) and affective (character) can produce engaging experiences for participants. We discuss the key role of a cognitive-affective architecture for characters and the process of cognitive appraisal as an engine for both in-character and in-role dramatic action.

Keywords: Augmented Reality, Emergent Narrative, Interactivity, Holodeck, Synthetic Characters, Affective Architectures

Introduction

Story is of central importance in human culture and society as well as in the individual's sense of self. Theoretical discussion of story goes back in the west to Aristotle, and has also been the subject of extensive work in psychology (especially around autobiographic memory), drama (Improv and interactive theatre), film and television, education and training (role-play, experiential learning) and art and digital-media (interactive installations). As a distinctively human activity, it was also an early topic in Artificial Intelligence research, beginning with work on story-grammars in the 1970s [1], aimed at the non-interactive generation of text-based stories. For example, Meehan's TALESPIN [2] used character goals and planning to produce very short fable-like stories.

The advent of multi-media systems and then Virtual Reality – immersive real-time interactive graphic environments – in the 1990s, created a new vision of a dramatic 'holodeck'-like experience [3, 4] or virtual theatre [5]. Here a highly-immersed user could act as a character interacting with other artificial characters in a graphical narrative experience qualitatively different from existing media – whether novels, theatre or film. With the advent of mobile technology and augmented reality, this vision extended into interactive dramatic or narrative experiences in which the real world would also be a component [6, 7].

A fundamental challenge in realising this vision is how to resolve the clash between the interactive freedom expected by the user in such environments and an authorial demand for guaranteed narrative structure. On the one hand, interactive freedom is a defining characteristic of virtual environments, with users now able to participate actively in shaping a narrative process as characters within it, rather than as the passive spectators of a narrative artefact. On the other, the demand for a satisfying and coherent narrative structure has classically required authorial creation that predetermines the actions of the characters in a narrative. We have called this the *narrative paradox* [8]. It can be recast as a conflict between plot and character since a user actively participating in an interactive narrative can be thought of as a character whose actions need not be those selected by a prior plot.

Computer games often avoid this problem altogether by using non-interactive 'cut' scenes for narrative content, isolating the substance of the narrative from the interaction of the gameplay. Less commonly, pre-authored branching structures have been applied, allowing the user a limited degree of interactive freedom by offering a controlled set of choices the author can anticipate, an approach first conceived in children's book form as 'Choose Your Own Adventure' [9]. However this illusion of interactive freedom [10] soon becomes obvious to the user as a mechanism for forcing them back into the pre-authored plot, alienating them from their own creative potential in the story-world.

Generating Structure

While modern theory has attacked the dominance of the authorial perspective ('the death of the author' [11]) it has retained the view of story-as-artefact in its focus on 'the text'. The spectator is allocated a more active role in conceptualising and internalising the narrative experience (a process we have referred to as 'storification' – [12]), but this does not encompass the co-creator role needed to support interactivity. We argue that co-creation requires us to abandon the idea of story-as-artefact for a dynamic process in which 'a story' becomes a specific traversal of a landscape of many possible narratives.

What then becomes of narrative structure? Here we turn to the concept of emergence, in which structure is dynamically generated by interaction between entities without being ascribable to any one of them. Goldstein [13] defines emergence as: "the arising of novel and coherent structures, patterns and properties during the process of self-organization in complex systems". A characteristic of emergence is that these structures, patterns or properties cannot be directly attributed to the individual entities within the complex system. The system is defined by the set of entities and their initial configuration, and by the interaction rules that drive it. However knowing these does not mean one can predict what structure will emerge – the system must actually run to determine this. Very different structures may emerge from the same entities and interaction rules just by varying the initial configuration.

Weather patterns are a good example of emergence in the natural world, but similar ideas have also been applied within the social sciences, for example to the development of human social organisations [14].

A well-known computational example is Conway's *Game of Life* [15] in which a small set of simple rules about survival or not in the next round are attached to cellular automata (CAs) which can be visualised as white squares on a black grid. The rules concern how many neighbouring CAs an entity has, thus modelling a simple form of interaction. Exploration of the outcomes of various initial configurations has revealed that a number of them generate coherent patterns, some static, and some moving across the grid. Figure 1 shows an initial configuration that produces an oscillation between two patterns after step 6.

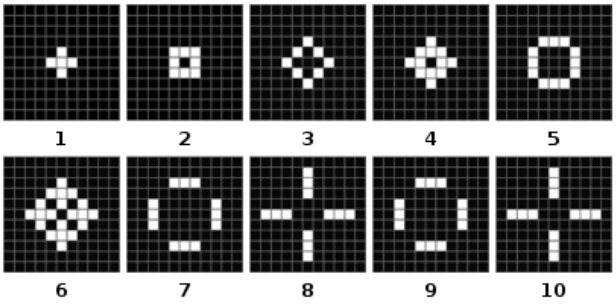

Figure 1: Game of Life, producing an oscillator

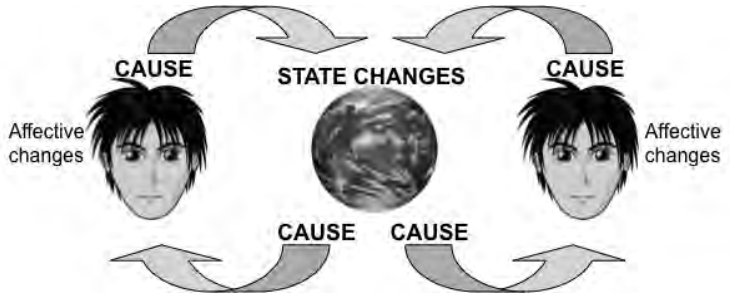

Figure 2: Narrative as a loop between affective and causal change

Emergent Narrative

Narrative may seem far from the *Game of Life*. However, defining the required entities as characters and the interaction rules as a control architecture for each character that takes percepts of other characters and generates responding actions, gives the same type of system. This produces a character-based rather than a plot-based view of narrative and raises the issue of affective impact as a principle of narrative interaction.

Forster [16] argued that 'the king died and then the queen died' is only a sequence of events, while 'the king died and then the queen died of grief' is a plot because it includes a causal link between the events. Significantly, it highlights an affective change in one of the characters. Many narrative formalisms have omitted character affective state altogether, focusing on external causal structure [17, 18]. However we can view the unfolding of a dynamically-generated story as an iteration between events in the world and affective changes characters that are both responses to events and causes of them [19], as in Figure 2. Causal chains that contain no affective impact upon characters are arguably more like the problem-solving of adventure games than narrative, while affective change in characters with no causal impact on the world are more like social environments than narrative.

The computational consequence is that the character control architecture must be an affective one. Rather than invent such an architecture from scratch, it seems more sensible to start from an appropriate psychological theory. One used since the early 1990s [20] for such architectures is Cognitive Appraisal, and in particular that articulated in [21], often referred to as OCC after its authors, Ortony, Clore and Collins. Cognitive Appraisal theory asserts that we do not act as pure observers of events around us but always evaluate them with respect to our own goals. Events congruent with our goals generate positive emotions; those frustrating our goals generate negative emotions. The attraction of OCC computationally was that it proposed a taxonomy of event types and resulting emotions that is straightforward to encode in executable rules [22].

While OCC can be used to deal with the percept part of the architecture, we still require a link between the generated affective state and the action that the character will take as a result of it. This provided by Coping Theory [23], asserting that we cope with our emotions in one of two ways. Problem-focused coping produces actions in the world, while emotion-based coping results in internal changes to beliefs and goals. Say you are confronted in the street by a stranger who shouts at you. This will probably generate anger and fear. With problem-focused coping, anger might lead you to shout back. On the other hand, fear might lead you to walk away quickly. Emotion-based coping might lead you to control the anger or fear and take no notice.

Hope and fear are particularly interesting as motivators for character actions since these are defined by OCC as relating to future events. When we plan actions, these precisely relate to the future, and so hope and fear support the integration of AI planning capabilities in characters [24], generating sequences of actions for long-term goals, not just instant emotional reactions. While hope and fear allow a character to assess its planned actions against its own goals, cognitive appraisal is in fact even more versatile than this. *Any* action a character is considering can be fed into its cognitive appraisal system as if it was an event that had already happened. This allows an estimate of what its emotional impact might be on other characters – at least 'if they are like me'. If we take emotional impact as a surrogate for dramatic impact, this gives the character a capacity of human actors – to decide how to create drama around it [25].

Example systems

We have brought these ideas together over an extended period in an architecture called FAtiMA [26] (freely available on sourceforge: http://sourceforge.net/projects/fatima-modular/) with which we have built a series of emergent narrative systems of increasing complexity. We will briefly describe each and the lessons learned for applying the concept of emergent narrative.

The first and least complex of these was *FearNot!* [27] a system using virtual drama to educate 9-11 year-old children against bullying. It was an episodic story running on a desktop computer in which characters in a virtual school were involved in a variety of bullying incidents. Interaction was based on the Forum Theatre concept [28] in which the child user acted as the 'invisible friend' of a victimised character. The idea was that by advising the character between dramatic episodes, the child would identify empathically with their situation and internalise the social dynamics of the episodes (there is no magic wand solution to bullying). Figure 3 shows screen shots. We did not want the child to interact directly within the virtual school, partly because some participants were themselves victims of real-world bullying, and partly because they would not be subject to the same constraints as the virtual characters. A virtual push would not really make them fall over, and since the virtual bully could do them no real harm, we feared that learning would not transfer to the real world. From the per-

Figure 3: *FearNot!* Left – screen shot; Right – Victim asks for advice from user

Figure 4: *ORIENT*. Left - the story-world; Right – interaction

spective of emergent narrative, this also allowed us to test the idea in a reasonably small-scale and tractable setting. A number of lessors were learned.

The first lesson was that an emergent narrative requires a great deal of content compared to a linear story. If we think of a linear story as one pre-determined traversal of the space of possible stores, then by definition, only the characters, props and world scenery actually relevant to the actions in it are needed. Once the traversal is not pre-determined, then the materials for many traversals must be supplied. Not for nothing are game-masters in table-top role-play games supplied with a volume – or several – of story-world materials. In *FearNot!* we created such material for 44 episodes and more would have been desirable.

The second lesson was that in an episodic narrative, the initial conditions must be set up for each episode with great care. Remember that emergent structure is very sensitive to initial conditions, which in this case consist of the characters present in the scene; their goals and affective state; their memory of past events; the props available for use in the selected location. We added a Story Facilitator (SF) agent [29] to the architecture, whose task was to select a location, a set of characters and their goals. This was related to the advice of the child user. If they told the victim they should 'hit the bully back' the SF would set up a scene in which the bully confronted the victim. If the advice was to 'make a new friend', the SF would set up a scene in which there was a character the victim could approach. The memory and affective state of characters were continuous through episodes. This meant that if the victim had already tried hitting back and failed, it would be too scared to try it again. While the SF did not control actions within an episode, it shaped the story at a more abstract level, much as a role-play facilitator typically will in real-world role-play.

Finally, since actions in an episode emerged from character interaction, the system had to be run in order to see what happened. On the plus side, this avoided a combinatorial explosion between the history of the character and the user's advice, which was entered as free text. On the minus side, there was no obvious end to an episode other than the characters running out of interactions or getting into a repetitive loop. The SF was therefore allowed to close an episode once bullying and a reaction to it had occurred.

The challenge of interactivity

The development of new low-cost interactive hardware and in particular hand-held devices such as smart phones opens up new possibilities for interactive narrative. After *FearNot!* we made use of these technologies in two new systems: *ORIENT* [30] – see Figure 4 - and *Traveller* [31] – see Figure 5, which at time of writing is still under development. Both are aimed at developing inter-cultural sensitivity and empathy by putting the user into direct interaction with characters from other cultures. Both put the user into a physical space in front of a projected virtual world and allow interaction with almost life-size characters. Unlike *FearNot!*, the user is now operating within the story-world as a character. Like *FearNot!*, in both cases the story can be thought of as episodic, but rather than each being set up by the SF, an episode relates to a story-world location and is set up by the user moving between them.

A desktop system can take user input from a keyboard, but systems like *ORIENT* and *Traveller* in which users carry out role-play in physical space would ideally be based on natural language interaction between user and character. However while text-to-speech is now able to produce quite natural speech output, speech recognition is still not robust enough to pick up more than a small set of key phrases. We have therefore focused on gesture as an interaction modality, exploiting the physicality of movement in real space.

In *ORIENT*, the characters are aliens in a world threatened by disaster and it is easy to define them as having a substantially gesture-based language. At the time *ORIENT* was developed, the WiiMote had just been released and was used by one of a group of three users (collectively role-playing a Space Patrol team) to produce appropriate gestures. Training users in a set of gestures proved harder than expected and far too much cognitive effort had to be put into the interaction mechanism at the expense of focus on the story.

By the time *Traveller* was developed, the Kinect was widely available, and to make interaction less demanding [32], the gestures for possible user actions

Figure 5: *Traveller*. Left – screen shot showing interaction prompts; Right - Interaction

were displayed on the screen using a Kinect skeleton, as seen above in Figure 5. This removes the need for user training, though some gestures are easier than others for the Kinect to correctly recognise and taller users seem to register better than shorter ones, probably due to limb length.

In both cases the interaction modality is independent of the underlying story mechanism, which is still driven by the affective state of the characters. In the case of Traveller, the architecture has been extended once more to support a parametrised set of cultural features derived from the work of Hofstede [33]. Using these features, characters will display negative emotional behaviour if the user commits social blunders, for example if the user fails to recognise power hierarchy in a hierarchical society or social decision making in a collectivist one. The affective architecture means that there is a direct link between the cognitive appraisal of events carried out by the characters and the appropriate expressive behaviour, and the use of emergent narrative means that the many possible stories do not have to be explicitly programmed.

The future

How far are we from the visions outlined at the start of this paper? Many researchers, ourselves included, have retreated from the idea of 'the Holodeck' in which users would experience a story within an immersive graphical system. The growth of pervasive games [34] in which the story is taken out into the real world of the user allows us to finesse the problems of mobility in virtual environments and interaction purely with virtual characters and without the advantages of natural language. An augmented reality approach can supplement story with the physicality of the real world and the full bandwidth interaction of other humans with each other, using virtual characters and other scaffolding for an engaging interactive narrative experience. We have called this Intelligent Computer-Assisted Role-Play (iCARP) [35] and see it as an exciting agenda for future research.

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References and Notes

1. J.B. Black & R. Wilensky. "An evaluation of story grammars". *Cognitive Science*, **3**, 1979. pp. 213-230.

2. James Meehan. "TALE-SPIN", in: R. C. Shank & C.K. Riesbeck. (eds.), *Inside Computer Understanding: Five Programs plus Miniatures*. Hillsdale, NJ: Lawrence Erlbaum Associates, 1981

3. J. Bates. "Virtual reality, art, and entertainment". *Presence: The Journal of Teleoperators and Virtual Environments* **1** no.1, 1992, pp.133-138.

4. J. Murray. *Hamlet on the Holodeck*. Cambridge, MA: MIT Press, 1998.

5. Barbara Hayes-Roth, R. van Gent, & D. Huber. "Acting in Character", in R. Trappl and P. Petta (eds.) *Creating Personalities for Synthetic Actors*. Springer, 1997.

6. S. Benford, A. Crabtree, R. Reeves, M. Flintham, A. Drozd, J.G. Sheridan, & A. Dix. "The frame of the game: blurring the boundary between fiction and reality in mobile experiences", Proc. *CHI '06*, pp.427-436, 2006, ACM.

7. M.L.Lim, R.S. Aylett, S. Enz, M.Kriegel, N.Vannini,N, L.Hall and S. Jones. "Towards Intelligent Computer Assisted Educational Role-Play", Proc. 4th Int. Conf. on E-Learning and Games, pp. 208-219, Banff, Canada, August 9-11, 2009, Springer.

8. R.S.Aylett. "Narrative in virtual environments – towards emergent narrative"; Proc. AAAI Symposium on Narrative Intelligence. pp 83-86, AAAI Press. 1999

9. Choose Your Own Adventure official website: http://www.cyoa.com accessed 5/6/2013..

10. M.L.Ryan. *Narrative as virtual reality*. Baltimore, MA: Johns Hopkins University Press, 2001

11. R.Barthes. *The death of the author*. Richard Howard, trans.pub. 1977. http://evans-experientialism.freewebspace.com/barthes06.htm accessed 12/8/13

12. R.S.Aylett. "Emergent narrative, social immersion and "storification". Proc. 1st Int. Workshop on Narrative and Interactive Learning Environments pp. 35-44, http://www.academia.edu/544496/Emergent_narrative_social_immersion_and_storification_ accessed 12.8.13

13. Jeffrey Goldstein. "Emergence as a Construct: History and Issues." *Emergence: Complexity and Organization* **1** no 1 1999, pp 49–72.

14. John F. Padgett & Walter W. Powell. *The Emergence of Organizations and Markets*. Princeton University Press, 2012.

15. M.Gardner. "Mathematical games: The fantastic combinations of John Conway's new solitaire game "life"". *Scientific American*, **223**, 1977, pp.120–123.

16. E.M.Forster. *Aspects of the Novel*. Edward Arnold, 1927

17. M.Mateas. "A preliminary poetics for interactive drama and games". Proc. SIGGRAPH 2001, Art Gallery, Art and Culture Papers, pp51-58. ACM Press, NewYork 2001.

18. V.Propp. *Morphology of the Folktale*. Laurence Scott, trans. University of Texas Press, 1968

19. R.S.Aylett, S.Louchart & A.Weallans. "Research in Interactive Drama Environments, Role-Play and Story Telling". Proc. ICIDS 2011, LNCS **7069** pp1-10 Springer, 2011

20. Bates [3]

21. Ortony, A., Clore, G., Collins, A. *The cognitive structure of emotions*. Cambridge University Press, 1988.

22. S.Marsella & J.Gratch. (2003) "Modeling Appraisal in Virtual Humans: Don't Worry, Be Happy". Proc. 2nd Int. Joint Conf. Autonomous Agents and Multiagent Systems, pp.313-320, ACM Press, 2003

23. R.Lazarus & S.Folkman. *Stress, Appraisal and Coping*. Springer, 1984.

24. R.S.Aylett, J.Dias, J &A. Paiva. "An affectively-driven planner for synthetic characters". Proc, Int. Conf on AI Planning and Scheduling, ICAPS 2006, pp2-10 AAAI Press.

25. R.S.Aylett & S.Louchart. "If I were you - Double appraisal in affective agents". Proc. Autonomous Agents and Multi-0agent Systems AAMAS 2008 pp 1233-1236 ACM Press.

26. J.Dias & A.Paiva. "Feeling and reasoning: A computational model for emotional agents" Proc. .12th EPIA 2005, Portugal, LNCS **3808,** pp127-140, Springer 2005

27. R.SAylett, S.Louchart,S, J.Dias, A.Paiva & M.Vala. "FearNot! - an experiment in emergent narrative". Proc. Intelligent Virtual Agents, IVA 2005, LNAI **3661**, Springer pp 305-316, 2005

28. Augusto Boal. *The Theatre of the Oppressed*. New York: Urizen Books, 1979.

29. R.Figueiredo, A.Brisson, R.SAylett & A.Paiva. "Emergent Stories Facilitated: An Architecture to Generate Stories Using Intelligent Synthetic Characters". Proc. Int. Conf. Interactive Digital Storytelling, ICIDS 2008, LNCS **5334**, pp 218-229, Springer, 2008

30. R.S.Aylett, N.Vannini, E. André, A.Paiva, S.Enz, & L.Hall. "But that was in another country: agents and intercultural empathy". Proc. 8th Int. Conf. Autonomous Agents and Multiagent Systems-Vol **1** pp. 329-336. IFAAMAS, 2008.

31. S.F.Mascarenhas, A. Silva, A.Paiva, R.S.Aylett, F.Kistler, E.André, E, N. Degens, GJ. Hofstede & A.Kappas. "Traveller: an intercultural training system with intelligent agents". Proc. 12th Int. Conf Autonomous agents and multi-agent systems pp. 1387-1388. IFAAMAS.

32. F.Kistler, B. Endrass, I. Damian, C. T. Dang, and E. André. "Natural interaction with culturally adaptive virtual characters", *J. Multimodal User Interfaces*, no. **6,** pp. 39–47, 2012.

33. G. Hofstede. *Culture Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations*, SAGE Publications, 2001.

34. Benford et al [6].

35. Lim et al [7].

ADA Mesh Cities: Network, Space and Memory in the Transitional City

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Abstract
In the aftermath of the 2010 and 2011 earthquakes, Christchurch, New Zealand is framed as a 'transitional' city, moving from its demolished past to a speculative future. The ADA Mesh Cities project asks what role media art and networks may play in the transitional city, and the practices of remembering, and reimagining space.

Keywords: Earthquake, Media art, Network, Space, Memory.

This paper summarises a panel discussion hosted by Aotearoa Digital Arts at ISEA 2013. It addresses the ways in which media artists around Aotearoa New Zealand are responding to the implications of the 2010 and 2011 Canterbury earthquakes. Aotearoa Digital Arts (ADA) is a network of media artists, writers, teachers, and audiences, and a charitable trust focused on supporting media arts in Aotearoa New Zealand. This panel is part of an ongoing series of events for the ADA Mesh Cities project, which broadly explores the role of media art in the 'transitional city.' Transitional in this context refers to the state of constant and future change in Christchurch, as the city is cleared of the rubble of its past and contested plans are made for its future. However, all cities are transitional, in a moment of being between versions of themselves, and in other New Zealand places now the relationship between the past and future in built environments is marked by new anxieties about the status of buildings and spaces 'after Christchurch'.

In the broader ADA Mesh Cities project, the transitional concerns of Christchurch and other places are connected by the framing ideas of network, space, and memory. These reflect new concerns with space in Aotearoa New Zealand: an overabundance of it in demolished Christchurch, the increased vulnerability of affordable spaces in often under maintained older buildings elsewhere, and new awarenesses of the kinds of unseen geographies that may be revealed by a seismic event. Memory speaks directly to the dual sense of Christchurch as a city now existing only in memories, and a city to be reimagined for the future. However, this particular version of transitionality is simply an extreme instance of the state of any space at any moment. The network connects spaces, memories, people, artists and practices.

With these issues in mind, this panel brings together artists from around the country to reflect on the impact of the Christchurch earthquakes on media art practice in Aotearoa New Zealand. The panellists are some of the key contributors to the ADA Network, and they variously respond to the themes of network, memory and space, and describe their own practices in art making and organising. Su Ballard traces art in the transitional city through disaster and post-industrialism. Caro McCaw outlines some of the implications of the earthquakes for artist spaces in Dunedin. Vicki Smith considers the network and community. Trudy Lane is working on walking, geologic time, and memory. Ian Clothier facilitates artists' negotiation of place through the SCANZ residency in New Plymouth. Janine Randerson is responding to memory and place around Onehunga in Auckland, and Danny Butt explores archiving and memory in the context of Auckland's hidden waterways.

As the written document of a wide-ranging panel discussion, this is a necessarily elliptical survey of responses to the earthquakes in Christchurch, and to the possibilities of network, space and memory. To begin with, Su Ballard and Caro McCaw ground the discussion in built spaces, art making, and networks.

Su Ballard

I have been thinking about the ways in which humans have historically imagined disaster and the current tools that we have for doing this. For me this connects with the concept of mesh cities, by asking how do artists contribute to the way that we might re-imagine a city post-disaster?

The 1755 Lisbon earthquake was a moment that shifted the ground that gave us Modernism. Authors, poets and artists found themselves confronting the ruins of what had until then been a sense of permanence, of the modern individual within certain architectural forms. The Christchurch earthquake will also contribute something to future art making. Lisbon 250 years ago was a specific and particular experience for the Portuguese people. It is a reminder of the general as well as the specific.

One of my key concerns is thinking through how, and what, a media arts network might contribute to thinking about the specific experience of disaster. The contemporary art gallery offers one answer. Over the past 25 years, in many western cities in the world, industrial spaces have been transformed into art galleries. Spaces that were once factories and mechanisms for industry have become sites of contemporary art. In Christchurch it is not so simple to occupy buildings. This means that we cannot engage with spaces in our usual way. We are also not dealing with a blank slate. Understanding the formation of a city through its networks counters a monumental method of thinking the city.

The second thing I would like to address is language. Since 9/11 our languages of disaster have become conflated into one language. When we talk about a terrorist attack and when we talk about a natural disaster, we use words that reflect the kinds of same affects (Brian Massumi has written extensively about this) [1]. The land attacks, we are threatened, fear is heightened. Both terrorism and earthquakes are hyper-objects (to use Timothy Morton's word [2]) and engender a particular language of response. In New Zealand, the languages of disaster became conflated into a single response, which was one of fear. This subsequently enabled an extreme neoliberal approach within the city to take complete control. Through the politics of fear, many alternative approaches to the city have been limited. And this is where it is exciting to watch the approach of artists and art institutions in Christchurch. The inspirational work is by individuals and collectives who immediately instigated different (and often disobedient) kinds of response and language.

My final question is: how do we contest the language of what has been happening on quite an unimaginable level, and in what ways do media arts practices begin the discussion?

Caro McCaw

I live in Dunedin, a small city relatively close to Christchurch in the South Island. We all have family and friends in Christchurch, and we feel the earthquakes, both physically and socially. Dunedin is not a very affluent city. Its economy peaked in the 1870s as a result of the Otago gold rush. We have a lot of old buildings that were built over 100 years ago, paid with gold. The contemporary networked city however does not need

this kind of architecture. These old buildings need to be either strengthened or demolished in the next 10 years. So we are facing a kind of rewriting of the city, a lot like Christchurch, where there is demolition, though in Dunedin there is no 'rebuild'.

A central thread through this discussion is the co-opted use of spaces, and the importance of remembering and reimagining the city. Underlying this is a set of values. In Dunedin our challenge also includes "How do we create value for cities, their spaces and stories, that no longer have economic value?" Part of the answer is in sharing histories through storytelling, and a need to create material and social experiences to share these stories, as a different form of architecture. New media has a role to play. However we need to think and experience histories beyond new media, not just archive histories as information for new media formats, for personal search and retrieval. Physical and social experiences of the city have a different value from the archive.

For the Aotearoa Digital Arts symposium in September 2013 we start with local architectural implications of the city, brought about by the change in building codes as a result of the Christchurch earthquakes. We consider and experience arts practices that engage with city spaces in New Zealand, and the city as a site that has geological as well as social histories, presences and futures.

Vicki Smith

I am from Harihari, located on the West Coast of the South Island. We have the alpine fault running through the valley and grew up feeling earthquakes. Some of the Christchurch quakes are also felt there.

As a visual artist my interest is in how the digital intersects with the physical, and real-time online story making. I also work with schools to develop 'community of practice' processes for distributed learning, which requires networks to provide both access and resources, especially to remote communities. I volunteer for the West Coast Kete project, a community story-gathering site. I am also a trustee for Sailing for Sustainability and a trustee for the ADA network.

I am positioning myself here because I am project manager for ADA Mesh Cities, a series of artist workshops, tours and symposia incorporating the ADA Community and drawing in a wider network.

The network is of particular interest to me, and I am influenced by Erenora Puketapu-Hetet, an eminent weaver whose practice bridges science, art and culture, who describes the strength of weaving as always being in the connections.

The Mesh Cities project references Robert Oullette's concept of the MESH [3], but also the cyclone fence: a mesh fence that is ubiquitous in our country and in Christchurch, where from February 2011 to June 2013 it encircled the 'red zone', and the space around damaged or demolished buildings. So it's a barrier, but permeable in its nature, with spaces that can be creatively co-opted. In one section of mesh fence in central Christchurch was woven the word 'Hapori'. This speaks of community and wellbeing, and illustrates the essential outcomes of Mesh Cities as I see them. That is creating something for the whole community, an opportunity to engage and participate in the practice of art in public as social process, rather than art as provided only for public consumption.

In thinking of communities such as ADA I suggest strong networks are those in which people are drawn together by a high degree of commonality, and successful networks are those that are flexible and encourage diversity in order to continue growth.

Trudy Lane

I live in Auckland in New Zealand. I grew up an hour south of Auckland, and have been involved with the ADA network for a number of years and work on the SCANZ (Solar Circuit Aotearoa New Zealand) residency.

I visited Christchurch recently for the first time since just after the first earthquake. Seeing the city this time was very shocking – there are just a few buildings among the empty spaces. It was surprising to realise that over two years later they're not actually re-building - they're still demolishing; that they are still trying to figure out what they're doing, and that it takes so long to demolish things properly. The other aspect that struck me was the stories of people in Christchurch, all of which reflect the very different kinds of experiences that people have when such a big event occurs that affects so many people.

I have been working on a project about geological time, called *A Walk Through Deep Time*. It is a shared walk project, which is now also an audioscape app that enables people to listen to and share scientific, philosophical, and personal perspectives that relate to the timescales of geologic time. So it was interesting to see how that perspective is now coming up in the stories people tell in Christchurch: everyone knows what liquefaction is, and everyone now knows about the geological structure of the city and the decisions made about building a city on an unstable alluvial plain. This perspective is now intruding on their lives, as they're all a lot more aware of it, and thinking about the city in a different way.

We started talking with those at the CEISMIC archive at the University of Canterbury whose role is to capture the stories of what people have experienced [4]. James Smithies, the archive project manager, described it as being like standing under a waterfall with a teaspoon – there are just so many interesting and tragic stories. That conversation has led to the possibility of working with the local arts group Gap Filler [5], which has done amazing work in the time since the earthquake. They fill the 'gaps', the big empty lots where buildings have been demolished, with community projects, and have been a really great focus of engagement to bring communities together again. So we are now developing this system for a location-sensitive audioscape for Christchurch, to allow people to record and share memories and ideas of place.

Ian Clothier

Part of the rebuild of Christchurch is actually the reconstruction of cultural life, and "Gap Filler" has done some marvellously simple things to help with that. They have organised successful events that have engaged the public, and I see them as engaging with issues and with audiences, articulating a creative participatory space very successfully.

My first arts council grant, received when I was 19 years old, allowed me to organise an open-air arts exhibition for a day on the steps of Christchurch's Town Hall, in 1979. The idea of 'pop up' events has been around for a long time, but has gained new currency recently, as electronic media provides new ways and contexts to engage with audiences.

My own practice currently involves connecting to the environment with data sensors, and then opening a dialogue with Indigenous people, and that is both in my practice and in the curatorial work I do. This approach also maps across to SCANZ, which I organise with Nina Czegledy and Trudy Lane. We are guided by three main values of engaging with the sciences and hybrid arts, acknowl-

edging the environmental crisis and engaging with Indigenous groups.

The next SCANZ event is coming up in January 2015, and is themed on water and peace. It is unusual in Western frameworks to combine a consideration of water with an ethic like peace. But this has come out of the work that we do with Indigenous groups, where those two things stand side by side. We will be spending the event's first weekend on a marae, and the works that get produced will be exhibited in public space. There is a river walkway that goes from the sea up into a botanical garden and this is the planned site for the works. We also intend having a walking symposium, along the same river, and this mirrors aspects of "Gap Filler" in terms of locating projects and activities in public space.

One of my projects involved putting data sensors in our local botanic garden. I recall talking to the park curator Chris Connolly, and us both commenting about works in public space being better for the audience, as there is no need to negotiate the cultural frameworks embedded in galleries. The public can just directly experience the work. So some of these "Gap Filler" themes involve wider discussions, which is a factor in their success.

Janine Randerson

I am based in Auckland, and the project I discuss here in relation to what is happening in Christchurch concerns memory. I have been working with master's student Hannah Alleyene on thinking about how media art, or spatial propositions in her case, can act as mnemonic devices to retain memories of a place. A mnemonic device is a kind of memory aid that might be visual, might be audio, might be kinaesthetic in some way, and that serves to aid and stimulate memory retention.

I have been thinking about disaster and memory in response to an article, "Disaster, Memory and Culture: Distressing Attempts to Develop Disaster Culture in Turkey" by Ali Tolga Ozden, that is about the post-disaster situation in Turkey after the Van earthquake in October 2011 [6]. Ozden identifies a problem with short memory caused by shock and fear following a disaster that can result in erasing the impacts of the disaster itself from memory, but also memories of places as well.

In my discussions with people from Christchurch, they have talked about this very strange feeling of having buildings that at first were ruins, so that it was possible to still identify with this building to some extent, and then a few days later having it completely gone, so that it is almost like losing some of your own mind, your mental synapses which help you to orientate yourself and situate yourself in the world.

That really resonated with me because of a project that Hannah and I are working on in Auckland, which is about the scheduled removal of the old Mangere Bridge, which is a physical scaffold between Onehunga, where I live, and the Mangere Bridge township. It is a pedestrian bridge that used to be for cars, but they now use a motorway nearby. The bridge has become a real community gathering point for fishing, talking, chatting, bike riding and hanging out, but it is about to be removed. There is a fear that its removal will also see this community meeting point disappear, and also all the memories of that place, memories of the Manukau Harbour that it spans over.

At the same time, the Auckland Council is also constructing an artificial beach, reclaiming land in the Manukau Harbour. This Harbour is still quite polluted because, for example, Fonterra is still discharging milk-processing effluent into it. In fact, there has never been a beach there, even before the harbour was polluted, there were only shellfish banks and that kind of thing. So there are odd transitions happening around this Onehunga Harbour area.

Hannah has been asking how can you actually retain memories of something that has disappeared, and I think the answer has a lot to do with the archival value of new media art. Wendy Hui Kyong Chun describes that as one of the defining features of digital media; its value as an archive, an ever-increasing archive in which things don't necessarily get lost or disappear (although inevitably they do). Chun calls this the 'always there-ness' of new media [7]. So perhaps by collecting these stories and creating different forms of archives we can generate mnemonic devices in these ways of remembering.

Danny Butt

"Waiariki" is a project by the Local Time collective for the 5th Auckland Triennial, 2013, curated by Hou Hanru. It has no obvious physical form. If you went to an event at one of the venues you would drink water sourced from a spring which runs underneath many of the Triennial venues. One of the questions it raises is, "What is the archive of information about this resource and how should that be circulated or not circulated?"

We realised that perhaps it was not our position to contribute that knowledge to institutional archives. What we wanted to do was to get people to find their own performative relationship to the water, perhaps talking to people who have knowledge rather than just picking up a brochure, or logging on and having it or feeling like they have it.

To me the project is quite influenced by the discourses of media art in a negative way. Many media art projects assert a certain autonomy over the process of archiving, and the archive is a question of democracy, and being able to contribute to archives is a positive thing. But with Waiariki, and perhaps Christchurch, if we think about the trauma of an event, an archive of memory is not always positive. These flows of information from archives about the event may not be always 'goods,' they may be 'bads' for particular people.

Derrida, Spivak and Stiegler talk about the pharmacological nature of archives, as medicine that is also poison [8]. You need them to make you better but they can also kill you in the wrong doses or if you have an allergic reaction. It is not always a good thing to remember; there is a certain protection in forgetting.

There seemed to be no real way to present both Māori and European/Pakeha perspectives on Waiariki at once in any easy archive. There is a tendency towards artworks wanting social mobilisation, but I think it is also worth recovering the avant-garde legacy that a negative space can help us think and to reflect upon.

Zita Joyce

The intertwined issues of water and archives and memory provide a perfect ending point here. One of the things that is resonant about Waiariki is the surfacing of water, because one of the big problems in Christchurch is that the European settlers covered over all the water when they filled in the swamp and then built a city upon it, made of unreinforced masonry. So the city is full of water that is invisible and covered over, and there is a metaphor in that for the sort of things that come up, the things that are hidden within a city and released by the trauma of an event like the earthquake, and then the demolition of the city in its wake. There is genuine trauma arising from the loss of people, homes, jobs and

the familiar environment that many of us can barely acknowledge even now.

A Victorian city built on a swamp in a country that straddles a tectonic plate boundary is inherently transitional in a way – such a place was never going to last. And when it came apart it also created space for artists to respond to the physical, political, and social implications of this new awareness of transitionality. There is a lot of wall art, there are the "Gap Filler" projects which are very community oriented, there is a cardboard cathedral, and lots of temporary 'popup' kinds of structures[9]. Many of these Christchurch based projects are about creating structures and spaces for people to gather and physically connect in. Many others focus on online mapping and archiving – such as mapping food foraging sites and archiving wildflowers growing in demolition sites.

One of the aims of the Mesh Cities project is to explore the possibilities of media art practice in and about transitional Christchurch, and the implications of the earthquakes and this new sense of transitionality for other places in Aotearoa. Particularly, in thinking about the connections between network, space and memory, we are asking how media artists can create responsive social works that connect with people's experiences of these things.

Danny Butt's caution that retaining, or archiving all memories is not necessarily beneficial establishes an important ethical ground for often documentation-focused media practice. However, the works shared by the contributors to this paper demonstrate the potential role of media artists in creating responsive social archives, independent of the unreliable structures of buildings; networked practices that resonate in the spaces and time between remembering the past, and imagining the future.

References and Notes

1. Massumi, Brian. 2002. *Parables for the Virtual: Movement, Affect, Sensation*. Durham: Duke University.

2. Timothy Morton, *Ecology without Nature: Rethinking Environmental Aesthetics*. Cambridge, Massachusetts: Harvard University Press, 2007.

3. Alter, Lloyd (2011), <http://www.treehugger.com/sustainable-product-design/mesh-cities-sustainable-intelligent-cities-of-tomorrow-today.html>, accessed 4 November 2013

4. UC CEISMIC, <http://www.ceismic.org.nz/>, accessed 3 June 2013

5. Gap Filler, <http://www.gapfiller.org.nz/>, Accessed 3 June 2013.

6. Özden, Ali Tolga, "Disaster, Memory and Culture: Distressing Attempts to Develop Disaster Culture in Turkey" (August 1, 2012), <http://ssrn.com/abstract=2256152>, <http://dx.doi.org/10.2139/ssrn.2256152>.

7. Chun, Wendy Hui Kyong, "The Enduring Ephemeral, or the Future Is a Memory," Critical Inquiry, Vol. 35, No. 1 (2008), p. 154.

8. On the pharmakon, see Derrida, Jacques. "Plato's Pharmacy," in Dissemination. Trans. B. Johnson. London: Athlone, 1981. 61-171; Spivak, Gayatry Chakravorty, "Responsibility" boundary 2 21, no.3 (Fall 1994) 19-64; Stiegler, Bernard Technics and Time, 1: The Fault of Epimetheus Trans. Beardsworth, Richard, and Collins, George. Stanford: Stanford University Press. 1998

9. Projects relating to 'transitional' Christchurch are ever evolving. Significant examples include the Christchurch Art Gallery's 'Outer Spaces' programme, running while the gallery building is closed for repairs <http://christchurchartgallery.org.nz/exhibitions/>; The 'Festival of transitional architecture' <http://2012.festa.org.nz/2013>; and others catalogued on sites like Neat Places <http://www.neatplaces.co.nz/browse/transitional-christchurch/>, and in the Project Freerange book *Christchurch: The Transitional City pt IV* (3rd edition, 2013) <http://www.projectfreerange.com/product/christchurch-the-transitional-city-pt-iv-updated-3rd-edition/>

MAPS OF TIME: EXPLORING THE RHYTHMS OF A MEDIATED WORLD

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Abstract

Rhythm is a fundamental part of the human experience of place. Traditional mapping, in its translation to the page, prioritises space over time, frequently removing the cyclical rhythms inherent in the experience of landscape in favour of a more linear approach. In the networked world we are constantly translating energies, marking places, and attempting to create interactions between body, space and time. By slowing down the inscription through real time events of environmental change, the experience of the viewer shifts, relating to the mapped space through a new lens. By exploring the layers of 'real-time' inherent within our daily lives we are able to re-frame the rhythms of the digital experience.

Keywords: map, rhythm, space, time, network, cycle, light

Our daily existence within networked environments is reliant on continuous information and data flow linked to the consistent communication between online systems. Mapping these data flows provides a means for communities to organise and share information and to generate specific languages. Our engagement with seductive high-speed data worlds leads us to disregard the larger, slower and constant rhythms of global movement that underpin all the layers of our technologically mediated world. It is by discussing artworks that engage with both the networked city on a local scale, and the networked world on a global scale, that this paper begins to show how similar technologies can provide differing examples of the rhythms that these technologies create. Mapping enables clarification and navigation through the complex layers of time, space and the multiple worlds in which contemporary society exists and offers a starting point to this discussion by placing space, time and finally the display of rhythms across the networked world.

Maps reflect communities; they reflect the environment and thinking of those that create them. In order for a community to create and use a map, a shared or common language is necessary; this is a vital part of the mapping process. How the map is displayed, be it with Jerusalem at the centre, or via a pin placed on Google Maps, each map provides a sense of everyday knowledge that becomes translated by those using it into something meaningful. This representation alone only provides one part of the experience for the user. Maps change, ideas change, spaces change, and the printed map very quickly becomes an historic document. Spatial maps can depict a certain moment in time; however they cannot depict time itself, as a constantly changing concept.

Therefore, in this instance time can be seen as separated from space. In the western world we display time through clock time, through the turning of hands, the digits changing on the watch face, through calendars, timetables and schedules. In his discussions of *rhythmanalysis*, Lefebvre notes, "the circular course of the hands on [traditional clock-faces and watches] is accompanied by a linear tick-tock" [1]. Traditional mapping, in its translation to the page, prioritises space over time. Although Rosenberg and Grafton address the notion of 'time maps' through the work of Eviatar Zerubavel and the attempted theorisation of time-lines, timetables and historical documents, these works face a similar problem of placing time at the heart of the equation, rather than space [2]. However, as with space, these types of times also become fixed, reflect communities, and enable a shared knowledge in order to function. Waiting for the bus in the UK, for example, becomes connected to a timetable that rarely changes, reflecting the order of that community. The recording and documenting of this material moves us towards a clock time, a fixed structure that remains linear in its approach. Lefebvre notes this distinction of linear time, stating that it "would come rather from social practice, therefore from human activity: the monotony of actions and of movements, imposed structures" [3]. The network (as a social practice) retains this fixed structure, yet enables some degree of change dependent on how it is used or manipulated.

Beyond the linear time that we can so often associate ourselves with, we can see another layer of time in the form of cyclical time, which "originate(s) in the cosmic, in nature: days, nights, seasons, the waves and tides of the sea, monthly cycles, etc" [4]. These 'other realities' seemingly beyond our comprehension function continuously to maintain the stability of the earth. The only way we can understand the integration of the linear and the cyclical in our own human perception is through what Lefebvre defines as the 'rhythm', the merging of space and time, and the 'expenditure of energy' that we come to recognise in trying to place the experience. Space and time combined create the rhythms of the everyday.

These rhythms become the human perception of cyclical time. However, when we start to formalise what this means, as we attempt to understand temporal relationships to space, these relationships shift towards a linear time with cyclical tendencies. Mapping both space and time simultaneously often forces this experience towards the linear, yet retains

Fig. 1. *The Lost Day* (Photo © Alison Gazzard and Michaela French)

the cyclical, repetitive rhythms that we start to recognize. It is these maps that are generated by the online network, by the connections between places, spaces and times that we so frequently now encounter in the everyday.

In her discussions of Virilio's work in relation to cyberspace, Chun discusses how "cyberspace has implemented a real time that is eradicating local spaces and times. This global one time threatens "a total loss of the bearings of the individual" and a "loss of control over reason," as the interval between image and subject disappears" [5]. However, instead of an eradication, it can be seen that cyberspace, or at least the network that maintains cyberspace, is instead creating a new layer of space and time, a new rhythm for those who input, explore and observe what is being created online. These rhythms can shift depending on what is being generated, and it is this shift that we are seeking to explore at the heart of this discussion.

Fig. 2. ***Two Places I Call Home*** (http://michaelafrench.com/portfolio/two-places-i-call-home**). (© Michaela French)**

Part of this paper was written in a space/time void. At 39000 feet above the earth on a journey from London to Sydney we travelled in the 'lost day'. Time became suspended, as all sense of space was lost in the air, and only momentarily captured again through glimpses at the onboard map. The realisation that space and time cannot, in many ways, be separated began to be highlighted during this experience. In a space that is perpetually daytime, represented by light pouring in through the windows, it is hard to locate oneself, as the natural rhythms of the earth become distorted through space-time travel. This same distortion starts to appear via the network as space and time shift and become updated in different ways.

Through our growing obsession with the network we can start to see differences in rhythms occurring. The network is a spatial/temporal medium connected to the numbered rhythms of download and upload speeds (with speed or velocity being distance over time, and the distance existing as a combination of spaces unknown). We are becoming increasingly aware of mapping ourselves through the representations of our avatarial positions slowly pulsing on the smartphone map application. In many hybridised Google Map/Google Earth sites, such as Fourwhere.com, as well as in Christian Marc Schmidt's works *Invisible Cities* and *Pastiche*, space is reconstructed through networked data. This data can be seen to re-frame and re-shape our connections and our identities in our response to the work. These artifacts rely on a hub of activity, a continued, growing database of connections, all conceived via the network. Gordon and de Souza e Silva define this phenomenon as 'net locality', which "implies a ubiquity of networked information – a cultural approach to the web of information as intimately aligned with the perceptual realities of everyday life. We don't enter the web anymore; it is all around us" [6]. It is this ubiquitous, pervasive nature of online communications that sees us lose our sense of space and time as new rhythms are created. The constant updating of social media feeds creates new communities of shared languages through related followers; imposing locative information from these feeds onto a visual map then creates another shared language of experiences. The rhythms created by these interactions become technologically charged, and change with every update, as the spaces and times of the online world remain in a constant state of flux.

In the networked rhythms of social media feeds and locative data the daily rotation is often lost in favour of a technological rotation that continues across time zones in a linear sequence of updating and temporal shift. As Jones notes in his discussion of natural rhythms, "much ecological, social and economic life has circadian rhythms, driven by the daily rotation of the earth in relationship to the sun" [7]. Night becomes day becomes night, but it can also seem to remain at a constant, much like the 'lost day' of no man's land as imposed on us by the plane journey. Although Christian Marc Schmidt's *Invisible Cities* piece is being generated in real-time, it does lend itself to a slowness of the city. Similarly, the city is also depicted at the extremes of being distorted and continually shaped by those existing in the technological layer on the streets. The city is no longer in its natural form, and we are forever reminded of the interference that it creates as we struggle to maintain a feedback loop between body and machine, machine and landscape.

For those of us that are technologically connected through computer screens, online access, mobile phone technologies with embedded GPS and location-aware applications, we can see how our relationships with time and space are shifting. These technologies create a desire for a speeding up of our lives, not for a slowing down. The constant buzz of notifications, e-mails, Google location messages, Foursquare check-ins, and Twitter replies adds to the 'always on', 'on demand' culture associated with the increasing ease of access we are believed to want to achieve.

This distortion of time made possible via the network occurs in applications such as Hyperlapse [8]. Here the user is able to time-lapse their own Google Street view journey, in order to preview routes that they might take. The journeys are speeded up or captured in bizarre sequences where we can warp between places (much like space in fictional videogame worlds). The distances in be-

tween become unrecognisable, the time of being in a place becomes fleeting rather than prolonged, and our ability to conceptualise how long people have been there starts to diminish. Jones recognises these moments through the work of Lefebvre, stating, "spaces (such as cities) have multiple types of temporal patterns and rhythms (linear, sequential, cyclical), and this is key to understanding the pulse(s) of life within them" [9]. The networked world exists as a layer within the other rhythms of the city, allowing for constant, updatable interactions in the true notion of cyberspace. It is these same networks that can be used to appreciate the local levels of rhythms occurring more naturally in the landscape.

Streetlight Storm by Katie Paterson is one such work attempting to do this. The piece utilises the network in order to reproduce lighting strikes across the world in a more localised setting, using the lights along Deal Pier in Kent, UK. In many ways this links to Jones' writing about the rhythms of the tide and the moon, where he states, "Landscapes become timescapes (Adam, 1998) in which intersecting rhythms are key features" [10]. Paterson's work clearly becomes a timescape, yet by coinciding with the space of Deal Pier, the rhythms are generated, much as they would be in a more localised lighting strike, drawn from live lightning storm sites as far away as the North Pole and North Africa. Cyclical rhythms emerge slowly, as the work emphasises the sporadic nature of the rhythms of worldly light. A return to more natural rhythms starts to take place, yet these can only be appreciated in short, fleeting moments of intensity, and not as a constant reminder of natural processes. However, the work starts to emphasis the real-time capabilities of the network to map something we see throughout our own lives. Here the weather takes the lead, rather than a constant humanised input, as the lights replicate parts of the world around us.

Although not what we would consider to be an everyday 'map', Paterson's work does involve the mapping of data feeds and real-time interactions. The lights act as a new key to a visually mapped experience; one to be interpreted and re-interpreted by those experiencing the piece from different points of view. The on/off nature of the light recreates the rhythms of the natural storm, yet passersby only start to recognise the shared language offered by the mapped sequence as they become more and more drawn into the experience and their perspectives start to shift to a new, slower way of life. As Gooley notes in his discussion of returning to more natural ways of navigating, "To understand the relationship between nature and direction at its purest and most fundamental level, the modern mind needs to be refreshed and to move away from the conventional ideas and imagery of direction. The natural navigator needs to restore the relationship between direction and the sky to its former loftier status, where direction is not simply found by looking to the sky but actually is what *is* seen in the sky" [11]. In *Streetlight Storm*, the light allows for a directional mapping, not only of the immediate surroundings, aiding boats along the pier, demarcating water and wood, but also a mapping of natural occurrences across the world and bringing them into one place.

In much the same way that Paterson's work connects with light, *Two Places I Call Home* by Michaela French is a light-based artwork which seeks to redress the loss of connection to cyclical rhythm through a synthesis of nature, art and technology. Instead of focusing on sporadic natural events, French's artwork maps constant global rhythms through the real-time observation of changes in light. The relatively slow rate of change in the artwork offers an insight into the immensity of global scale and acts as a counterpoint to the fixation with speed we encounter in contemporary networked life.

Two Places I Call Home seeks to collapse the vast distance between two distinct locations on opposite sides of the globe. Real-time measurements of light are collected from two specific locations: one in the northern and one in the southern hemisphere. This light data is translated into a visual form to create a single oscillating artwork which maps cyclical rhythms of global rotation in real-time, as day moves to night on one side of the earth and night moves to day on the other. French's work is arguably illustrative of Merleau-Ponty's proposal that it is no longer a "question of speaking of space and light; the question is to make space and light, which are *there*, speak to us" [12]. *Two Places I Call Home* seeks to address this question by enabling a dialogue in which universal light is able to speak to its audience. As the audience observes the changes in light their experience of time slows down, and an increased awareness of the larger constant rhythms of global change begin to emerge. The complexities, desire, speed and illusion of the linear mediated world fall away as the constancy of the cyclical rhythm comes to light.

French's piece enables light to be mapped at its own pace and in its own rhythm. This rhythm is the inverse to those of our mediated world, and enables a renewed sense of the value of our connection to the global cycle. Light navigates us back to the core rhythms of life, it peels back the layers of linear time and places us firmly in a grounded experience of the natural world. According to Grandy, "light is a throwback to the first moment of light,…its indifference to space and time is aboriginal, and, it would seem, timelessly operative" [13]. Through mapping changes in light, *Two Places I Call Home* brings both this timelessness, and also our own integrated relationship with light, to the fore. Grandy goes on to suggest that "light, while informative of the world, is simultaneously constitutive of our own nature…light informs or shapes our knowing faculties while informing us of the world" [14]. This light-based artwork is intended to increase receptivity to new ways of seeing the familiar and to generate expansion of vision, for in observing light, we observe ourselves. "Light is bound up in truths that transcend space and time, and as light-infused beings, so are we" [15].

Two Places I Call Home acknowledges the value of our mediated, networked world, and brings the universal and the individual together by visually mapping cyclical time within a linear framework. The individual is able to observe changing global rhythms through the common language of the linear network. Moreover, breaking the conventions of this language by connecting the user to cyclical time draws on what Deikman terms "a dehabituating or "de-automatizing" of perceptual sensibilities, which leads to perceptual expansion" [16]. This expansion encourages the individual to reobserve the linear framework of the mediated world within the broader context of a renewed sense of real-world cyclical rhythms. The artwork provides a counterpoint to the habitual, and reveals the extraordinary that lies latent within everyday experience, both mediated and real.

Preliminary responses to *Two Places I Call Home* suggest that the observer's awareness of cyclical changes in light

in the real-world environment were more pronounced after spending time observing the slow change of light within the mediated environment. By mapping light and cyclical time within the linear framework of the networked environment, *Two Places I Call Home* bridges the space between the technologically mediated experience and the authentic real world experience, and seeks to connect the individual more genuinely within both worlds.

By examining different examples of rhythms as mapped by the networked environment, we can see how similar technologies can present the natural world in various ways. Instead of focusing only on the frequent connections of check-ins and consistently changing location-based data, we can also use the network to move beyond the cluttered layers of our technologically mediated world, and instead evoke a renewed sense of connection to place and experience by revealing the slowness of the underlying rhythms of global change.

References and Notes

1. Henri Lefebvre, *rhythamanalysis* (London, U.K.: Continuum, 2004)

2. Daniel Rosenberg and Anthony Grafton, *Cartographies of Time* (New York, U.S.A: Princeton Architectural Press, 2010)

3. Henri Lefebvre, *rhythamanalysis* (London, U.K.: Continuum, 2004)

4. Henri Lefebvre, *rhythamanalysis* (London, U.K.: Continuum, 2004)

5. Wendy Hui Kyong Chun, 'The Enduring Ephemeral, or The Future is a Memory', in Erkki Huhtamo and Jussi Parikka (eds.), *Media Archaeology: approaches, applications, and implications* (Berkeley, U.S.A: University of California Press, 2011)

6. Eric Gordon and Adriana de Souza e Silva, *Net Locality: why location matters in a networked world* (London, U.K.: Wiley-Blackwell, 2011)

7. Owain Jones, 'The Breath of the Moon': The Rhythmic and Affective Time-spaces of UK Tides', in Tim Endesor (ed.), *Geographies of Rhythm* (London, U.K: Ashgate, 2010)

8. http://www.teehanlax.com/labs/hyperlapse/

9. Owain Jones, 'The Breath of the Moon: The Rhythmic and Affective Time-spaces of UK Tides', in Tim Endesor (ed.), *Geographies of Rhythm* (London, U.K: Ashgate, 2010)

10. Owain Jones, 'The Breath of the Moon: The Rhythmic and Affective Time-spaces of UK Tides', in Tim Endesor (ed.), *Geographies of Rhythm* (London, U.K: Ashgate, 2010)

11. Tristan Gooley, *The Natural Navigator* (London, U.K: Virgin Books, 2010)

12. Maurice Merleau-Ponty (1964). *The Primacy of Perception* (Chicago, U.S.A: Northwestern University Press, 1964)

13. David Grandy, *The Speed of Light: Constancy and Cosmos* (Indiana, U.S.A: Indiana University Press. 2009)

14. David Grandy, *The Speed of Light: Constancy and Cosmos* (Indiana, U.S.A: Indiana University Press. 2009)

15. David Grandy, *The Speed of Light: Constancy and Cosmos* (Indiana, U.S.A: Indiana University Press. 2009)

16. Arthur Deikman, 'De-automatization & Mystical Experience', in Charles. T. Tart (ed.), *Altered States of Consciousness* (New York, USA: Harper Collins, 1990)

ORANGUTAN PLAY ON AND BEYOND A TOUCHSCREEN

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Abstract

Non-humans in captivity require enrichment, which often takes the form of play. Over the course of past decades, various technologies have been introduced in zoos around the world to support captive animals' wellbeing. With a critical design / player ethnography approach, TOUCH project brings computer technologies to orangutans living at the Tasikoki Wildlife Rescue Centre in Indonesia. This paper discusses the role of play in the lives of two young male orangutans, Bento and Is, and explores how play can serve as a basis for cross-species communication between humans and orangutans.

Keywords: ACI, games, enrichment, touch technologies, non-human animals, game design

Introduction

This paper addresses the game design research project TOUCH, specifically its aim to facilitate meaningful interactions between humans and orangutans. Overall, TOUCH strives to 1) provide enrichment for captive orangutans who cannot be reintroduced to their natural environment, 2) raise awareness around environmental and ethical issues related to the wellbeing of orangutans as endangered species, and 3) create new possibilities for cross-species communication through game design. The current primary location for the project is Tasikoki Wildlife Rescue Centre, North Sulawesi, Indonesia. In the project, custom-made, rugged touch interfaces are played by, and with, captive orangutans as part of their enrichment program, under close human supervision. Various forms of interactive and non-interactive content have been provided, in order to test and understand orangutan preferences in the use of such technologies; these have included games, videos, images, drawing software, music applications and digital cameras.

Due to the limited resources and conditions available for implementing technically and socially demanding research projects in a developing country, the work has so far been conducted in an ad hoc nature. Emerging from this specific condition, the purpose of this paper is to discuss how real personal experiences with orangutans can serve as a basis for the third goal of the project - that is, how firsthand encounters between humans and orangutans can help in the design of their technologically mediated counterparts. Without going into the details of game design or game testing, the paper attempts, through a perspective of critical design practised alongside ethnographic player research, to establish an understanding of this unusual game player prior to any elaborate design decisions or prototyping.

To provide background information for the entire project, this paper considers two Bornean orangutans, Bento and Is, living in captivity at the Tasikoki Wildlife Rescue Centre. They were introduced to me by project collaborators Dr Willie Smits, Tasikoki Program Manager Simon Purser, and Orangutan Keeper Yan Menda. The two male orangutans of around ten years old, whom I now consider my friends, were rescued from the illegal animal trade and brought to the rescue centre as young orphans. Their life at the rescue centre is possible through donations to the Masarang Foundation, under which Tasikoki belongs, and their care is largely in the hands of volunteers who come to work at the centre from all around the world, for two weeks to two months at a time.

However, this paper is by no means about Bornean orangutans, or captive animals in general; it is an account of two specific individuals, participating in an experimental study that explores the use of digital game technologies with primates. What all animals in captivity share, however, is an abundance of time combined with limited sources of cognitive and physical stimulation.

Digital technologies, especially game-like applications, have been proposed to help enrich the lives of animals in captivity [1], [2]. Recently various studies, exploring digital enrichment for primates in particular, have been published - for example [3], [4], [5], [6]. For those studying digital games, it may come as an illustrative example that when studies of human play were focused on the negative effects of videogame violence in the 1970s, researchers looking at primate play found possibilities for the opposite in digital games. For example, Markowich [7] demonstrated how the introduction of a simple speed game reduced friction and tension among mandrills at Washington Park Zoo.

Fig. 1. Is, a Bornean orangutan, examines a Panasonic tablet computer while in a quarantine cage (image © Hanna Wirman)

Continuum of Play

So, this story starts with boredom; and boredom here is a result of being held in captivity, of being deprived of the natural challenges and stimuli of animal life. For orangutans, captivity means freedom from the duties of the forest – from finding food, staying safe, building nests, and socialising with other animals. The meaning of play in their lives also differs significantly between what we call the natural environment and captivity; for in natural settings, animals only play when they are sufficiently fed, safe, and without immediate threat [8]. Play in nature is, therefore, a rare luxury for most, whilst in captivity it is something animals do most of the time, to 'kill time'; we can thus establish combatting boredom (and all kinds of psychological problems that result from it) as the primary motivator behind animal play in captivity.

Play, moreover, has been adopted as a glue that has the potential to bring humans and non-humans closer together. As Aarseth asserts, "you can't tell your dog a story, but the two of you can play together" [9]; play is seen as an equalising plane that can help cross-species communication and bring us together [10], [11]. It existed before culture and language [12], [13], and is arguably shared between thousands of species.

Given that technology, then, separates human from non-human play, practical implementation of technologically-enhanced gameplay for and/or with other species does not fit with the perceived easiness of playing with another species. Elsewhere I have discussed how orangutans play 'wrong' in relation to the assumptions that a human designer typically bases on earlier practice with fellow humans [14]. Games with simple puzzle-type tasks (touching items to make them disappear and move, playing sounds, drawing, and selection based on memory), and digitally created colour representations of everyday objects, such as fruits and toys, have been approached with great curiosity, but incoherence as regards interaction, by orangutan players. Their primary focus, to the extent I can understand, has so far been on the physical features of touch technologies, on the supporting technologies, and on the human supervisors and play-enablers.

Earlier I have introduced surprising uses of touchscreens, and proposed that what appears unusual in the apes' behaviour with the screens can aid designers' understanding of their implicit design decisions. Design for a very different user – for the genuine 'Other' – can therefore be seen as useful in designers' self-reflection and professional development in general; using the screen with the tongue, exploring supporting technologies, scattered gameplay sessions, and interest in hardware over software applications are all examples of such. These alternative approaches may then guide future interface and game design, for instance, and drive innovation for both humans and non-humans.

Furthermore, when designing for human play, it is relatively easy to tell a participant when they are supposed to 'play' and 'have fun'; human players can then try to adopt a specific attitude, and in general adjust their expectations and behaviour accordingly. However, this is certainly not the case with orangutans; this very meta-communicative aspect of play poses a challenge for cross-species communication and play.

Animals have play-initiating signals which are species-specific, and which are not straightforward to adopt. A computer does not automatically signify play, or suggest that there is play about to happen, for an orangutan. In short, the kind of focussed and systematic one-finger touchscreen play that we are used to seeing in humans is not likely to take place in orangutans.

Digital game play for Is and Bento is, furthermore, on a continuum of various technologically enhanced, as well as non-digital, play practices. Play on/with the screen blends seamlessly into play with another orangutan, with the cage gates, with insects, water, food, or with other available items and structures [15], [16]. Among these forms of play appears a set of practices that involve nearby humans.

It is on this play with humans that I will focus for the remainder of this paper. In this project, moments that mark the transition of an ape's interest from technology to human have served as a basis for approaching the potential for cross-species communication. While games designed to be played on the touchscreen have so far apparently failed to establish shortcuts to cross-species interaction (although it is possible that further testing and development could still lead to such shortcuts), some forms of human-orangutan interaction have evolved in the shadows of my primary focus, and only recently caught my attention as proto-forms of cross-species communication. While these practices demonstrate straightforward interaction between species, they have the power to suggest such play in terms of negotiation over rules that are based on different capacities and competencies.

Playing with the 'Other'

Without the benefit of inserting video material here, a short introduction must suffice. The mentioned cross-species practices are evident in my, and my project collaborators', physical interactions with the orangutans between sessions of touchscreen play. These include means developed to retrieve supporting technologies, such as Ethernet cables, from the apes; attempts to open and close cage doors; and play with hands.

Typically various forms of physical engagement, sometimes struggle, take place as the humans attempt to facilitate the smooth operation of touchscreens.

Fig. 2. Bento invites play with an Ethernet cable he has managed to 'steal' (image © Hanna Wirman)

For instance, the installation of IP cameras turned into a multi-hour performance consisting of play with cables, poking sticks, pulling clothes, and spitting.

Playing with hands, meanwhile, is a common practice that evolves from the apes' interest in human skin, particularly hands, usually the only body parts they can reach. I have found such play a relaxing interlude between sometimes overwhelming and chaotic sessions of touchscreen use. More importantly, hand play has proven significant in developing friendship and trust with Bento and Is.

In my reading, such practices are generally labelled as play. In these moments, the new physical and cognitive engagement appears similar to a tug-of-war, with the exception that both parties seem highly mindful of avoiding acting in

ways that would directly and willingly hurt the other. It is, in fact, characteristic of such moments to be about trying out the limits of the Other; they are precisely about establishing the Other in relation to oneself. On both sides, it seems that the individual is not, for instance, trying to pull back the cable as forcefully as possible, but respects the physical capabilities of the other. On average orangutans are several times as strong as humans, yet they have never hurt me in such 'play'. An unexpected form of meta-communication somehow appears, without words or conscious attempts to establish such.

Following Bekoff and Pierce, we could consider whether it may indeed turn out that "play is a unique category of behaviour that tolerates asymmetries more than other categories of social behaviour" [17]. What these cases highlight is the way in which play allows beings of different kinds to come together despite their differences and asymmetry. Not only are the physical strength of the orangutans, or the tools available to the humans, reduced through self-handicapping; an (from the human's point of view) uncomfortably unequal power distribution between the caged animal and the relatively 'free' human is rendered meaningless in the moment of play, thus establishing new boundaries that exclude the power relations inherent in the usual interactions between the two. Both parties can forget themselves in play, which allows not only a physical but also an (albeit only momentary) ethical concession for the individuals involved. From the point of view of human-orangutan communication, this is an enormous step towards cross-species play and its digital forms.

Although, in relation to animal play, meta-communication is usually seen as something that takes place before play can begin, the introduced cross-species play allows us to explore meta-communication as serving to establish the very rules of play, both during and throughout play. It is about learning the limits, knowing the boundaries, and getting to know what is 'accepted' in play. Meta-communication is hence not a one-off initiation, after which rules are set and play can start; it is, rather, a continuous process and an integral part of play itself.

What we may consider as game design for such cross-species communication, then, is a process of facilitating exchange and exploration between species. The designer may consider that while play does indeed help overcome asymmetries, play itself may take the form of establishing and understanding, in both directions, what those asymmetries are. After all, "for all of its carefree nature, play turns out to have significant implications for being nice and for doing what's right […] play is one of nature's most effective social lubricants" [18].

Moreover, the game designer's role involves close study of the existing patterns of cross-species interaction and communication, and recognition of the ways in which these can be enhanced through use of technologies, and developed to afford communication over physical distance.

Lastly, a designer must consider the social, cultural, cognitive and physical limitations of cross-species communication in a rescue centre or zoo setting, in order to prepare for ethically sound and sustainable practices.

Conclusions

During the past five years, game studies have come to accept and adopt an approach of 'situated play' that acknowledges a historically, culturally, geographically, physically and socially constructed gameplay context, and its implications with respect to gameplay interests, experiences and importances. This has resulted largely from games research becoming more informed by cultural studies.

In this paper and in earlier presentations, I have demonstrated how orangutan play (and, by extension, all animal, including human, play) is not only situated in a specific context, but should also be considered in relation to other forms (both on- and off-screen) of play that take place before, after and parallel to it. Cross-species interaction between humans and orangutans has emerged throughout the TOUCH project, although not where intended.

This paper has proposed that play has the potential to facilitate communication and meaningful engagement between species, as it helps in overcoming asymmetries and establishing the particularity of the Other in relation to one's own standpoint and being, and in accepting the Other in their difference [19]. I consider it to be my role, as a designer for orangutan-human cross-species play, to pay attention to the subtle moments of physical interaction that mark existing communication between the species, and to build technologies to further enhance these practices. Cable pulling, playing with hands, biting, poking, and play with water or food will serve as points of departure for my future co-design research.

References and Notes

1. B.M. Perdue et al. 'Technology at the zoo: the influence of a touchscreen computer on orangutans and zoo visitors', in *Zoo Biology*, 30 (2011).

2. R.M. Yerkes. *Almost Human* (New York: New York, 1925).

3. S. Inoue and T. Matsuzawa. 'Working memory of numerals in chimpanzees', in *Current Biology*, 17(23), 1004-1005 (2007).

4. I.H. Iversen and T.A. Matsuzawa. 'Acquisition of navigation by chimpanzees (Pan troglodytes) in an automated fingermaze task', in *Animal Cognition*, 4, 179-192 (2001).

5. K.A. Leighty et al. 'Use of a touchscreen-mediated testing system with mandrill monkeys', in *International Journal of Comparative Psychology*, 24, 60-75 (2011).

6. K.B. Swartz and S.A. Himmanen. 'Individual response strategies in list learning by orangutans', in *International Journal of Psychology and Psychological Therapy*, 6(2), 233-248 (2006).

7. H. Markowich. 'Engineering environments for behavioral opportunities in the zoo', in *Behavior Analyst* 1, 34-47 (1978).

8. P. Balcombe. *The exultant ark: A pictorial tour of animal pleasure* (Berkeley: University of California Press, 2011).

9. E. Aarseth 'Genre trouble: Narrativism and the art of simulation', in N. Wardrip-Fruin & P. Harrigan, eds., *First person: New media as story, performance, and game*, 45-55 (Cambridge: MIT Press, 2004), pp. 6-7.

10. H. Wirman et al. 'Defeated by an orangutan? Approaching cross-species gameplay', paper presented at DiGRA 2011 Conference, Utrecht School of the Arts (14-17 September 2011).

11. H. Wirman. 'A touch screen as encountered by an orangutan', poster presented at Minding Animals Conference, University of Utrecht (4-6 July 2012).

12. J. Huizinga. *Homo ludens: A study of the play-element in culture* (Boston: Beacon Press, 1938).

13. B. Sutton-Smith. *The ambiguity of play* (Cambridge, MA: Harvard University Press, 1997).

14. H. Wirman. 'Unexpected and unplanned play: Digital games among orangutans', keynote speech, Foundations of Digital Games Conference, Technical University of Crete (14-17 May 2013).

15. H. Wirman. 'Game form and its implications to games as art', paper presented at the Social life of forms Hong Kong seminar, City University of Hong Kong (21 March 2013).

16. Wirman [14].

17. M. Bekoff and J. Pierce. 'Wild justice: Honor and fairness among beasts at play', in *American Journal of Play* 1(4), 451-475 (2009), p. 461.

18. Balcombe [8], p. 28.

19. H. Wirman. 'Nonhuman animal players: Overcoming speciesism in cultural studies of digital game play', paper presented at Crossroads in Cultural Studies 2012, Sorbonne Nouvelle University and UNESCO (2-6 July 2012).

CLOUD MUSIC: A CLOUD SYSTEM

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Abstract

This paper suggests that artworks such as Yoko Ono's Sky TV (1966), Hans Haacke's Condensation Cube (1963-65), and David Behrman, Robert Watts and Bob Diamond's Cloud Music (1974-79) are ancestors to a significant strand of contemporary art practice that binds weather, emergent technologies and the observer-participant. Such projects freed technical instrumentation (meteorological devices, cameras, video analysers and circuitry) from their conventional usage in communication or science. It will be argued that the highly variable patterns of weather provide a live, improvised score, yet are still subject to restraints, where hierarchies between artist or composer and audience, as well as human and machine, became unsettled.

Keywords: Ecological Aesthetics, Cybernetics, Electronic Music, Installation Art, Meteorological Art, Early Computer Art, Fluxus

The dynamic patterns of weather were adopted as a direct feed in kinetic, performance and early televisual art in the 1960s and 70s. The variability and 'liveness' of weather became a driver in 'real-time' systems in many artworks, including in the international avant-garde movement Fluxus. For instance, Yoko Ono's well-known work *Sky TV* (1966) trains a video camera on the sky in a closed circuit loop to a monitor, exemplifying an early experiment with weather and new technology. This paper focuses on the audiovisual installation *Cloud Music* (1974-79); a collaboration between the artist Robert Watts, most well known for his work in Fluxus, David Behrman, experimental composer of electronic music and Robert (Bob) Diamond, systems engineer, and video designer. A first-hand account of the development of *Cloud Music* was related to the author in an interview in May, 2013 with David Behrman and Bob Diamond; Robert Watts passed away in 1988.

The area of media art practice that I have called 'Meteorological art' [1] has links to systems theory, cybernetics and concepts of chaos and indeterminism in physics. I will refer in particular to British cyberneticist Gregory Bateson's chapter 'Cybernetic explanation' in *Steps To an Ecology of Mind* (1973) as a frame to discuss how dynamic systems operate in *Cloud Music*. The paper will examine the implications for an ecological aesthetic by taking Cloud Music as a model of relations across a series of recursive, differential systems. As a cultural 'dialectics of transformation' [2], these works suggest an analogy between changes of state in physical systems and the possibility of shifting or rethinking human-technology-nature relations.

During 1945-1960 when cybernetics was established as a discipline, Gregory Bateson, Norbert Wiener, John von Neumann, Claude Shannon among many others met at annual conferences sponsored by the Josiah Macy Foundation to formulate the core concepts of a theory of communication and control that would incorporate the bios, the human and the machinic. A key concern of this developmental phase of cybernetics was homeostasis, or the ability of living organisms to maintain steady states in diverse environments by using feedback loops. This focus was reformulated in the 1960s and 1970s as 'second-order cybernetics.' Participants from the Macy conferences, especially Margaret Mead, Gregory Bateson, and Heinz von Foerster, resolved to attend to the implications of the feedback loop that could also 'loop through the observers, drawing them in to become part of the system being observed'[3].

The concern of cybernetics is not with the substance of any one specific system, but with, "the structurality of systems in general and above all, the structurality of differential relations between and across systems", to cite theorist Louis Armand [4]. This view of systems as mutually causal and interconnected across social, biological, and technological systems, and the inclusion of the observer as participant, correlates to relational approaches to art practice in the 1960s and 1970s.

In addition, sciences that considered ways of behaving or transforming; processes rather than predetermined outcomes, sparked the attention of art practitioners of the period. The shift of focus in science from ontology (what things are) to ontogenesis (how things become) described by physicists Isabelle Stengers and Ilya Prigogine (1988) is also discernable in art experiments of the period. In addition, Stengers argues that vernacular translations of 'chaos' and 'complexity' have held a redemptive function for science, freeing science from charges of reductionism [5]. Order and disorder are no longer perceived as binaries; order is encoded within chaos, where a process such as entropy may lead to a higher order. In relation to meteorological systems in particular, new connections between computers and weather were forged during World War II that enabled meteorologists to increase the accuracy of weather prediction.

The study of complexity in meteorology intensified after founder of cybernetics Norbert Wiener delivered his paper 'Non-linear Prediction and Dynamics' at Berkeley in 1956. Wiener's theory introduced a mathematical model where the coordinates would constantly fluctuate. Several meteorologists at MIT used Norbert Wiener's paper on non-linear dynamics to reinforce their current statistical forecasting methods based on formulas that cover a spectrum of changing factors, such as current temperature, combined with wind speed, or the temperatures of a neighbouring city. However one meteorologist, Edward Lorenz, felt that Wiener's paper was being misinterpreted. Lorenz tested Wiener's theories by selecting a non-linear, hypothetical set of weather data equations based on the various interactions of twelve variables. He thought he could capture the essence of how weather changes through these non-linear differentials. [6]

By 1963, the numerical experiments of Lorenz revealed the 'sensitive dependence of the initial conditions,' where the amplification of an initial discrepancy could produce a pattern that was quite different to an earlier weather forecast, in the case of a weather prediction. Yet it was not until the 1970s that 'certain fluctuations that produce a higher order through complex relationships' [7], and Lorenz's 'strange attractor diagram', become widely known as 'chaos' theory. 'Chaos' signaled a new paradigm in science that could be applied to many systems from the stock market to epidemics.

'Chaotics', a term coined by N. Katherine Hayles to describe cultural interpretations of the science of chaos, was construed on multiple levels by composers, artists and writers of the mid twentieth century [8]. Compositions by David Tudor and John Cage contain musical interpretations of disorder, order, probability, randomness, freedom and indeterminacy for instance. In many cultural forms disorder was regarded as integral to a work, rather than an aberration. Prior to *Cloud Music* David Behrman collaborated with Tudor and Cage on early 'Experiments in Art and Technology' events as a young assistant, and later as a composer with the Merce Cunningham dance company. Both chaotics and chaos theory were important to *Cloud Music*. Video designer Bob Diamond will be cited at length in the following, with

regard to how the piece was connected to his work in a different environment as a systems engineer for NASA on the Apollo project.

Cloud Music

To enable Robert Watt's poetic idea of listening to the clouds, Behrman and Diamond designed a whole system from scratch, including audio and video, that they dubbed the 'Cloud Machine'. The video analyzer, designed by Bob Diamond, linked six crosshairs on a monitor positioned towards a particular set of clouds, to six control voltages. As the light values of the moving clouds changed as they passed across the crosshairs, the voltages changed and were converted into triggered progressions of pitched sounds, made by a music synthesizer. Diamond explained, "the whole idea of it was to almost be able to feel the shape of the clouds. […] depending on the shape of the cloud different parts of the screen will be activated at different sensitive points"[9]. Behrman regarded each of the six cross hairs as possessing a 'music personality'.

The artists worked collaboratively over a two-year period from 1972-1974 to develop the work. The egalitarian nature of this collaboration was unusual for the 1970s where electronic art would often be promoted as the work of a single well-known artist, supported by unnamed assistants. Bob Diamond was shifting between a remote cabin in Montrose, Pennsylvania and working for the experimental WNET TV Lab on video synthesizers and video circuitry in New York. He custom-designed video switchers for Nam June Paik, with whom he worked closely during this period [10]. Diamond's method relies on time-base or sync signal of the video. This signal synchronizes the sweeping movement of the electron beam in a television picture tube with the Sony video camera [11].

The six circuit boards for each cross hair of the video analyzer were soldered together with Diamond's wife Pat in a smaller version of a 'Model-T Ford' production line-style process in the cabin over ten months.

Central to *Cloud Music* (1974-1979) are, of course, the clouds themselves, a highly dynamic physical system. Even in this century scientists still struggle to understand the complex set of drivers which determine the height, density, composition and color of clouds, which, combined with their ephemeral nature, means that clouds remain one of the least understood aspects of the climate system. The response of the climate system (and feedbacks) to large scale changing cloud patterns is also largely unknown [12].

The process of sensing the differences in clouds in *Cloud Music* relies on an analysis of pixel coordinates. Diamond professes to seeing the sky in terms of equations, saying; "I see a mesh of two-dimensional points with depth and magnitude" [13]. In Bateson's 'Cybernetic Explanation,' a chapter written contemporaneously with *Cloud Music*, he writes "Formal processes of mapping, translation or transformation are, in principle, imputed to every step of any sequence of phenomena which the cyberneticist is attempting to explain" [14]. In cybernetics, substance devolves to the information "carried" by the events and objects in the circuit in Bateson's analysis, just as the physical movements of the clouds devolve to audio information in the artwork. Although there is no causal link between Bateson's text and *Cloud Music* itself, there are parallels between cybernetic theory, Diamond's practical knowledge of feedback systems from his training in electro-engineering and Robert Watt's conceptual premise for the work.

Robert Watts would arrive in an exotic car at the cabin in Montrose to exchange ideas with Diamond on the artwork and then drive back to New York. Watts was primarily responsible for the installation design, and like Hans Haacke's *Condensation Cube* (1963-65), he made a Plexiglas box on top of a steel box to house the circuit boards. To reveal the interior of the technological black box was important to the *Cloud Music* collaborators [15]. Open or closed boxes that revealed or hid their structural workings were something of an obsession among avant-garde artists as well as a key motif in cybernetics [16]. In 1964, the Dwan Gallery staged the show *Boxes*, which included Robert Watt's work along with Edward Keinholz and Larry Bell and many others. Robert Watt's earlier artwork, *Three Clouds* (1965) included photographs of clouds and skin applied to three box-shaped plastic laminate pedestals.

The interior workings of Diamond and Behrman's intricate electronics of the 'Cloud Machine' were open to view through the clear Perspex case. Behrman's wirey custom-built audio generator included analogue as well as digital chips. From 1975 Behrman was acting director at the Center for Contemporary Music at Mills College, in Oakland, California. There was a small community of artists there who were working with emergent digital technology. Diamond described Behrman's music generator in reverential terms; "…it actually had AI (artificial intelligence) and a temporal memory. It could remember sequences that happened in the past. This was before computers had hard-drives and memories" [17].

Behrman explained further,

> The synthesizer had counters and adders that could mark and count the light-change events as they came in. It had six banks of three oscillators; each one could run backwards to replay what just happened, on a simple level. The history of light change-caused changes was recorded. Voltages from the video analyzer were changed into digits 0 to 7, and these integers determined the audio output tunings [18].

As well as having a temporal memory, environmental responsiveness was a central trope in *Cloud Music*. Behrman notes,

> If you think of a conventional composition as an object that is fixed from beginning to end, [instead] we were creating a situation to be explored by musicians. So that situation where the musician would play and trigger things is analogous to what happens in Cloud Music where the clouds could randomly trigger things. So these ideas of interactivity were in the air then, and they were related to Cage. Where you would leave in elements that you can't predict and it keeps it lively that way. You try and get rid of your own clichés. Cage used chance, [sic] he used the I-Ching to open up a situation. And, in a way, the clouds moving across the sky is like the I-Ching. […] [19]

While Behrman frames *Cloud Music* in terms of Cagean aesthetics, he also employed cybernetic notions of 'self-regulating systems that feedback on themselves' and 'drift' [20]. Behrman states that Bob Watts was certainly aware of cybernetic concepts at the time of making *Cloud Music*. The science of circular, causal mechanisms, fluctuation and 'feedback' were popular motifs for artists and composers in this period. A cultural discourse that could be responsive to chaotic factors and non-linearity

seemed to valorize the minutiae of local ecologies, even to deconstruct the liberal humanist subject and subvert the technological determinism of Twentieth century militarism.

For instance, art critic Jack Burnham cites Hans Haacke on his *Condensation Cube* as follows, "I was very excited about the subtle communication with a seemingly sealed off environment and the complexity of interrelated conditions determining a meteorological process" [21]. According to Haacke, this process produces in the viewer's mind a conceptual oscillation, in dialectical conflict with both traditional art and the hierarchical organisation of physical relationships. Whether or not a 'conceptual oscillation' is actually produced is a matter of speculation but his statement suggests that the audience might take an equal role in the constitution of an artwork. In second order cybernetics the observer in a living system is part of the cycle of information exchange, rather than a one-way model of transmission and reception. The observer does not just monitor pre-existing systems, but actually creates them through the act of observation. Haacke's later work *Recording of climate in an art exhibition* (1970), references the effects of the respiration of the audience in a particular environment, in his 'systems-based art' [22].

Although Behrman was frequently experimenting with harmonic tonal compositions where the frequencies would develop randomly and the sequences would eventually drift, in Cloud Music the system was intended for a long-term, unmanned installation so it was not allowed to drift indefinitely, or, as the musician comments, the oscillators would go out of tune. Behrman explains,

> There was a finite set of pitch possibilities derived from one Master oscillator, using digital dividers and multipliers. This gave the sound of *Cloud Music* a slightly colder feeling than earlier pieces that were allowed to drift. [Yet] Even on a day with a plain blue or grey sky, some little change will happen in the sky once in a while, causing a voltage to cross over a threshold in the synth, resulting in a harmonic change. [23]

Although *Cloud Music* was clearly a reactive artwork, the tendency towards random harmonics in the Cloud Machine mechanism was restrained by a return to the original family of harmonic tones. Behrman contends you could always recognize the sounds in the installation as *Cloud Music*. To think about the piece in relation to cybernetics once again, Bateson describes such systems where 'the circuit is energized from some external source', or 'events within the circuit may be influenced from the outside or may influence outside events' as always open. Bateson writes, "A very large and important part of cybernetic theory is concerned with the formal characteristics of such formal circuits, and the conditions of their stability. Here I shall consider such systems only as sources of restraint" [24]. The harmonic changes in *Cloud Music* might be understood by an analysis of the restraints, or stabilizing effects, whereby the ceaseless variation of the clouds was countered by mechanisms in the circuit. Undoubtedly these restraints were also intended for aesthetic effect.

Bateson asks the reader to entertain the following idea,

> Consider a variable in the circuit at any position and suppose this variable subject to random change in value (the change perhaps being imposed by impact of some event external to the circuit). We now ask how this change will affect the value of this variable at that later time when the sequence of effects has come around the circuit. Clearly the answer to this last question will depend on the characteristics of the circuit and will therefore, be not random. [25]

Bateson's notion of randomness as part of a greater pattern can also be read as a reference to a larger relational nexus, or ecology; as that which exists beyond the confines of the box in which a system is located. As Hayles argues, if pattern was initially a privileged term among the electrical engineers developing information theory, randomness became increasingly understood as the creative ground from which new kinds of pattern can emerge. [26] If pattern is the realization of a certain set of possibilities, for Bateson randomness is "the much, much larger set of everything else, from phenomena that cannot be rendered coherent by a given system's organization to those the system cannot perceive at all." [27] In the case of *Cloud Music* there are given restraints in the circuit that reveal that even the chance occurrence of cloud movement, or the timing of encounter of the viewer of the sound may be part of a higher order.

Diamond's experience in the space research environment translated to his willingness to experiment with the chaotic problem of sensing the clouds. He reflects;

> For two years I was working for NASA, working on Project Apollo. And one of the problems was that the engines kept exploding. And I was working on a way of determining by analyzing the engines to figure out why they were failing. Part of that problem was chaos; where the engine was acting like a whistle and it was blowing itself up because of the vibrations. […] This experience influenced me a lot in thinking about interactivity and designing an artwork that was interactive. Because depending on what that engine was sensing it would react in an interactive way; you could have blown on the exhaust and cause an oscillation that could explode it. […] The work with systems in *Cloud Music* was actually some kind of closure of this period of NASA research, where a concept that was causing so much pain could actually be resolved into a pleasurable experience. [28]

Diamond also noted that the video analyzer for *Cloud Music* was made from military grade parts that could withstand up to 100 degrees Celsius and work in a radiation environment or on a spacecraft. The cross hairs on the monitor themselves that sense differences in light are similar to the task of marking targets from ground-based artillery. Technologies initially developed for destruction were redeployed in an art context, as a means of subversion. However, the power dynamics that theorist of science Peter Galison (1994) points to in his discussion of the military origins of cybernetic ontology, including Wiener's development of war machines such as the 'Antiaircraft AA predictor', may also be considered in relation to *Cloud Music* [29].

Rather than tracing the cybernetic lineage in militarism, theorist of technology Andrew Pickering (2010) focuses on the emergence of cybernetics in the science of the adaptive brain and the environment. For instance in 1952, the British cyberneticist and psychologist Gordon Pask developed the *Musicolour machine*, an electro-mechanical device that collaborated with the musician to create a synthetic light show. Pickering suggests that Pask's musicolour machine undercuts any familiar dualist distinction between the human system and the machine. Similarly, in *Cloud Music* we find an assemblage of cloud-machine-observer or listener. To extend agency to the clouds and the machine extends informational importance and creativity to

the non-human physical world. Instead of the urge to dominate machinery and nature, in Pickering's words, we experience the possibility "of riding the inscrutable dynamics of the machines circuitry" [30] along with the chaotics of the clouds. *Cloud Music* is important in an ecological sense as it asks the audience to listen intently to the messages of the clouds, as mediated by technology.

Systems theory, cybernetics and ecological relations co-evolved as Bateson makes explicit when he posits that cybernetics is a means to think through the problem of "relations between an organism and its environment", when faced with the destruction of the world's environment [31]. He warns that if you "arrogate all mind to yourself, you will see the world around you as mindless and therefore not entitled to moral or ethical consideration. The environment will seem to be yours to exploit" [32]. Bateson finds 'mind' immanent in pathways and messages outside the body, in the structural organization of a system. If the mind expands outwards beyond the ego he writes, "a certain humility becomes appropriate, tempered by the dignity or joy of being part of something much bigger" [33]. His attribution of mind to non-human systems resonates with Bruno Latour's more recent exhortation to recognize the agency of non-human entities or 'things' conjoined into an expanded version of democracy [34]. To watch the sky and listen to non-human messages or patterns creates immediate affects that are beyond the self. Weather shifts in *Cloud Music, Sky TV* and *Condensation Cube* operating through the senses of the audience suggest a relational, rather than autonomous art object and a relational sense of self, or Bateson's "organism plus environment".

In conclusion, *Cloud Music* is a timely work to revisit as it reflects the multi-directional flows between art and science, technology and nature. We can recognize this project's importance as a release mechanism from the regulated informatics of meteorological science or the instrumentalism of the space race era. Such art practice is frequently framed in terms of resistance to scientific power-mechanisms, yet implicitly techno-industrial forces also move through creative works, as we can detect in the materials and operation of the Cloud Machine itself. In contemporary art, a growing number of artists are mediating between the atmospheric sciences, digital processes, online networks and 'live' weather itself. A high degree of specialization is often needed to understand scientific messages about our weather but the affective processes of media art, in the 70s as today, can mobilize our passions more immediately. *Cloud Music* models the complementarities and contestations between art, science and technology, and an emergent ecological consciousness.

References and Notes

1. Janine Randerson, *Meteorological Art: Weather as Media* (Media and Communications, University of Melbourne, PhD thesis, 2012).

2. J. Burnham and H. S. Becker and J. Walton, *Framing and being framed: 7 works 1970-75/ Hans Haacke; with essays by Jack Burnham, Steps in the formulation of real-time political art (*Halifax: The Press of the Nova Scotia College of Art and Design, 1975) p. 131.

3. N. K. Hayles, *How We Became Posthuman: virtual bodies in cybernetics, literature, and informatics* (Chicago: University of Chicago Press, 2010) pp. 7-9.

4. L. Armand, "Language and the Cybernetic Mind" *Theory, Culture & Society* **25**, No. 2, (2008), p. 127.

5. I. Stengers, *Power and invention: situating science (*Minneapolis: University of Minnesota Press, 1997) p. 3.

6. E. N. Lorenz, *The Essence of Chaos* (Seattle: University of Washington Press, 1993) p. 8.

7. Lorenz, [6].

8. N. K. Hayles, *Chaos Bound: orderly disorder in contemporary literature and science* (Ithaca, N.Y., Cornell University Press, 1990).

9. D. Behrman and R. Diamond interviewed by Janine Randerson, Cloud Music (Auckland, New York, San Jose via Skype connection, May 12th, 2013).

10. Bob Diamond also developed video synthesizers at WNET TV-Lab for Sesame Street and The Electric Company (1971-79).

11. D. Behrman, R. Diamond and R. Watts, "Cloud Music: a hybrid audio-video Installation" (1976) in ed. W. and S. Vasulka, *Pioneers of Electronic Art* (Linz: Ars Electronica, 1992) pp. 152-153.

12. G. L. Stephens, "Cloud Feedbacks in the Climate System: A Critical Review" *American Meteorological Society* **18** (2005) p. 237.

13. Behrman and Diamond interview [9]

14. G. Bateson, "Cybernetic explanation" *Steps to an Ecology of Mind: collected essays in anthropology, psychiatry, evolution and epistemology*. (St. Albans: Paladin, 1973).

15. Behrman and R. Diamond interview [9]

16. Norbert Wiener used the box motif in the well-known description; "I shall understand by a black box a piece of apparatus, such as four-terminal networks with two input and two output terminals, which performs a definite operation on the present and past of the input potential, but for which we do not necessarily have any information of the structure by which this operation is performed. On the other hand, a white box will be similar network in which we have built in the relation between input and output potentials in accordance with a definite structural plan for securing a previously determined input-output relation." See N. Wiener, *Cybernetics: or Control and Communication in the Animal and the Machine* (Massachusetts: MIT Press, 1948), preface. page xi. (footnote 10).

17. Behrman and Diamond interview [9]

18. Behrman and Diamond interview [9]

19. Behrman and Diamond interview [9]

20.'Drift' is a term used by linguists and in Wiener's pure mathematics. George Kubler (1964) describes drift as produced by "cumulative changes in the articulation of sounds can be related in turn to the interferences that distort any audible communication." (Kubler, cited in P. Lee, *Chronophobia: on time in the art of the 1960s* (Cambridge; Mass.: MIT Press, 2004) p. 233.

21. Burnham [2] p. 132.

22. For a detailed explanation of Hans Haacke's practice in relation to both cybernetics and systems theory see L. Skrebowski, "All Systems Go: Recovering Hans Haacke's Systems Art," *Grey Room* **30** (2008) pp. 55- 83.

23. Behrman and Diamond interview [9]

24. Bateson, [14] p. 410.

25. Bateson, [14] p. 410.

26. Hayles, [3] pp. 285-286.

27. Hayles, [3] pp. 285-286 cites Bateson's comments on randomness from the prologue of G. Bateson, *Our Own Metaphor* pp.13-16. Hayles also compares Bateson's idea of randomness with Francisco Varela's biological model of randomness as the 'froth of noise from which coherent microstates evolve' from F. Varela, *Making It Concrete: Before, During, and After Breakdowns*. We could equally refer to Gilbert Simondon's schema of concretization, (which he also refers to as condensation --an analogy appropriate to *Cloud Music*). Concretization is the operative solidarity of formerly disparate energetic fields in a new technological invention. G. Simondon, "Technical Mentality," *Parrhesia* **7** (2009) p. 41.

28. Behrman and Diamond interview [9]

29. P. Galison, "The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," Critical Inquiry **21**, No. 1 (1994) pp. 228-266.

30. A. Pickering, *The Cybernetic Brain: Sketches of Another Future* (Chicago: University of Chicago Press, 2010) p. 320.

31. Bateson, [14] p. 454.

32. Bateson, [14] p. 468.

33. Bateson, [14] pp. 467-468.

34. B. Latour and P. Weibel, *Making Things Public: atmospheres of democracy* (Cambridge, Mass, MIT Press; Karlsruhe, Germany, ZKM/Center for Art and Media in Karlsruhe, 2005).

CYBERNETIC CONFIGURATIONS: CHARACTERISTICS OF INTERACTIVITY IN THE DIGITAL ARTS

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Abstract

Cybernetic theory and interactive media art share much in common, including an interest in human relationships with technology, and in what their interactions reveal about both human and technological agency. In this paper we identify four characteristics of cybernetic systems and discuss their relevance to interactive sound art. We hope to contribute to a critical lexicon around the cybernetic nature of interactive artworks more broadly, and to promote further engagement with the principles of cybernetics amongst electronic and digital arts practitioners and scholars.

Keywords: cybernetics, new media, interaction, systems theory, agency

"*We have decided to call the entire field of control and communication theory, whether in the machine or in the animal, by the same 'cybernetics', which we form from the Greek 'kubernetes' or steersman*" Norbert Wiener [1].

The term 'cybernetics' was first used to describe a field of experimentation in interactive systems that emerged in the 1940s [2]. At that time the explorations were focused on mechanical and robotic systems that were able to self-regulate in response to sensory input from their environment. Many of the early cyberneticians were, as Pickering [3] points out, practicing psychiatrists who sought to model (with their machines) human cognition and behaviour. In the decades that followed, peaking in the 1970s, cybernetic theory evolved to include humans, and other living systems, as part of the system rather than simply observers. The implications of this approach on the arts did not go unnoticed at the time [4] even if it was not mainstream. This second wave of human-in-the-loop cybernetics is referred to as second order cybernetics [5]. It is on the basis of this extended definition that interactive electronic and digital artworks can be seen as potentially cybernetic.

The prefix cyber, from cybernetics, has continued to be used with reference to human-machine systems. Particularly as a result of the use of the term cyborg in science fiction, the field of cybernetics took on an oft dystopian complexion. Interactive art works such as Stelarc's *Third Hand* [6] reinforced the transhumanist perspective on cyborg culture as one of extension through prosthesis, and deliberately played on concerns about human control (or lack thereof) over such hybrids.

However the past decade has seen the reinvigoration of interest in cybernetics viewed optimistically as human-machine partnerships. This has been evident in the recent works of a number of digital artists, including the authors; in the theme for the 2012 Re-New digital arts festival, "Cybernetics Revisited - towards a third order?"; and in various publications such as "Cybernetic Aesthetics and Communication" [7] and, most notably, "The Cybernetic Brain: Sketches of another future" by Andrew Pickering [8].

Given the diversity of interpretations of cybernetics and its myriad offshoots, including cyber-art, cyber-reader, cyberculture and more, we are keen to establish more clearly the features of cybernetic systems and how they manifest as characteristics of interactive art works. We propose that such a clarification might assist in the description and analysis of interactive art works both as being (or not) cybernetic in character and also to more clearly distinguish different kinds of cybernetic interaction.

Our background is in music, and so we populate this article with examples of interactive music systems because this is what we know well, however we believe the principles outlined apply more broadly to visual and performing arts.

Interactivity

Interactivity in the arts is a broad topic - its meaning nebulous, and its applicability to particular works often contested. As with cybernetics, "interactivity is a much used and abused term" [9]; in many cases 'reactivity' is more apt.

Garth Paine suggests a sharper definition of interactivity, where "in order for the system to represent an interaction, it must be capable of changing and evolving ... a response–response relationship where the responses alter in a manner that reflects the cumulative experience of interrelationship" [10]. Both human and technological parties in a truly interactive system should have the ability to *improvise* rather than simply *respond*.

We adopt and adapt this perspective by defining *interaction* as *mutual adaptation.* There are various configurations of artist, artwork and audience that fit this definition, though the human experience of different configurations may be quite disparate. When the interactive artwork comprises an audience member interacting with a physical or digital machine - as is often the case for interactive installations in a gallery exhibition, the human participant is both interactor and audience. Contrastingly, in a performance context, an interactive artwork may consist of a human performer interacting with technology - so the roles of audience and interactor are distinct.

The assumption that a system includes a person interacting with technology aligns most strongly with the second (rather than first) order cybernetic approach where the 'observer' is considered to be inside the loop of interaction, rather than an external observer. This participatory viewpoint is common to both modern cybernetics and to interactive arts.

Example: PIWeCS

The *Public Interactive Web-based Composition System* (PIWeCS) project, developed by Ian Whalley [11], is designed to "increase the sense of dialogue between human and machine agency through integrating intelligent agent programming" [12]. PIWeCS and a human performer enter a musical 'dialogue'. The computer, with a repertoire of prerecorded sound samples, and the human performer, using an acoustic instrument, engage in concurrent playing, listening and analysing as the performance proceeds. A technical feature of this software is that visual interfaces are web-based and audio is streamed allowing participants to be geographically separated.

Cybernetic Features

In the remainder of this paper we outline four characteristics of cybernetic systems and provide examples of their application to interactive music systems. These characteristics are; a reliance on *feedback* as a mechanism for ongoing self-regulation, a *systems view* that promotes interaction and partnership over reactivity and control, the recognition of *agency* and autonomy in each component of the system, and a degree of *symmetry* amongst the components of a system including some shared responsibility and shared objectives.

Following discussion of each characteristic we describe an interactive electronic art work exhibiting the discussed characteristic. These case studies include outputs from our own creative practices and highlight the types of cybernetic

interactions that are of particular interest to us. We think these types of 'cybernetic' works deserve further attention, because the ideas remain vital even almost a century after the initial cybernetic explorers began their investigations.

Feature 1: Feedback

Feedback is a basic characteristic of all cybernetic systems. Early descriptions of cybernetic systems considered the 'system' to be a machine with some self-regulatory capacity, so as to achieve *homeostatis;* the stabilisation of a system parameter despite varying environmental conditions.

Homeostatis was implemented through dynamic error-correction, conceptualised as feedback from the environment, rather than pre-calculated actions. Taking inspiration from Watt's steam-engine governor, which utilised corrective feedback to maintain an approximately steady steam-engine speed in the face of varying loads, Weiner coined the term cybernetics from the greek *kubernetes* meaning "the art of steersmanship" [13].

In these early cybernetic configurations, described as first-order, the system (comprising a machine) and the environment, participated in a causal-loop "in which each of the elements contained in the loop act upon the others in a constant and varying fashion to maintain equilibrium" [14].

Second order cybernetics expanded the boundary of the 'system' to include human-machine configurations, and also machine-machine configurations in which components of the system were considered as independent 'agents', coordinating their behaviour through mutual feedback. A precursor was Ashby's [15] *homeostat*, in which four mechanical 'agents' interacted with each other to maintain a stable state—again utilising a closed causal feedback loop, which Paine suggests is "one of the principal concepts of cybernetics" [16]. The original homeostat had no particular purpose – it simply operated as a proof-of-concept for Ashby's theories of multi-agent system stability through mutual feedback.

Example: Fond Punctions

An interactive music system directly inspired by the homeostat is Alice Eldridge's *Fond Punctions*. The work is an improvised performance of a human-computer electroacoustic partnership, comprising live cello and processing. The computer system implements a digital simulation of Ashby's homeostat to create semi-stable patterns (simply by observing the homeostat's internal state variables), mapped to rhythmic parameters of a granular synthesis engine. Eldridge describes her motivation for designing the system: "it is very hard to pre-programme digital systems that both avoid repetitious tedium and can be 'trusted' to behave appropriately in a live musical setting. The beauty of generative systems is that they allow a designer to compose a space of possibilities in which the machine is free to roam. Some regions of the space may be richer than others, but the use of simple adaptive generative mechanisms seems to provide a workable balance of reliability and unforeseen inspirational novelty" [17].

Eldridge's system also generated live visual projections of "bubbles and buoyant cell-like aggregations that twitch to the pulse of the homeostatic oscillations" [18].

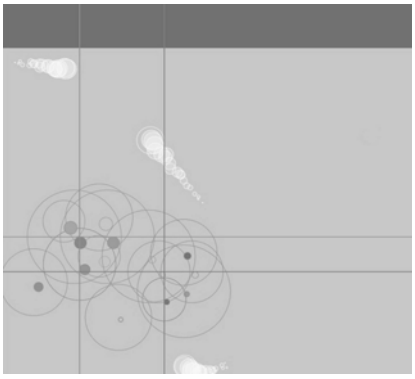

Fig. 1. Fond Punctions video projection. © Alice Eldridge 2005.

Feature 2: Systems Perspective

Second order cybernetic systems are seen as collections of collaborating agencies. The elements of a system are coupled through interaction such that they are mutually influencing. In human-machine or human-computer partnerships the systems view is concerned with the overall behaviour of the system or its output. In artistic systems the output can be a dynamic visual and/or sonic rendering. From the systems perspective there is not only interest in a particular artistic output, but in the range of possible outputs the system might produce.

Generalising from the idea of homeostasis (interaction that maintains a stable parameter), coordination amongst the agencies in a system can be seen as oriented toward achieving a shared goal. Shared objectives may, of course, be deliberately thwarted at times; as in the case of a duet musical performance where one performer may choose either to play in sympathy with, or in contrast to, the other performer. Nevertheless, this feature of cybernetic systems may provide a distinction between interactive systems where agencies operate in parallel and those designed to converge or complement.

Example: _Derivations

_Derivations by Ben Carey (see http://derivations.net/) is interactive music performance software that is particularly reliant on the human as part of the musical system. It uses recorded sonic material from prepared and live recordings of the instrumentalist as the basis for its output. The software is designed to facilitate collaboration between musician and machine where the software learns to adapt to the sonic and gestural aspects of the performer in a process forged over periods of rehearsal that culminate in performance. Carey writes that _Derivations is designed "to encompass the cumulative interrelationship present both inside and outside of a performance time interaction. By definition this then includes a privileging of the role of the performer as an active and creative decision maker in this process" [19].

Fig. 2. _Derivations (Photo © Ben Carey)

Feature 3: Agency

In cybernetic systems each component has some autonomy, some responsibility, or some impact on the overall system behaviour and therefore on the output. While humans, and other living systems, are generally assumed to possess agency, it is less clear that machines or software possess agency. Cybernetic relationships involving shared agency contrast with human-tool relationships where the tool is considered to be subservient to the human intention.

The question of agency in materials and technologies is by no means straightforward. There is an argument that even static artistic objects can exercise agency through their signification and its effect on human behaviour [20]. There is also the influence of features in artifacts and

processes that suggest or *afford* particular actions or ideas [21]. Finally, there is the material agency, or constraints, that objects and technologies possess that guide the outcome of human users.

In cybernetic systems, the agency of a technological partner is typically considered more than merely its ability to influence human perception or action, but rather its active contribution to the partnership. Agency, in the cybernetic sense also assumes some kind of goal orientation and the systems approach implies some shared, or at least symbiotic, goals amongst the agencies in the system.

Example: CIM

The *CIM* (Controlling Interactive Music) software developed by the authors is an interactive music improvisation partner [22]. Based on a model of musical duet interaction that provides it with a repertoire of 'activities' and parametric controls over balance and independence, CIM is designed to impart a sense of musical agency for both its performing partner and for the audience. As well as relying on the duet interaction model to help structure is behaviour it uses a reflexive approach to content generation where its musical material is largely based on its memory of what the human performer has played.

Feature 4: Symmetry

Even when each agent in the cybernetic system makes an active contribution, these contributions may not be the same, nor may they be of equal significance to the outcome. It is this balance (or imbalance) of influence that we term the symmetry within the cybernetic system. Most straightforwardly it is a symmetry of agency within the system.

Interactive art works can be designed to operate with particular degrees of symmetry or asymmetry. For example, Jeff Albert's *Interactive Music Partner* (IMP) was designed to be generally symmetrical but with an ability to range between moments of greater or lesser prominence. He explains IMP "should be a partner, meaning that it is equal parts leader and follower, not always simply accompanying the improvising human, and at the same time, not always requiring the human to accommodate its output" [23].

Example: Jambot

The *Jambot* [24], developed by the authors, is an interactive music system, designed to have substantial agency, and yet also afford substantial control to the human performer. Here the symmetry of agency lies somewhere between the poles of symmetric and asymmetric. The Jambot augments musical audio input in real-time, and implements a number of musical goals for the ensemble as a whole.

Fig. 3. The Jambot (Photo © Australian Broadcasting Corporation)

Conclusion

Cybernetics and interaction are oft-used yet loosely defined terms, covering a broad range of phenomena. We have outlined features of cybernetic systems and shown how these features have been applied to some media art works.

The features of cybernetic systems outlined are *feedback*, a *systems perspective*, *agency* and *symmetry*. We suggest these features provide both a set of useful cybernetic design ideas for interactive media art, and a critical lexicon for analysing extant works.

As artists and scholars we are interested in cybernetic human-computer partnerships because they present an interesting balance between control and unexpectedness, between authorship and collaboration. The behaviour and outcomes of such systems prompt us to reflect on what is it is be creative, interactive, and even human.

References and Notes

1. Norbert Wiener, *Cybernetics; Or Control and Communication in the Animal and the Machine.* (Oxford, England: John Wiley, 1948). p. 19.

2. William Ross Ashby, *An Introduction to Cybernetics*. (London: Chapman & Hall, 1956).

3. Andrew Pickering, *The Cybernetic Brain: Sketches of another future*. (Chicago: The University of Chicago Press, 2010).

4. Roy Ascott, "Behaviourist art and the cybernetic vision," *Cybernetica, Journal of the International Association for Cybernetics*, (*Namur*) 9, (1966)

5. Francis Heylighen and Cliff Joslyn, "Cybernetics and Second-Order Cybernetics," in R. A. Meyers, ed., *Encyclopedia of Physical Science & Technology 4* (3rd Edition., pp. 155–170). (New York: Academic Press, 2001)

6. Stelarc, *Third Hand*. (1980) <http://stelarc.org/?catID=20265>

7. Claudia Giannetti, "Cybernetic Aesthetics and Communication," *Media Art Net*. (2004). Retrieved from<http://www.medienkunstnetz.de/themes/aesthetics_of_the_digital/cybernetic_aesthetics>

8. Pickering [3].

9. Steve Dixon, *Digital Performance : A History Of New Media In Theater, Dance, Performance Art, And Installation*. (Cambridge, MA: The MIT Press, 2007) p. 561.

10. Garth Paine, Interactivity, where to from here? *Organised Sound*, 7, (2002) p. 298.

11. Ian Whalley, "PIWeCS: Enhancing Human/machine Agency in an Interactive Composition System," *Organised Sound* 9, No. 2 (2004) pp. 167–174.

12. Ian Whalley, "Software Agents in Music and Sound Art Research/Creative Work: Current State and a Possible Direction," *Organised Sound* 14, No. 2 (2009) p. 162..

13. Ashby [2] p. 1.

14. Paine [10] p. 302.

15. William R. Ashby. *Design for a Brain.* (London: Chapman & Hall, 1960).

16. Paine [10] p. 302.

17. Alice Eldridge, "Fond Punctions: Generative processes in live improvised performance," in *Ernest Edmonds, Paul Brown, and Dave Burraston, eds. Generative Arts Practice* 5 (2005) p. 46.

18. Eldridge [17] p. 44.

19. Ben Carey, "Designing for Cumulative Interactivity: The _derivations System," in *Proceedings of NIME '12*. Presented at *New Interfaces for Musical Expression* (Ann Arbor, Michigan: University of Michigan, 2012). p. 1.

20. Alfred Gell, *Art and Agency: An anthropological theory* (Oxford: Clarendon Press, 1998).

21. James J. Gibson, *The Senses Considered As Perceptual Systems* (Boston: Houghton Mifflin, 1966).

22. Andrew R. Brown, Toby Gifford, and Bradley Voltz, (2013). "Controlling Interactive Music Performance (CIM)," in *Proceedings of the Fourth International Conference on Computational Creativity* (Sydney: The Association for Computational Creativity, 2013) p. 221.

23. Jeffry V. Albert, Interactive Musical Partner: A system for Human/Computer duo improvisations. (PhD Thesis, Louisiana State University, Louisiana, 2013) p. 22.

24. Toby Gifford, Improvisation in Interactive Music Systems. (PhD thesis, Queensland University of Technology, 2011).

TANGIBILTY: HIGHLIGHTING PHYSICALITY IN INTERACTIVE INSTALLATIONS

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Abstract

Touch is our connection to our world and, as digital technologies develop, we must find ways to recontextualise touch within emerging digital spaces. This paper discusses the development of 'Tangibility', an installation combining tangible interaction, synaesthetic visualisations, and lens based animation techniques to encourage audiences to explore tactility. It introduces a system of sensual analysis and presents an interpretation of Laban's effort analysis as an evaluation tool for the effectiveness and design of tangible interfaces. It also explores how Kennedy's "Aesthetics of Sensation" can be adapted for synaesthetic visualisations and discusses how materiality within lens based animation techniques creates physicality within an image.

Keywords: Interactivity, Synaesthesia, Tactility, Installation, In-camera animation, Tangible interfaces

"in the skin and through the skin, the world and body touch, defining their common border... the world and body meet and caress in the skin" - Michel Serres [1]

Touch is important, it is what connects us to our world [2]. As our world becomes increasingly mediated, through the prevalence of screen and virtual interaction technologies, it is important to develop systems of physicality and representation of touch within these digital spaces. *Tangibility* is a practice based research project, exploring how tangible interfaces, synaesthetic visual language and physical imagery combine to create interactive spaces that celebrate and encourage tactile engagement. Designed as a cinematic interactive installation, 'Tangibility' is an attempt to explore how lens based animation techniques can be used to preserve physicality within digital, tangible interaction.

The current prototype explores a single aspect of physical interaction, the relationship between force and resistance. It consists of a brilliant white screen and a tabletop interface of stretched fabric. Tactile engagement with this interface changes the composition of the screen, adding dynamic, lens based imagery that explores representations of the sensations present within the interface.

This paper will detail the process of developing this work, examining my research approaches and conclusions within sensation analysis, interaction design, synaesthetics and animation mediums.

Sensation Analysis

Touch is essentially an experiential entity, and thus the development of any language of touch must be approached through an iterative exploration of experience. In his work, *The Five Senses* Michel Serres [3] playfully explores the senses, particularly the sense of touch, "I touch my lips... with my finger... The I vibrates alternately on both sides of the contact, and all of a sudden presents its other face to the world" [4]. Since the aim of the project was to encourage an audience to playfully engage with tactility, I attempted to approach my own research with the same experiential curiosity as presented here.

Tangibility explores four tactile experiences: running a hand along a chain-link fence; walking in high heels; sipping a cup of tea; and sinking into an armchair. These activities were selected as they demonstrate the different levels of intention, temporality, comfort and emotion present within physical contact.

Of the four, running a hand along a chain-link fence is the only activity undertaken for the simple joy of tactile exploration. Playing with tactile experience in this way produces some physical discomfort that is somehow negated by the emotional response of curiosity and playfulness. The sensations within this experience function to highlight the causal and reflective relationship between numbness and vibration. Prolonged physical vibrations build to remove all other sensations from the fingers, and continue to persist beyond physical contact. Temporality is key, as the relationship builds and fades over a drawn out period of time, independent of direct physical contact with the fence.

Walking in high heels is at the opposite end of the intention spectrum. Here tactile experience is an unconsidered, often painful, consequence of an aesthetic choice. There is a disconnect between tactile and emotional response - while the actual experience is uncomfortable, the emotional response is one of confidence and empowerment. This duality demonstrates the functions of force and resistance, highlighting how one both conflicts with and depends upon the other. As force upon an object increases, so does the resistive sensation, until a tipping point is reached and one must yield to the other.

Sipping a cup of tea is a ritualistic act, where tactile experience is secondary to emotional comfort and taste, however it is the tactile experiences - warmth of cup in hand, steam rising onto face - that fuel the comforting emotional response within the experience. Here, familiarity and repetition function to create comfort. The relationship between ritual and comfort is particularly evident when it is disrupted by unfamiliar and unexpected sensations. The subversion of anticipation within this set of sensual experience creates a jarring discomfort.

Sinking into a comfy armchair is an anti-tactile action. The desire is to remove tactile input. There are, however, numerous physical experiences that exist within this context - pressure on the back and thighs, the slow relaxation of muscles over time. Sensations develop over time as pressure builds, creating discomfort from comfort. This shifting of experience highlights the relationship between weight and absence in tactile sensation - where there is weight there can be no absence of sensation.

The four pieces of *Tangibility* explore these relationships: numbness and vibration; force and resistance; temperature and comfort; and weight and absence. The work will produce interactive representations of each of these relationships, combining tangible interfaces, synaesthetic visualisations and physical imagery to produce an immersive whole.

While three of these four pieces are currently in the design phase, a working prototype of the force and resistance element has been constructed. This prototype consists of a tangible fabric interface that controls a series of animations made from dyes, oils and water. User interaction creates a series of parameters that select the video played and directly influence its playback. The following will explore the interaction design, aesthetic and material development of this specific piece, while also providing an explanation of the conceptual structure of the work as a whole.

Interaction Design

'Tangibility' aims to create an immersive, tangible interaction that encourages the

audience to playfully explore tactile experience. This was achieved through highlighting materiality within the interaction medium. The use of physically embodied objects within an installation design creates a heightened sense of physicality. *Tangibility* builds upon this sense, creating a tangible experience by combining a physicality in image and tactile interface. The interface was designed to reflect the nature of sensations present within the aforementioned tactile experiences, encouraging exploration of the relationships present in tactile experience, rather than the literal action itself.

Force and resistance have a symbiotic relationship: as one element grows stronger so does the other. The interface required a medium that would push back against the participant forcing them to decide whether to push onwards or yield. To this end stretch fabric was secured over a wooden frame, providing a flexible membrane with which the audience can engage. This fabric would give easily at first, building resistance, eventually forcing the user to abandon their forward motion.

In order to further develop the work it became necessary to find a method of evaluating action through which interactive parameters could be identified. For this purpose, I have adapted Laban's effort analysis. As Schiphorst explains "for Laban, touch enables the relationship between movement and space to be discerned within bodily-experience" [5]. He explored this idea through detailed analysis of effort, categorising action into spectrums of weight, space and time [6]. Actions are classified in terms of particular gestures according to where they sit on the spectrum. A movement, or in the case of *Tangibility*, an interaction, that is flexible, strong, and sustained would be classified as 'wringing', while another effort that is direct, light and sudden would be classified as 'dabbing'. This system allows the gestures enacted through the interface to be identified, analysed and evaluated.

The tactile relationship explored through this prototype, force and resistance, functions most conspicuously across the spectrum of weight and is best represented through sustained and direct contact. Three kinds of action - thrusting, pressing and gliding - can be identified by the system to produce different visual outcomes. This is done through the use of three short range proximity sensors, placed below the fabric. These sensors track the depth to which the fabric has been pushed downwards. This data is used to determine the speed and intensity of the engagement. A quick thrusting motion will trigger a short animation in which the white background is quickly overtaken by an intense colour. Pressing, a slightly slower, more deliberate engagement, produces a fast flowing and shifting imagery that gains intensity as the interface is further engaged. An even more controlled engagement by the viewer will result in a longer, more subtle animation, consisting of shifting tones of blues and greens. As resistance mounts against the user, a persistent, yet gentle, exertion of force will reveal a breakdown of this colour, to reveal a pattern of concentric shapes.

User engagement controls playback. Each depth is mapped to a specific frame within the animation, and the further one engages the interface the more of the animation is revealed. This also functions to demonstrate the push and pull relationship of force and resistance. As the user yields to the resistance and removes their hand, the imagery is reversed. This scrubbing interaction provides a tangible and immediate visualisation of the state of dominance within each element of the work.

In this way 'Tangibility' seeks to exploit the material nature of its interface to highlight the functioning of tactile relationships, allowing the audience to make their own connections between the sensations they experience and the imagery they see. Users are encouraged to play with the system, exploring the different forms of tactile engagement within the interface and examining how they produce different outcomes within the visual aspect the work.

Synaesthetics

Tangibility required the creation of a visual language that produced a synaesthetic representation of touch. Such synaesthetic representations exist across many forms of visual and new media. While many artists from various backgrounds (Henri Matisse, Golan Levin, Zach Leiberman and Rushland Khasanov) influenced the visual development of this work, it was *Synchromy* [7] and *Lictspeil* [8], the works of experimental animators Norman McLaren and Walter Ruttmann respectively, that formed the basis of a process of investigation that led to the production of my own synaesthetic language. Each of these works seek to create visual representations of sound while celebrating their material mediums, highlighting the physical nature of their subject matter. Physicality permeates their work as they seek to represent sound as sensation, a tangible, temporal, knowable occurrence.

Analysing the language of these works using a series of classifications loosely adapted from Barbara Kennedy's "Aesthetics of Sensation"[9], an interpretation of Deleuze's discussion of the function of sensation within visual work, allowed for the production of a lens through which to view my own visual experiments.

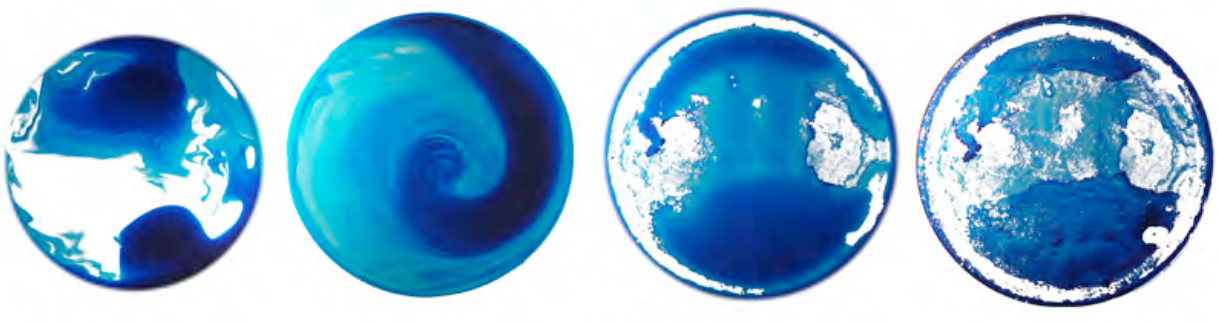

Fig. 1. Stills from an evaporation sequence (©Rachael Priddel)

Within her book, *Deleuze and Cinema: the aesthetics of sensation* [10] Kennedy discusses three ways - vibration, resonance and forced movement - in which rhythm, colour and form behave to create sensation within an artwork. These classifications were loosely adapted for the movement based works of McLaren and Ruttmann.

Vibration uses the rhythmical oscillation between the intensity of colours to produce a sensation that is “more nervous than cerebral”[11]. Representations of these rhythms rely on the fluidity of the image, presenting tonal shifts, and waxing and waning forces. Materiality and matter function as the vessels of colour and movement, to create synaesthetic imagery as “each tone or modulation of colour exercises a force upon a corresponding body” [12]. The rigid aesthetics of *Synchromy* [13] demonstrate this kind of functionality, consisting of vertical lines over a solid background disrupted by small flickering rectangular shapes, beginning with layers of the same tone at varying intensities, and continuing on to produce more complex colour relationships. In this way McLaren reflects the nature of the sound he is representing as a complex series of temporal, tonal relationships.

This outcome was desired to demonstrate the emergence of tension and strain before the inevitable tipping point and tonal shifts were employed to portray this within the final prototype. The series of animations that deal with a drawn out struggle consist of varying intensities of colour congregating, pulsing and shifting, battling to dissipate into the paler tones around them. As the participant engages, the image begins to collapse in upon itself, moving into the second of Kennedy’s sensation-creating behaviours - resonance [14].

Resonance is the state in which two entities shift intensities, "embrac[ing] each other as if in a state of symbiotic energies"[15]. This interaction produces a sensation of sustained contact, slowly shifting and developing over time. Resonance functions strongly within Walter Ruttmann's work as shifting forms of light and dark create sensation. *Lictspeil: Opus III* [16], the third element of the series, includes a section of vertical black waves moving across a blue background. Here Ruttmann can be seen to demonstrate how synergies of movement, symmetry and metamorphosis function to create corresponding give-take relationships within all areas of the image, conveying sensations of weight and force.

Force and resistance have a similar symbiotic relationship, one is useless without the other. In the absence of force there is nothing to resist, and conversely the lack of resistance renders force unnecessary. Resonance functions within *Tangibility* to produce a visual representation of this search for unachievable dominance. The imagery creates a series of stages of resonance. First, a vibrant bleed of colour emerges to fill the projection area. This is then pushed outwards from within to reveal a white form, punctuated with instances of colour. This resonance is complimented by the audience’s control of the playback speed and direction, causing these forms to interact continuously. These elements combine to produce visual sensations that characterise force and resistance.

The final category - forced movement - is a distortive aesthetic characterised by division and withdrawal – “two sensations draw apart, release themselves, but also, now to be brought together by the light, the void, the air that sinks between them”[17]. This functioning of sensation relies on expectation and anticipation, as unpredictable variations of intensities and disruptions within individual frames create a sense of rhythm and discord within the whole. Within his film, *Synchromy* [18], Norman McLaren uses symmetry to create this effect, establishing relationships between elements through the mirroring of movement and form, suddenly severing those connections as elements behave individually. This division is continued within the work as the established relationships between vision and sound are subverted, punctuating the piece with periods of black. This subversion functions to produce divisive, disorienting effects, reflecting the disparity between expectation and consequence, creating a sensation of uncertainty and disconnect between body and mind.

Force and resistance are interdependent, and as such there has been no use of forced movement within the current prototype of *Tangibility*. This mode of representation, however, will be further explored in the elements of the installation that represent relationships of weight and absence, and numbness and vibration, as these possess a more discordant nature. These functions work with the tangible interaction interface to produce a visceral and immersive work.

The physicality of the lens based animations add to this experience to convey further dimensions of touch and tangibility.

Animation Medium

Physicality was the primary concern when determining the animation medium to be used within *Tangibility*. This work demonstrates how physical processes can explore the nature of a sensation to produce materially embodied imagery.

Lens based animation techniques were used to provide a material, “real world” feeling within the imagery of *Tangibility*. The materiality of force and movement is one of ebb and flow, smooth morphing

Fig. 2. Stills from an oil sequence (©Rachael Priddel)

forms, and sharp shifting tones. The transient, dynamic nature of fluids proved to be highly representational of the push and pull sensations required for this work. The intensity of tones perfectly suited the creation of vibrating and resonant images. Testing was carried out with a number of fluids from which water, dyes and oils were selected. These mediums produced imagery with a strong sense of shifting physical dominance. The flexibility and transience of fluid make it the perfect physical repository for the relationships between vibration and resonance.

The final imagery used within the work fall into three categories. Blends (see Figure 1) - created by adding small amounts of dye to water and using time lapse photography to capture it dissipating - are used to portray sudden and strong interaction as resistance gives way to brute force. Oils (see Figure 2) - where oils were mixed with dyes and slowly added to water – correspond with a more measured interaction. Evaporations - time lapsed footage of dyes evaporating - begin with a vibration filled struggle between tones. Once resistance yields, the intense colour retreats resonantly, revealing concentric patterns of light and shade.

By using these photographic techniques the imagery maintains a material connection with the world. The light, colours and forms exude physical presence, culminating in an aesthetic that compliments and extends the tactility of the interaction space.

Conclusion and Future Directions

Our body is our connection to our world, it is important to recognise the value of tactility within our interactions with digital space. Interactive installation works allow the viewer to explore and redefine the relationships that exist between their sense of self, their bodies and the world. By investigating the functions of touch, representing them through synaesthetic forms and physical imagery, and presenting these outcomes within a tactile interactive space, we can explore the relationship between our physical world and our sensory perceptions, highlighting and reinvigorating the role of the tactile.

This project will continue to develop and refine these aesthetic functions, exploring how they can be applied to all identified tactile relationships: numbness and vibration; ritual and comfort; and weight and absence. The final outcome of the work will be a series of four installations, each with differing forms of tactile engagement and visual outcomes.

References

1. Michel Serres as cited in Steven Conner “Michel Serres’ Five Senses” (999) paragraph 23, <www.stevenconnor.com/5senses.htm>

2. Michel Serres, *The Five Senses: a philosophy of mingled bodies* (New York, USA: Continuum, 2008)

3. Serres [2]

4. Serres [2] p.22

5. Thecla Schiphorst “The Varieties of User Experience: Bridging Embodied Methodologies from Somatics and Performance to Human Computer Interaction” (University of Plymouth, 2008) p.201

6. Rudolf Laban and F. C. Lawrence *Effort: Economy in body movement*, 2nd Ed. (Boston, USA: Plays, 1974)

7. Norman McLaren, *Synchromy* (1971), film

8. Walther Ruttmann, *Lictspeil* (1921-1925), film series

9. Barbara Kennedy, *Deleuze and Cinema: The Aesthetics of Sensation* (Edinburgh, U.K.: Edinburgh University Press, 2000)

10. Kennedy [9]

11. Kennedy [9] p. 113

12. Kennedy [9] p. 113

13. McLaren [7]

14. Kennedy [9]

15. Kennedy [9] p. 113

16. Walther Ruttmann, *Lictspeil: Opus III* (1924), film

17. Gilles Deleuze and Felix Guattari, *What is Philosophy?* (New York, USA: Columbia University Press, 1994) p. 168

18. McLaren [7]

SUPERESTE UT PUGNATIS (PUGNATIS) UT SUPERESTE.

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Abstract

The title of the work discussed in this paper, *Supereste ut Pugnatis (Pugnatis) ut Supereste*, is derived from the motto (*Fight to Live*) of the Chemical Defense Establishment located at Porton Down in the UK. The work is a mixed media installation that examines the intersection between the Visual Arts and Bio-Sciences and is conceptually focussed upon the development of metaphors that address the membrane in terms of biology, politics, language and culture.

Keywords: Bio-art, Multimedia installation, Art and Science, Immigration Policy, Chemical Warfare.

Fig. 1. *Supereste ut Pugnatis (Pugnatis) ut Supereste* at the PowerHouse Museum ISEA2013. Photo © Ian Hobbs.

We are defined, structured and bounded by membranes, selective barriers that function at a molecular level within our bodies and operate at the macro scale as socio-political boundaries.

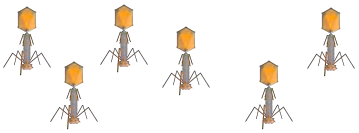
My French raincoat (a membrane of sorts) bears the legend Impermeable, I can assure you it is not, like most membranes worth their salt it is semipermeable!

Membranes are selectively permeable structures, controlling the exchange of ions in our synapses, transforming photons into carbohydrates in plants. Membranes form the meniscus of the world ocean, trading gasses with the atmosphere which regulate our climate.

Manifest as an architecture of power, the membrane is the portcullis and drawbridge regulating access to a Norman Castle. It is a filter of economic privilege to the VIP lounge and the algorithm that structures the flow of surveillance information at airport security.

The membrane is the tissue of language that described the legal pressure valve transporting the poor and disaffected to Australia in a risible attempt to rid England of its criminal class, and that provided the tongue twisters that policed the White Australia policy.

It is easier for a camel to pass through the eye of the needle, than for a rich man to enter into the kingdom of heaven. [1]



Supereste ut Pugnatis (Pugnatis) ut Supereste [2] drifts in these interstitial spaces between biology, politics, culture and history, constantly recalling the functional significance of the membrane as border; as a cultural and linguistic filter; as a generator of difference.

Supereste ut Pugnatis (Pugnatis) ut Supereste is offered as an omnisexual bacterium ingesting histories and narratives that associate through a labyrinth of metaphorical bonds, some faint and tenuous, others powerful and robust.

A sonic sculpture illuminated by canary yellow [3], the yellow of egg yolk, the pallor of yellow fever, the threatening tide of the yellow races, the warning yellow flag of quarantine and contagion and more prosaically the globalised yellow of international art crates.

Take a journey down any of these wormholes to discover a centripetal force that pulls back to the centre of this metaphorical nexus.

Here we encounter morphological references to antique Chinese gunpowder rocketry [4] carrying payloads of poisonous and infected material, hybridised with the physical structure of the Bacteriophage [5], a semi-living viral entity that pierces the membrane of a host Bacteria, injecting its DNA and commandeering the genetic machinery of the Bacteria to replicate itself; all this done without an entry permit!

My hand has found like a nest the wealth of the peoples; and as one gathers eggs that have been forsaken, so I have gathered all the earth; and there was none that moved a wing or opened the mouth or chirped. [6]

The payload of these mutant rocket forms, glass cylinders containing infected eggs, pay an ironic homage that reprises the origins of modern bio-warfare research, where chicken eggs were the bio-reactor of choice at the Chemical Defense Establishment at Porton Down near Salisbury UK [7] (the motto of which, Supereste ut Pugnatis, this work is named after) as well as the Russian weaponised Smallpox facility at Zagorsk [8].

Humpty Dumpty sat on a wall
Humpty Dumpty had a great fall
All the King's horses
And all the King's men
Couldn't put Humpty Dumpty Together again.

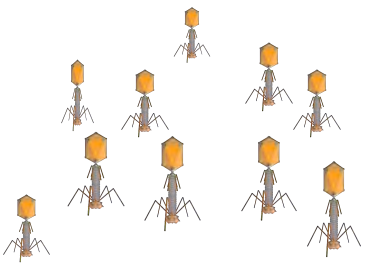


Fig. 2. You Won't Be Settled in Australia, *plus ça change*! (Australian Government Advertisement).

"When I use a word," Humpty Dumpty said in a rather scornful tone, "it means just what I choose it to mean, neither more nor less."

"The question is," said Alice, "whether you can make words mean so many different things."

"the question is," said Humpty Dumpty, "which is to be master, that's all."

And so to the slippery membrane of language, a tissue of words that wrap us in culture and identity and one that attempted to render Australia as white as egg albumen, protecting these shores from the influx of Chinese migration, a migration according to the xenophobes, as yellow as egg yolk.

心灵的控制首先在于物理的掌握。这是常人难以置信的简易。真正的掌握来自于宁静，从意图的思考到最终的言行。宁静是最高尚的美德一位男士或女士的静坐是多么少见

That mental control depends, first of all, on physical mastery, is so obvious that few believe it. Real control begins from stillness, from deliberation of manner, and eventually speech and action. Stillness remains the rarest of virtues. How seldom does one see a man or a woman sitting still?

These words, scrolling across the LED display and sounding in a Chinese translation, are an example from hundreds of pages of *Dictation Tests* that operated in all Australian ports of entry from 1901 until 1958 with the primary function of excluding undesirables (specifically Asians) from migrating.

This policy was coupled with the general and popular understanding that the indigenous population would be 'bred-out,' lightened and whitened until their genetic traces disappeared. With an ominously contemporary resonance;

"A message was sent out to the world that *coloured* people could not settle in Australia." [9]

The membrane is after all a skin; a skin of colour; a skin of language and culture, a flexible container designed to keep


NOTE.

Book No. 252

Form No. 21.

GERTIFICATE

TEST.

DESCRIPTION.

PHOTOGRAPH

Fig 3. An exemption certificate from the Dictation Test (National Archives of Australia).

Fig 4. *Supereste ut Pugnatis (Pugnatis) ut Supereste* (detail). Photo © Ian Hobbs.

what is of value within and what is perceived as a contaminant without. Its permeability determines the nature, rate of change and adaptation, the type and efficiency of cultural metabolism.

To conclude with another Dictation Test passage for good measure, its jingoism recalling John Howard's obsession with Cricket trivia as a criterion for citizenship. Perhaps you might like to take the test?

The swagman wrapped his gnarled and desiccated digits round his minuscule ukulele and with prodigious and egregious deficiency of musicology essayed a resounding, cacophonous rendition of 'Waltzing Matilda' that caused a phobic frog to hurl itself suicidally into a brackish billabong.

Maybe that is Impermeable!

References and notes

1. The New Testament, Matthew 19:24, The Eye of the Needle was a small gate in the walls of Jerusalem.

2. *Supereste ut Pugnatis (Fight to Live)* is the motto of the Chemical Defense Establishment, which is located at Porton Down in the UK.

3. In Ancient China yellow was considered the colour of joy, glory and wisdom. However from the 3rd millennium B.C. yellow was associated with power and domination. In contemporary China it is associated with pornography as it is with prostitution in Russia.

4. The Fire Drake Manual 14th Century Chinese military treatise, edited by Jiao Yu and Lui Ji, details the evolution of rocketry circa C10th.

5. A Virus that infects and then replicates within a Bacterium.

6. Isaiah 10:14

7. In 1940 biological warfare work began at Porton Down, UK in a highly secret autonomous group called Biology Department Porton now known as the Chemical and Biological Defense Establishment.

8. The first smallpox weapons factory in the Soviet Union was established in 1947 in the city of Zagorsk, close to Moscow. The bio-weapon was produced by injecting small amounts of the virus into chicken eggs. An especially virulent strain (codenamed India-1967 or India-1) was brought from India in 1967 by a special Soviet medical team that was sent to India to help to eradicate the virus. The pathogen was manufactured and stockpiled in large quantities throughout the 1970s and 1980s.

An outbreak of weaponized smallpox occurred during its testing in the 1970s. General Prof. Peter Burgasov, former Chief Sanitary Physician of the Soviet Army, and a senior researcher within the program of biological weapons described this incident: “On Vozrozhdeniya Island in the Aral Sea, the strongest recipes of smallpox were tested. Suddenly I was informed that there were mysterious cases of mortalities in Aralsk. A research ship of the Aral fleet came 15 km away from the island (it was forbidden to come any closer than 40 km). The lab technician of this ship took samples of plankton twice a day from the top deck. The smallpox formulation— 400 gr. of which was exploded on the island—“got her” and she became infected. After returning home to Aralsk, she infected several people including children. All of them died. I suspected the reason for this and called the Chief of General Staff of Ministry of Defense and requested to forbid the stop of the Alma-Ata to Moscow train in Aralsk. As a result, the epidemic around the country was prevented. I called Andropov, who at that time, was Chief of KGB, and informed him of the exclusive recipe of smallpox obtained on Vozrozhdeniya Island.” A production line to manufacture smallpox on an industrial scale was launched in the Vector Institute in 1990.

9. Jupp, J. (2002) *From White Australia to Woomera*. Cambridge: Cambridge University Press.

THE HACKING MONOPOLISM TRILOGY

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Abstract

The three artworks of the *Hacking Monopolism Trilogy* are *Face to Facebook* [1], *Amazon Noir* [2] and *GWEI-Google Will Eat Itself* [3]. These works have much in common in terms of both methodologies and strategies. They all use custom programmed software to exploit three of the biggest online corporations, deploying conceptual hacks that generate unexpected holes in their well-oiled marketing and economic system. All three projects were 'Media Hack Performances' that exploited security vulnerabilities of the internet giants' platforms to raise media attention about their abuse of power. These performances were staged through the global mass media for millions of spectators worldwide. The processes of the projects are always illustrated diagrams that show the main directions and processes under which the software has been developed to execute the performances. Finally, all the installations we exhibited did not use computers or networks, focusing more on the display of the processes than on the technologies.

Keywords: Face to facebook, Amazon Noir, Google will eat itself, hacking, revelatory diagrams, big online corporations.

Face to Facebook is the third work in a series that began with *GWEI-Google Will Eat Itself* and *Amazon Noir* (the last two co-authored with Ubermorgen). In *GWEI* we wanted to buy Google using its own money, generated by serving Google AdSense text advertisements first on a fake marketing website, and then on a network of hidden web-servers. With the money we got we automatically bought Google shares, so we were able to potentially buy Google via its own advertisements. By establishing this auto-cannibalistic model, we deconstructed the new advertisement mechanisms by rendering them into a surreal click-based economic model.

In *Amazon Noir*, Amazon.com's website was the vulnerable target. We eluded their copyright protection with a sophisticated hack of the 'Search Inside the book' service: by searching the first sentence of a book we obtained the beginning of the second sentence, and then by reiterating a few thousands searches, we obtained the whole text, redistributing it as pdf file through peer-to-peer networks.

In *Face to Facebook*, through special custom software, we collected "public profile" data from more than 1,000,000 Facebook users. Then we studied and customized a face recognition algorithm. The algorithm was programmed to 'group' the huge amount of faces we collected (and their attached data) in a few simple categories ('climber', 'easy going', 'funny', 'mild', 'sly' and 'smug' - working definitions), with some intuitive differences, for both male and female subjects. The software effectively extracted 250,000 faces that were connected to the relevant public data in our database. We established a dating website called *www.Lovely-Faces.com*, importing all the 250,000 profiles. Users trying to contact them ended up at their respective Facebook public profiles.

Fig. 1. Face to facebook installation at Transmediale festival, Berlin, 2011

The trilogy

We found a significant conceptual hole in all of these corporate systems and we used it to expose the fragility of their omnipotent commercial and marketing strategies. In fact, all these corporations established a monopoly in their respective sectors (Google, search engine; Amazon, book selling; Facebook, social media), but despite that, their self-protective strategies are not infallible. And we have been successful in demonstrating this.

There are other common themes in the projects. In all of them we stole data that is very sensitive for the respective corporations. With Google it was the "clicks" on their AdSense Program; with Amazon we started to steal the content of entire books, and with Facebook we stole a huge amount of public data profiles. In all the three projects, the theft is not used to generate money at all, or for personal economic advantage, but only to twist the stolen data or knowledge against the interests of the respective corporations. In *GWEI* it was the shares obtained through the money created by the AdSense program; in *Amazon Noir* it was the pdf books distributed for free; and in *Face To Facebook* it was the collection of profiles moved with no prior notice to a dating website.

Indeed all the projects, independently claim that some of the corporation's "crown jewels", including their brand image and marketing approaches, can be hacked, by focusing only on their established strategies and thinking in a "what if?" fashion. Furthermore, all of the projects were based on a "hacking" idea that, although pursued on a sophisticated level and with custom software, could have been applied by anybody with similar results. This is one of the fundamental values of these projects. Finally, all the installations we exhibited did not use computers or networks. We were trying to be coherent with the projects, but focused more on the display of the processes than on the technologies.

Face-to Facebook, smiling in the eternal party

Social networking is naturally addictive. It's about exploring something very familiar that has never been available before: staying in touch with past and present friends and acquaintances in a

single, potentially infinite, virtual space. The phenomenon challenges us psychologically, creating situations that previously were not possible. Before the rise of social networking, former friends and acquaintances would tend to drift away from us and potentially become consigned to our personal histories. Having a virtual space with (re)active people constantly updating their activities is the basic, powerful fascination of the social network. But there's another attraction, based on the elusive sport (or perhaps urge) to position ourselves. The answer to the fundamental identity question, "who am I?" can be given only in relation to the others that we interact with (friends, family, work colleagues, and so on). And the answer to this question seems clearer after we take a look at our list of social network friends.

So an intimate involvement and (endless) questioning of our online identity (often literally juxtaposing with our physical one) is perpetrated in the social network game. But social network platforms are not public organizations designed to help support social problems, rather they support private corporations. Their mission is not to help people create better social relationships or to help them improve their self-positioning. Their mission is to make money [4]. Economic success for these corporations rests on persuading users to connect to the several hundred people who await them online.

The market value of these companies is proportional to the number of users they have. Facebook is valued at around 50 billion dollars [5]: it has one billion users [6]. The game can often translate into a form of social binging in which the number of friends a user has is never enough to satisfy. But what kind of space is Facebook? Facebook is not home - it is way larger and more crowded. And it's not the street, because you're supposed to know everybody in your space. Facebook is an eternal, illusory party, under surveillance and recorded for all time. Its structure invites you to first replicate and then enhance your real social structures, replicating your experiences on your own personal "screen space".

In this unending party, you meet and join old and new friends, acquaintances and relatives. As with most parties, everything is private, or restricted to the invited guests, but has the potential to become public if accidentally shared. Here the guests' activity and interests are also recorded through their posts in different formats and media (pictures, movies, trips, preferences, comments). It's an induced immaterial labour with instant gratification. Guests produce content by indirectly answering the question "who am I?" and they get new friends and feedback in the process.

Fig. 2. Lovely Faces dating website

In fact, Facebook's subliminal mantra seems then to be "be personal, be popular, never stop." It has even gone so far as to make it difficult to notice when a friend closes their account (you need to check the friend's list to have any idea) [7].

The more successful (and crowded) the party, the more the private funders are happy to put money into it. The price the guests are unconsciously paying is that they are giving away their (constantly updating) virtual identity. Guests, in fact, organize their own space, and therefore their own 'party', offering the party owner (Facebook) a connected, heterogeneous group of people who share interests. As such they offer what can be termed as "crowd-sourced targeting" – the indirect identification of people's targets and desires by the users themselves. In fact the spontaneously posted data provides an endless (almost automatic) mutual profiling, enriching and updating the single virtual identities, in a collective self-positioning. But can profile data be liberated from Facebook's inexorable logic? The answer is yes, but it's important to focus on the core of the Facebook profiles and see how they are recognized as virtual identities. First, the profiles sublimate the owners' (real) social actions and references through their virtual presences. Second, they synthesize their effectiveness in representing real people through a specific element: the profile picture. This picture, an important Facebook interface, more often than not shows a face, and a smiling one at that. Our face is our most private space and simultaneously the most exposed one. How many people are allowed to touch our face, for example? And, generally speaking, the face is also one of the major points of reference we have in the world.

There are even "special" regions of the human brain, such as the fusiform face area (FFA), which may have become specialized at facial recognition [8]. Faces are now so exposed that they do not remain private, but are thrust into the public domain and shared (they can even be "tagged" by other people). So any virtual identity (composed of a face picture and some related data) can be stolen and become part of another identity, through a simple re-contextualization of the same data.

Furthermore, 'face recognition' techniques can be applied to the purpose of grouping vast amount of Facebook pictures. This process is also quite

paradoxical, because the "surveillance" aspects (face recognition algorithms are usually used together with surveillance cameras) here are not used to try to identify a suspect or a criminal, but to capture and group people with similar somatic expressions. The resulting scenario is that different elements forming the identities can be remixed, re-contextualized and reused at will. Facebook data become letters of an unauthorized alphabet to be used to narrate real identities or new identities, forming new characters on a new background.

And this is a potentially open process that anybody can undertake. It becomes more tempting when we realize the vast amount of people who are smiling. When we smile in our profile picture, we are truly smiling at everyone on Facebook.

So any user can easily duplicate any personal picture on his hard disk and then upload it somewhere else with different data. The final step is to be aware that almost everything posted online can have a different life if simply re-contextualized.

Conclusions

Facebook is an endlessly cool place for so many people, and at the same time it's a goldmine for identity theft and dating - unfortunately, without the user's control. But that's the very nature of Facebook and social media in general. If we start to play with the concepts of identity theft and dating, we should be able to unveil how fragile a virtual identity given to a proprietary platform can be, and how fragile enormous capitalization based on exploiting social systems can be. This phenomenon will eventually mutate, from a plausible translation of real identities into virtual management, to something with no assumed guarantee of trust, crumbling the whole market evaluation hysteria that surrounds the crowded, and much hyped, online social platforms.

References and Notes

1. Face to Facebook, http://www.face-to-facebook.net, accessed 1 July 2013.

2. Amazon Noir, http://www.paolocirio.net/work/amazon-noir/amazon-noir.php, accessed 1 July 2013.

3. Google Will Eat Itself, http://www.paolocirio.net/work/gwei/gwei.php, accessed 1 July 2013.

4. Peter Lunenfeld, 'The Secret War between Downloading and Uploading', The MIT Press (2011), p.145.

5. Dominic Rushe, "Goldman Sachs suffers Facebook fiasco," *The Guardian* (2011), <http://www.guardian.co.uk/business/2011/jan/17/goldman-sachs-facebook-private-placement>, accessed 1 July 2013

6. Geoffrey A. Fowler, "Facebook: One Billion and Counting," *The Wall Street Journal* (2012), <http://online.wsj.com/article/SB10000872396390443635404578036164027386112.html>, accessed 1 July 2013.

7. Adam Hyde, Mike Linksvayer, Kanarinka, Michael Mandiberg, Marta Peirano, Sissu Tarka, Astra Taylor, Alan Toner, Mushon Zer-Aviv, 'What is Collaboration Anyway' in ed. by Michael Mandiberg "The Social Media Reader", NYU Press (2012), p.59.

8. Fusiform Face Area, <http://en.wikipedia.org/wiki/Fusiform_face_area>, accessed 1 July 2013.

PLASTICITY: NOISE, CORRELATION AND INTERACTION

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Abstract

This paper introduces the interactive and performative installation artwork, Plasticity (Jane Grant, John Matthias, Nick Ryan and Kin) and its software engine the Neurogranular Sampler via a journey through the synchronized pendulum clocks of Christian Huygens, entrainment in dynamical systems, and correlations and noise within neuronal networks. I examine ways in which the public are 'playing with noise' in the artwork and suggest that the public engagement with the work is closely connected to the fact that the dynamics of the artificial neuronal network lie at the borders between synchrony and randomness.

Keywords: installation Art, Performativity, Neuronal Networks, Plasticity, The Fragmented Orchestra, Dynamical Systems, Noise, Synchronisation.

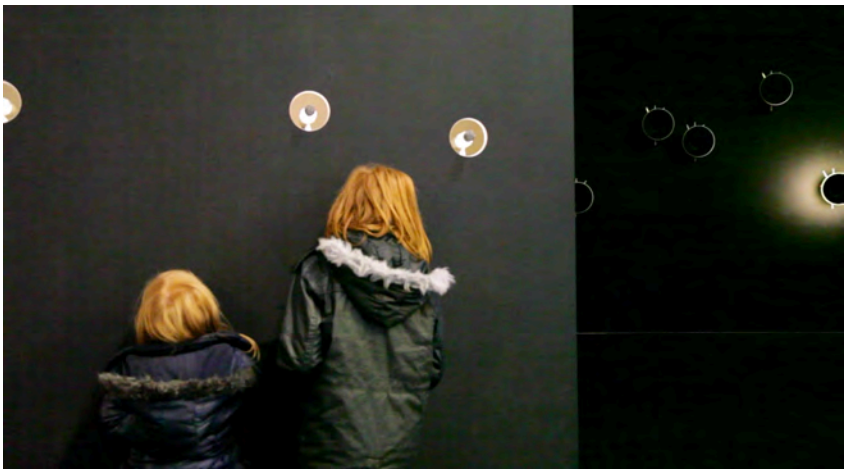

Fig 1. Visitors to 'Plasticity' at the onedotzero 'Adventures in Motion' Festival make sounds into the microphones which are re-triggered by the firings of an artificial neuronal network accompanied by flashing LED lights at firing events in the adjacent gallery space. © Jane Grant, John Matthias, Nick Ryan and Kin. Image by Avril O'Neil.

Introduction

In the artwork, *Plasticity* (Jane Grant, John Matthias, Nick Ryan and Kin), visitors to a gallery installation space are invited explicitly to 'perform'. That is, they are invited to participate in the work by making noises into several microphones installed into a wall in the gallery. Following this noisemaking, lights light up around the microphone, which is followed by the lighting up of LED ribbon around various loud speakers a few metres away accompanied by fragments of the noisemaking, now disembodied from the noise-maker and scattered across the speakers. These fragments of sounds and light, the viewer/listener/noisemaker is told, are triggered by the firing of artificial spiking neurons which exist in the computer behind the wall; the rhythms of the sounds and the patterns of light are artificial neural reconfigurations of the original human-made sounds.

When *Plasticity* was installed in the BFI Southbank as part of the onedotzero 'Adventures in Motion' Festival, London in November 2011, hundreds of people delighted in interacting with the work (you can see a documentary video of it here [9]). After being questioned by the artists, many members of the public typically said that they didn't really know what was happening, but that it was 'cool' and also that there was a certain fascination with the fact that there was a kind of 'brain' within the computer. There was also something else at play here. Members of the public continued to 'play' the instrument. The sounds and lights coming back from the instrument are not randomly generated, but consist of rhythmic patterns generated by the interactions between the artificial neurons in the software. There is a fascination in playing with these rhythms, the rhythms at the borders between randomness and synchrony, especially when the sources of the sounds are made by the public themselves. In this paper I will begin to explore the reasons behind this fascination, beginning by discussing Christian Huygens, continuing with an explanation of ideas of noise and correlation, and ending with a brief description of Polychronisation in Neuronal networks.

Synchronisation

In 1654, whilst in bed with influenza, the Dutch physicist Christian Huygens discovered that the two pendulum clocks fixed to a common support onto his bedroom wall would synchronize into an exact contrary motion after a short period of time, no matter what the initial phases (positions) were within the clock's oscillatory cycle. This phenomenon, now known as 'synchronisation' or 'entrainment,' wasn't fully understood until the late twentieth century [1] but has now become one of the fundamental principles within our understanding of dynamical systems (things that interact and move). Furthermore, many natural systems exhibit this phenomenon, including the synchronous flashing of fireflies and the circadian rhythms of animals [2]. If we begin with a number of completely independent (that is, uncoupled) oscillators which start at randomly chosen initial phases, then these oscillators will continue without changing their cycles. However if there is an interaction between the oscillators, no matter how small, then entrainment is likely to occur. Huygens' pendulums, for example, were sending vibrations to each other continuously through a common wooden support –if the two pendula had been fixed to opposite walls, then there would have been no coupling.

If we take one pendulum and measure its position from the starting point as it moves and plot that position against time on a graph, then the plot would look like a sine wave. An alternative way of representing an oscillator is within a description called 'frequency space,' for which the frequencies of a collection of oscillations are plotted on a Cartesian x-axis with their contribution to the whole signal plotted on the y-axis. For a single pendulum, this representation would look like a single spike at the frequency of oscillation; a frequency which is determined by the weight and length of the pendulum.

If we measured the positions of a collection of many uncoupled pendula and added all the positions together to make a combined signal, the signal would look very noisy (it would fluctuate a lot) as it would be made from an addition of oscillators with randomly connected phases. A random signal (for which there is no temporal correlation between one moment and any other) is represented in frequency space as 'white noise' in which all frequencies of the signal contribute an equal part. A graph of the power of the contribution of frequency, or amplitude, against frequency therefore looks like a flat horizontal line for a white noise signal.

If we watched the change in this frequency space description for a group of identical coupled pendula, from initial

random starting points evolving to an entrained 'pulse', then we would see a gradual change from a horizontal line to a single spike. The speed of the change depends upon the strength of the coupling. It is possible to witness (and listen to) the phenomenon of the entrainment of several mechanical oscillators using several identical mechanical musical metronomes, a plank of wood and two drinks cans [3]. If the metronomes are put on a table and started at arbitrary phases, and then placed on a piece of wood which is balancing on the two drinks cans, then the metronomes very quickly change their phases (but not their frequencies) to beat together. When one listens to the rhythms caused by the metronomes' beaters, one hears a transition from a set of almost random clicks to a (nearly) single pulse. The two extremes of this situation are not particularly interesting –our brains quickly stop listening to and 'filter out' random signals, however there is an enormous temporal range of rhythmic activity between these two temporal extremes mediated by interaction between all kinds of oscillators; natural and otherwise.

Self-Organised Criticality

In the examples above, the interactions act as a dynamic filter to gradually change the random signal into a correlated one. Turning on an interaction, even a tiny one, changes the temporal dynamics radically. Here we make a connection with many theories of the interdependent roles of correlation, noise and interaction in physical interacting systems [1]. The theory of self-organized criticality [4], in which a toy computer sand-pile model is perturbed by dropping virtual sand grains at randomly chosen positions and times, is one such example. The grains of sand in Bak, Tang and Wiesenfeld's computer model are allowed to fall onto a flat regular lattice 'surface', landing either onto a vacant lattice point or onto a lattice point already occupied by a 'grain'. The only rule in the simulation is that if the relative size of adjacent towers of grains becomes larger than three (say) then the next grain that lands onto that tower has to topple onto any one of the nearest-neighbour lattice points. This leads to a simple dynamic of growth and avalanche in which the system quickly becomes stable at a point at which all of the 'hills' of sand are at their critical angle to form the next avalanche. Moreover, Bak, Tang and Wiesenfeld measure the number of grains per second (or grain current) which topple over the edges of the digital surface. This signal is not a random signal but is 'coloured' by the correlations that have been imprinted from the very simple dynamical rules in the toy model.

When we analyse the power contribution of the frequencies in the grain current signal (which indicates when the sand grains are falling off the digital surface) we find that we do not get a white noise signal. The resulting graph has a functional form which falls as 'one over the frequency'; a ubiquitous natural form of noise called 'One over *f*' or 'Flicker' noise. This process of introducing functional form into the power spectra of noisy signals is often referred to as 'colouration', and is used in engineering as a method of probing the dynamics (and interactions) of physical systems. The noisy signals in coloured noisy patterns which have this kind of form (often referred to as 'power law') have a scale symmetric structure, which means that patterns in the signal are repeated over many length scales in a kind of fractal symmetry and for this reason are also often referred to as 'fractal noise'. Such noise patterns are found within many diverse natural systems including fluctuations in the luminosity of stars and the fluctuation of cars travelling in highway traffic [5]. It is important to realize that the motivation of Bak, Tang and Wiesenfeld's work was not to study the physics of sand-piles, but rather to examine universalities of the physical laws of the dynamics of driven interacting complex systems.

Plasticity

Noise is ubiquitous and indeed necessary in biological neuronal systems and in many theories and experiments is interpreted as a driving force to keep these natural systems 'buoyant'[17], enabling them to explore many energetically possible dynamical states rather than being confined to single solutions [16]. Neuronal systems are also susceptible to entrainment but typically lie within the interesting dynamical area between randomness and correlation [6]. In the example of the interacting penudula, the interaction is a continuous one. The pendulum clocks on Christian Huygen's wall were continuously interacting through the support on the wall. The interaction within Neuronal networks is not continuous but is referred to as 'pulse coupled'. Each neuron interacts with the others by sending spike signals (a temporal pulse of around a millisecond) along long tubes called 'axons' to connect with the other neurons at a junction called a 'synapse'. The spiking rhythms of the cortical neurons contain all of the information carried between connected cortical neurons in our brains.

As illustrated in *Plasticity*, we exploit a musicality of these spiking rhythms and the fact that they generally lie within a rich temporal dynamic domain in many of our installations and musical works in which recorded and live sounds are controlled and re-triggered by an artificial spiking neuronal network [7, 8, 9, 10]. Neuronal systems are noisy, and this noisiness is exploited in many spiking neuronal models such as the biologically plausible cortical model, the Izhikevich model [10] which drives the neurons with an external noisy current assumed to be representative of a signal from the thalamus. The interactions between the neurons act as a dynamic filter to introduce many correlations in the signal in a similar way to the much simpler digital sandpile described earlier. Our interactive sound installation, *Plasticity* [9], drives many Izhikevich neurons with a noisy signal but also with the participative sounds made by visitors to the Gallery through a number of microphones. Visitors play with the noise. The output sounds become correlated by the correlations within the initial sounds made by the noisemaker and also by the interactions between the neurons in the software which affect the relative timing of the firing events which cause the re-triggering of the sound. Clearly a statistical frequency space description of the output sound signal in a work such as *Plasticity* would be an inadequate way of describing the work from an experiential point of view. What the public performing the work find interesting are the individual rhythms generated in the software which produce unpredictable (though not randomly generated) phrases which last a few seconds, mixed with the rhythms and timbres of the sounds made by the participants over smaller durations, which are captured in the fragments of sound. The *Plasticity* installation is partly driven by a multichannel version of an audio unit which we have developed called *The Neurogranular Sampler* [10]. In this software, an artificial Izhikevich neuronal network takes grains of sound from live sound input and retriggers them upon neuronal firing events, which are controlled by the parameters on the instrument's interface within a single computer. The firing patterns output form the software are the rhythms of

'Polychronisation' [11], in which the imaginary and the memorial are linked with sensory perception and the dynamics of the spiking neurons.

Polychronisation

The idea of polychronisation follows from Izhikevich's [12] two-dimensional reduction of the Hodgkin-Huxley electrical model of a neuron [13], which has the voltage on the neural cellular membrane as the main physical variable. In a network of artificial Izhikevich neurons, a spike signal is sent from a neuron along an axon to the synapses of all its connected neighbours when the voltage on its membrane reaches a certain threshold voltage. On reaching the neighbours, these spikes transfer a voltage commensurate with the strength of the synaptic coupling at the post-synaptic neurons. The strengths of the synaptic couplings are not fixed, but change according to a process that has become known as 'Spike-Timing Dependent Plasticity' or SDTP [14]. In STDP, the strength of the coupling is increased in the case of causal spiking (one spike precedes another) and depressed in the reverse case, mediated with an exponential temporal functional form. The phenomenon of Polychronisation follows as a result of the interplay between the STDP and the introduction of axonal delays into an artificial neuronal network. An axonal delay is simply the transit time of a spike from the neural cell body to the synapse of a connected neuron. Crucially this introduces the spatial into the calculation of the neurodynamics, an element surprisingly neglected until very recently in computational neuroscience. When a neuron in an artificial Izhikevich cortex is regularly stimulated to fire by either a sensory signal or by a spike signal from another connected neuron, it sends spikes to connected neurons which become reinforced through the process of STDP –a kind of Hebbian learning [15]. In this way subgroups of neurons become Polychronised (firing together in a group but not at the same time) and it is the pattern of the firing sub-group which represents the signal pattern for the initial stimulation. Izhikevich's idea introduces 'simple memory' into this scenario by suggesting that the re-firing of the polychronised group of neurons evokes the original stimulus within our imagination.

In the work *Plasticity* and within the *Neurogranular Sampler*, it is the polychronised rhythms which scatter across the speakers in the gallery and from the instrument respectively, and the changing of the neural circuitry becomes a method to change the out-coming sonic rhythms. If one takes a set of identical artificial neurons and removes any synaptic plasticity within the model, the spikes rapidly entrain in a similar manner to the connected metronomes or Pendulum clocks which Huygens noticed. That is, the spikes all occur at very similar times across the network (rather like a spasm or seizure) and this is perceived as a pulse within the context of the sonic artworks if the duration of the live sounds triggered by the firing times is small. It is interesting to note that if we change the neural circuitry by introducing synaptic plasticity (such as Spike-Timing Dependent Plasticity STDP, for example) into this pulse-like behavior, the result is to de-correlate the activity [6]. We can therefore introduce synaptic plasticity as a control mechanism, a method of changing the dynamic activity within the network, which in turn controls the temporal dynamics of the sonic output.

References

1. Arkady Pikovsky, Michael Rosenblum and Jürgen Kurths (2001) *Synchronisation: A Universal Concept in Nonlinear Sciences* Cambridge University Press.

2. Steven Strogatz (2003) *Sync: How Order Emerges from chaos in the Universe, Nature and Daily Life* Hyperion (New York)

3. See for example http://www.youtube.com/watch?v=W1TMZASCR-I (Lancaster University, UK)

4. Per Bak, Chao Tang and Kurt Wiesenfeld (1988). *Self-organized criticality* Physical Review A 38 (1): 364–374.

5. Per Bak (1996) *How nature works: The Science of Self-Organised Criticality* Springer-Verlag (New York).

6. Lubenov E.V. and Siapas A. G., 2008. Neuron 58 118-131.

7. Jane Grant, John Matthias and Nick Ryan *The Fragmented Orchestra* www.thefragmentedorchestra.com Retrieved July 22nd 2013.

8. Jane Grant *Ghost* (2011) Istanbul Biennial/ ISEA Istanbul See also http://blog.bowers-wilkins.com/news/events-and-shows/bowers-wilkins-at-istanbul-biennial-2011/ Retrieved July 22nd 2013.

9. Jane Grant, John Matthias, Nick Ryan and Kin *Plasticity* (Gallery Installation) –short documentary film at http://blog.bowers-wilkins.com/sound-lab/lovely-film-of-plasticity-installation-at-british-film-institute/ accessed 2nd May 2012.

10. John Matthias, Jane Grant, Nick Ryan, Tim Hodgson, Kin Design, Eduardo Miranda *The Neurogranular Sampler* (Audio Unit) You can see a simulation of the Neurogranular Sampler here http://vimeo.com/15191681 Retrieved July 22nd 2013.

11. Izhikevich E. Gally J. and Edelman G. (2004) *Polychronisation: Computation with spikes* Cereb. Cortex 14 933-944.

12. Izhikevich, E.M. (2003) IEEE Transactions on Neural Networks 14:1469.

13. Hodgkin A.L. and Huxley A. F. (1949) Journal of Physiology 117:500-544.

14. Song, S. Miller K.D and Abbott L.F. (2000) Nature Neuroscience 3 921-926.

15. Donald Hebb (1949) *The organization of behavior* New York: Wiley & Sons.

16. Edmund T Rolls and Gustavo Deco (2010) *The Noisy Brain: Stochastic Dynamics as a principle of Brain function* Oxford University Press.

17. Jane Grant (2011) *Neural Ghosts and the Focus of Attention*, ISEA, 2011. Retrieved July 20 2012 from http://isea2011.sabanciuniv.edu/paper/neural-ghosts-and-focus-attention

DIGITAL IMAGING AND ARTISTIC EDUCATION: A PEDAGOGICAL MODEL WITH FREE SOFTWARE GIMP [1].

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Abstract

This paper describes the results of the investigation "Digital Imaging and Artistic Education: A Pedagogical Model" developed by the research group Hipertrópico, Universidad de Antioquia, Colombia. The text contributes to the development of a pedagogy that not only integrates the teaching of digital art in secondary education by using the free software GIMP but also promotes digital literacy in the city of Medellín.
The text describes how the research methodology promotes the integration of practical work with conceptual reflections on the examination, testing and design of the multimedia tutorial Líneas digitales: Una Introducción a la enseñanza y la creación gráfica digital con GIMP.

Key words: digital art, free software, GIMP, digital literacy, multimedia Líneas digitales.

Fig. 1. Multimedia tutorial logo. (© Hipertrópico.)

Introduction

The use of Information Technology, IT, has become one of the most important strategies governments have implemented to improve education in many countries. In the specific context of the city of Medellín, Colombia, the integration of digital technologies in the public education system has resulted in infrastructure improvements rather than digital literacy.

In general, the integration of technology in secondary schools reveals major results in informatics teaching, and fewer results in the teaching of areas of social sciences and arts. In particular, the use of digital media in arts education in the city of Medellín has been extremely limited. Art teachers design their classes following a pedagogy based on the teaching of analogue media such as drawing, painting, photography, sculpture, among others. Secondary teachers' approach to integration seems to be aligned with the idea that "the world of education collects technological developments with some sort of suspicion" [2]. Although teachers have basic information regarding digital art, they still need to have more capacity to understand the potential of this medium to configure new cultural, aesthetic and artistic possibilities in their classes. For this reason, teachers need to have dynamic training and material to empower them to use IT.

To contribute to the integration of technology in artistic curricula at a secondary level in Medellín's education system, Hipertrópico developed the research project: *Digital Imaging and Artistic Education: A Pedagogical Model*. Two precedental workshops, conducted by the research group with secondary students and teachers from public schools, provided the initial elements for selection of a qualitative methodology that allows researchers to consider the perceptions and personal experiences related to the use of technology in their academic communities [3]. By using this methodology, the group aims to understand the difficulties that impede real implementation of digital media in the artistic curriculum and the use of digital media as a form of creative expression and thinking. With these considerations the researchers selected the public institution *INEM José Felix de Restrepo*, a high school that offers degrees with an emphasis on visual art, as a case study that allows the group to work with two art teachers and their students to obtain the artistic and conceptual elements necessary to structure the multimedia tutorial *Líneas digitales: Una Introducción a la enseñanza y la creación gráfica digital con GIMP*.

This paper provides an account of the conceptual and experimental inquires that comprise the framework for the development of the multimedia tutorial. To design *Líneas digitales*, the researcher group Hipertrópico considered the potential of using what Michael Joyce calls *hypertext environments* as "tools for working at traditional tasks which have the effect of changing the tasks themselves" [4]. *Líneas digitales* provides an interface that allows users to access content specifically related to the use of the free software GNU Image Manipulation Program (GIMP). Likewise, researchers used the metaphor of a traditional school of art as a way to design the user experience (teacher, students and amateurs interested in starting a creative process in graphic digital art) to bridge analogue and digital aesthetic possibilities.

By designing a conceptual and graphic interface that mimics the logic of a school of art, *Líneas digitales* aims to provide not only introductory information about the use of GIMP but also examples of artistic exploration that can be done using GIMP. To move away from the arid methodologies of standardized tutorials, nine video tutorials were developed with local artists whose work depicts a diversity of poetic uses of digital media (such as: Reflections on the urban experience, identity, consumerism, abstraction, realism, and so on). The *Líneas digitales* tutorials aimed to depict an artistic appropriation of technology and to contribute to the development of a pedagogy that aligns with the idea that "the digital literacy should focus on teaching about technology and not be limited to teaching with or throughout technology" [5].

Defining a context: difficulties for teaching digital art in Medellín's classrooms.

In 2010 the Hipertrópico research group was selected to direct and provide training to 17 public school teachers in *La Escuela del Maestro, Alcaldía de Medellín*'s official institution that provides training in the use of IT to teachers of different disciplines. The training allowed the researchers to conduct a survey among the teachers to solicit information about their difficulties, fears and expectations regarding the use of digital technologies in their classes. Data collected through interviews reveals that technology is primarily used in the informatics area and less in social sciences or arts. Additionally, the survey shows that although the *Alcaldía de Medellín* has promoted the use of technology in primary and secondary education, the results are not as expected. Specifically, the use of technology in education at the secondary education level is centered on the use of the Internet as a tool for research and for broadcasting information. In particular, art teachers encounter three main problems with integrating technology in their classes. First, financial difficulties prevent them from obtaining the appropriate software for artistic digital creation. Second, the teachers are not trained to understand the potential of technology as a poetic and creative tool. Finally, there isn't enough training to develop a methodology that empowers art teachers to keep up with the fast pace of their students' capacity to absorb computer-related material.

Limited initiative to use technology in the educational system feeds the gap in the use of technology between leisure

time and school time for teenagers in Medellín. This is consistent with Buckingham's idea that "Nowadays, digital media - Internet, mobile phones, video games, interactive television - is an essential aspect of the experiences that children and teenagers have in their leisure time. The relation the young population has with digital technologies does not occur primarily in the educative context – as it used to happen in the 1980s, and part of the 1990s- but in the domain of popular culture" [6].

To reduce this gap between students' free time and academic time, the interviewed teachers prioritized strengthening training policies implemented by local authorities. Furthermore, they think that educational administrations have to define long range strategies that allow schools to improve on two different levels: infrastructure and digital literacy.

After analyzing teachers' responses to the research questions, it is possible to conclude that the necessary training has to provide enough elements to understand not only the technical use of the software and hardware, but also the potential of this media as a creative tool. To facilitate this goal, art teachers need to have innovative tools and training that empower them to build alternative methodologies in their classrooms. The survey results also indicate that inadequate digital training could make teachers doubt the importance of introducing IT in their classes and therefore discourage them from integrating these technologies in their classrooms.

In terms of infrastructure, the survey revealed that the majority of schools where the interviewed teachers worked had at least a computer lab with internet connection. Although the number of computers per student presents a barrier to permanent curriculum development in digital art, the most difficult problem in terms of infrastructure that schools face is the lack of appropriate software for artistic creation. Specifically, schools do not have enough resources to acquire software licenses for digital graphic creation such as Adobe Photoshop or Illustrator.

A pilot experience: exploring the free Software GIMP as a tool for teaching digital art.

The free software GIMP is an alternative for schools that face financial restrictions which prevent them from acquiring licensed programs for 2D imagery creation. Based on examples of successful uses of GIMP to develop imagery, primarily for the design of virtual classes in Moodle (a free software platform used to design courses online) at Universidad de Antioquia, the Hipertrópico researchers developed a technical experiment with GIMP in 2008. This experimentation aimed to measure the potential of the software to create images with higher resolution and photographic quality than that required for internet use and to offer an appropriate platform to manipulate images. The artistic projects created as a result of this exploration demonstrated the potential of GIMP as a tool to develop 2D imagery in art.

The researchers of Hipertrópico utilized the results of their technical and artistic exploration with GIMP to identify the elements to design a pilot workshop to measure the viability of teaching graphic digital art in Medellín's public schools.

Fig. 2. CEFA's workshop. (© Hipertrópico)

In 2008 the first workshop was conducted in the public school *Institución Educativa Centro Formativo de Antioquia, CEFA.* This workshop was provided to a group of informatics students in the 11th grade level of secondary school. In a twelve hour workshop, the researchers were able to train participants in the management and use of the basic elements of GIMP. With this training, participants were able to develop digital imagery related to the given topic of digital ecologies in the contemporary world. Furthermore, the work completed and the ease of use demonstrated GIMP's potential as a tool to develop imagery that extends analogue media's uses and aesthetic strategies such as collaging, appropriation, drawing and painting to digital creation. Given that these aesthetic strategies were already well known by the students, utilizing GIMP demonstrated the importance of bridging new possibilities in digital media with analogue's possibilities in traditional media.

A case study: working with the community of the school *Institución Educativa INEM José Félix de Restrepo*.

As part of the methodology, the members of Hipertrópico conducted a practical training program for two visual art teachers at the *Institución Educativa INEM José Félix de Restrepo*. Parallel to this work, the researchers conducted training for 9th and 11th grade students of the same institution. The main goal of this practical training was to provide enough information about GIMP and enough information about the aesthetic possibilities of digital media so they can begin to use it independently and apply it to their own teaching and learning. In addition, the training was personalized in a way that facilitated direct dialogue between researchers, teachers and students and provided the elements to design didactic tutorials for the multimedia *Líneas digitales.*

The two teacher participants used GIMP from different perspectives. The 11th grade teacher used the software as a tool for artistic creation and reflection about the concept of the circus and the city.

In contrast, the 9th grade teacher integrated the use of GIMP as a tool to translate some painting strategies to digital media. In this way the exploration focused more on the correlation between the tools of the software and analogue media.

Fig. 3. *Payaso*, 2010. Example of visual reflection about the circus and the city, made by one 11th grade student using GIMP. (© Sergio Giovanny Flórez).

Fig.4. Example of painting explorations with GIMP to create connection between digital and analogue tools. (© Hipertrópico.)

From the analysis of these two experiences, it can be said that these perspectives both relate to two possibilities for the use and exploration of digital media established by Christiane Paul in her book *Digital Art.* In her book, Paul establishes a distinction "between art that uses digital technologies as a *tool* for the creation of traditional art objects – such as photograph, print, sculpture, or music – and art that employs these technologies as its very own *medium*, being produced, stored, and presented exclusively in the digital format and making use of its interactive or participatory features" [7]. Although both groups primarily used technology as a tool in their experimentations with GIMP, the work done under the conceptual idea of the city and the circus has a closer affinity with Paul's idea of *digital technology as media*, while the digital paintings completed by the 9th grade participants fall closer within the parameters of Paul's idea of *digital technology as a tool*.

Design process of the *Multimedia Líneas Digitales: una introducción a la enseñanza y a la creación gráfica digital con GIMP.*

Conceptually, the multimedia *Líneas digitales* was designed following parameters that align with Michael Joyce's ideas about the exploratory and constructive uses of hypertexts. For Joyce "the authors and audience of hypertexts share a transforming interrelationship. They are, (…), co-learners. Even the most transparent exploratory hypertexts involve a shared process of mapping this interrelationship, while constructive hypertexts make the transparent mapping visible, active and personal" [8]. Additionally, the design of *Líneas digitales* aims to enable users to encounter dynamic information about the use of GIMP as a tool for developing 2D imagery that is both creative and useful. In this way, users are invited to explore the content inside the multimedia and to expand their exploration by reviewing references on the web and using the software to bridge the digital gap. *Líneas digitales* provides a dynamic structure for the content, and in this way the multimedia tries to go beyond the limits of traditional tutorials found on the web, which primarily focus on describing the technical aspects and possibilities of GIMP in a written or rigid audiovisual manner.

The content of the *Líneas digitales* aims to empower teachers to use GIMP in their classes by highlighting the importance of using the software as a tool for artistic and creative expression and to bridge the digital divide between home and school. To accomplish this task the graphic and conceptual interface of *Líneas digitales* was conceived and developed under the metaphor of a school of art, combining in this way technical, conceptual and aesthetic content. All components of *Líneas digitales* were distributed in six different virtual spaces (outlined below) that mimic the logic of a traditional school of art, as a way to exemplify relations between analogue and digital media.

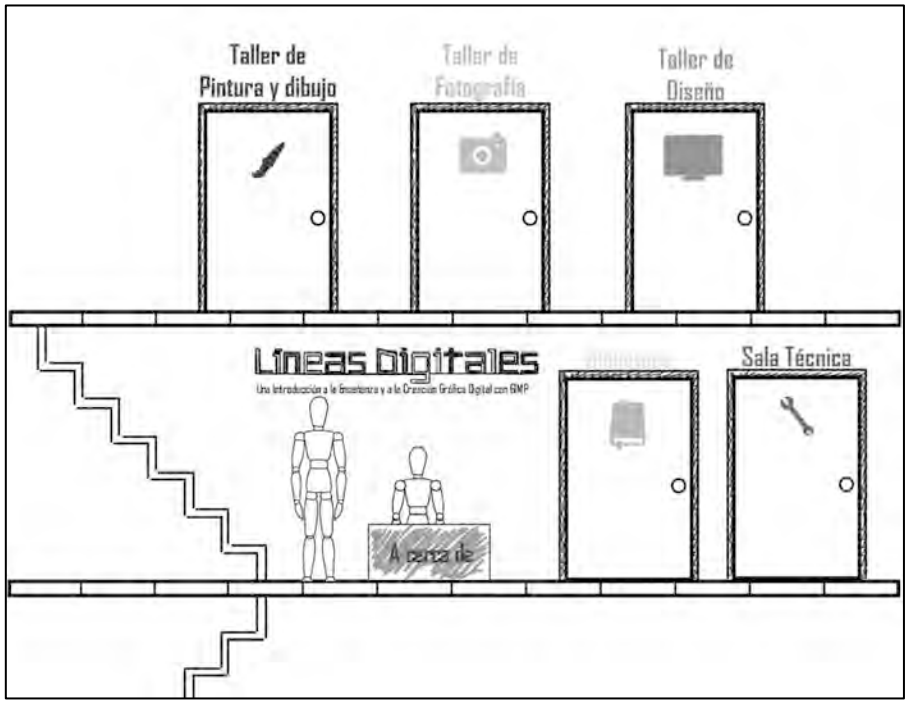

Fig. 5. *Líneas digitales*' intro (© Hipertrópico.)

Incorporating analogue and digital media in *Líneas digitales* underlies the importance of associative thinking and allows teachers to expand their former experience in analogue media via their experience with the software. For this reason, to develop the multimedia content, the Hipertrópico researchers payed more attention to the common syntaxes and semantics of visual imagery. The idea behind this strategy was to emphasize the strengths that users (teachers, students or amateurs) already have when they begin to use digital media as a tool to symbolize a vision of their worlds.

The structure of *Líneas digitales* works in the following way:

1. The initial visual interface of the multimedia offers users the possibility of accessing information in the following spaces: three workshops (drawing and painting, photography and design), a library, a tool room and the information desk of a school of art.

2. The workshops: drawing and painting, photography and design. All the workshops have the same informational structure and begin with a written introduction to the workshop. Each workshop provides three video tutorials organized by their level of difficulty in terms of the tools that were used by the artists in the creation of their work.

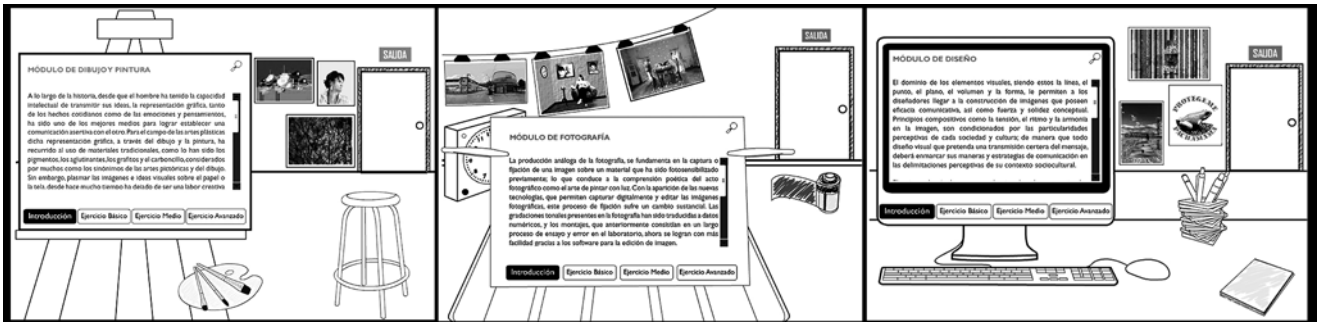

Fig. 6. Images of the screenshot of the drawing and painting, photography and graphic design workshop. (© Hipertrópico.)

The tutorials can be accessed by the user by selecting the picture or by selecting the exercise level. For the tutorial, nine artists in Medellín were invited to produce original work for *Líneas digitales* that exemplify their artistic interests [9].

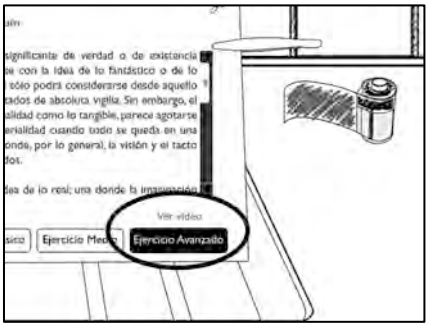

Fig. 7. Accessing the video tutorials. (© Hipertrópico.)

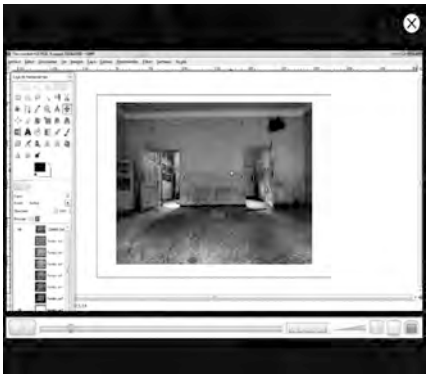

Fig. 8. Example of one frame of Lindy María Marquéz's video tutorial. (© Hipertrópico.)

In this way the videos depict a diversity of aesthetic approaches developed using GIMP. Some of the artists had previous experience with digital media and others were trained in the use of GIMP by the Hipertrópico researchers in order to develop their piece.

The process of developing the videos had two stages. First, researchers recorded the process of creation by the invited artist. Second, researchers organized the recordings that each artist provided in relation to his/her artistic work and the experience of using GIMP as the main tool.

Fig. 9. Producing the video tutorials. (© Hipertrópico.)

All the tutorials have an introductory text that addresses the artistic searches of the artists and indicates artistic references, artistic concepts and the tools that were used. Complementary information can be accessed in the tool icon (extended information about the artist, artistic concepts, and a digital glossary). The way to exit each workshop is clearly specified in red at the main door (*Salida*).

Fig. 10. Complementary informationabout the artist Alejandro Vásquez Salina. (© Hipertrópico.)

3. The library provides access to the bibliography that was used for the research and development of *Líneas digitales*, the artistic concepts that were addressed in the tutorial, and the links to web pages with reference information for the artists mentioned in the video tutorials.

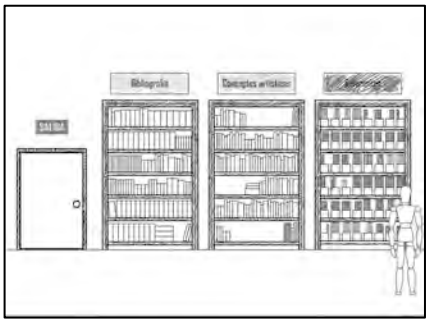

Fig. 11. Image of the library. (© Hipertrópico.)

4. The technical room offers three set of tools. First, a blackboard with access to short videos that depict the performance and use of GIMP tools, information about the layers, channels and paths window, and the working space. Second, a blackboard that offers introductory information about digital concepts for beginners on the use of digital media.

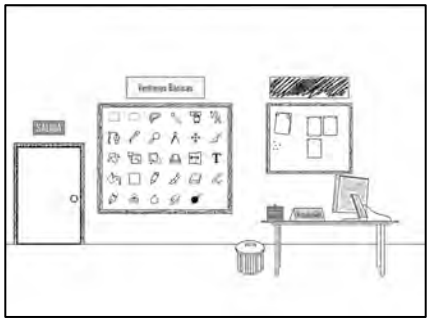

Fig. 12. Image of the technical room. (© Hipertrópico.)

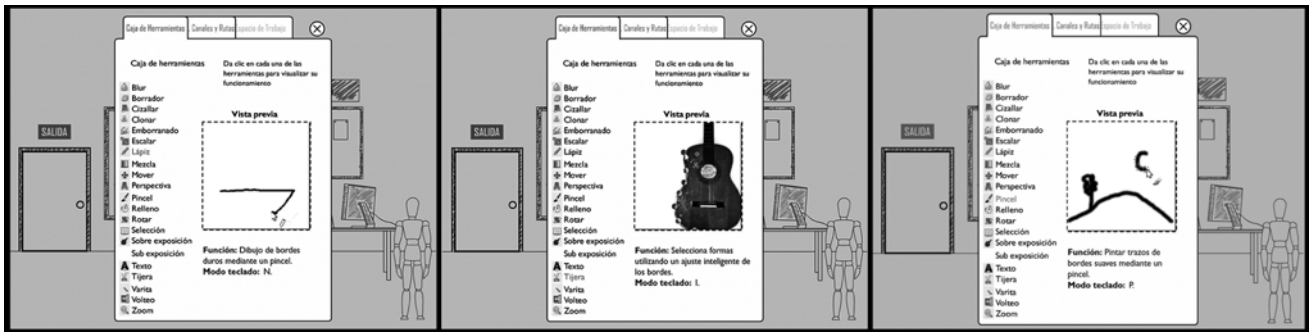

Fig. 13. Example of the pen, scissors and brush tools. (© Hipertrópico)

Finally, the computer on the desk provides directions on how to download the program for Windows and Linux. The information can be downloaded to the users' desktops as a PDF file.

5. The front desk of the digital school provides information about the Hipertrópico researchers, the resulting articles and the credits.

Testing the multimedia tutorial

The multimedia tutorial *Líneas Digitales* was released for testing purposes as a DVD in 2011. At this point, the multimedia has been used at Universidad de Antioquia with students obtaining their credentials to teach art, and with students that have introductory classes in digital media. A second venue for testing the multimedia has been academic fairs that are open to general audiences. An example includes: *Expouniversidad 2011, Innovación: un encuentro con la creatividad y la ciencia*, an academic fair that highlighted research from Universidad de Antioquia and advocated the innovative use of technology that contributed to the development of local cultural uses.

Fig. 14. Líneas Digitales, *Expouniversidad.* (© Hipertrópico Copyright Holder.)

The culmination of these experiences with the use of the *Líneas digitales* has allowed the researchers in Hipertrópico to measure the potential impact of using GIMP to create a set of multimedia tools. In particular, the users of *Líneas digitales* have expressed their interest in the artistic and narrative approaches in the video tutorials. In general, they validate more the potential of navigating the content through video components based on the ease of this medium to grasp the information. Two important suggestions from users have been addressed by the researchers. The first one relates to the importance of releasing the material on the internet, and the second is based on the potential of developing more video tutorials emphasizing the artistic appropriation of the software. Both suggestions will be integrated into the proposal for the second step of this research to enhance validity and make the tutorials even more user friendly.

Conclusions

In Colombia the government has expressed a willingness to support emerging technologies, as tools for improving education. In particular, Medellín's local administration has put effort into improving the technological infrastructure and training teachers in digital literacy. However, these efforts have had more impact on informatics education and less on social or artistic teaching. From this initial analysis, it can be said that more research needs to be done to develop projects that contribute to the integration of technology in Medellín's secondary school course curriculum. Additionally, in order to integrate digital media in the artistic curriculum, it is necessary to overcome the lack of appropriate software.

This integration can be achieved through the development of many projects that can be completed through the use of free software. In particular, based on the conclusion of this research, it can be said the free software GIMP offers a viable, realistic opportunity to help teachers overcome financial difficulties and to enhance their curriculum through conceptual and experimental research.

Líneas Digitales has been demonstrated to support digital literacy in Medellín because it not only provides examples and information to create graphic digital art with GIMP, but also motivates users to continue their own experimentation and training in digital media.

References and Notes

1. The research *Imagen Digital y Educación Artística* was founded by *Comité para el Desarrollo de la Investigación, CODI, Universidad de Antioquia*. The members of the research are: Isabel Cristina Restrepo, Alexandra Milena Tabares, Carlos Mario Sánchez, and Pablo Andrés Pulgarín.

2. Umberto Roncoroni, *La forma emergente, arte y pedagogía en el medio digital*, (Lima: Fondo Editorial Universidad de Lima, 2007). P. 300. Translation by the author of the paper.

3. The research group Hipertrópico did a pilot workshop in 2008 with 11th grade high school students of the public institution *Centro de Formativo de Antioquia, CEFA*. The other workshop was done in 2010 by Hipertrópico in a training supported by the local administration of the city.

4. Michael Joyce. *Siren Shapes. Exploratory and Constructive Hypertexts.* In: *The New Media Reader*, (Cambridge, Massachusetts, 2003). Edited by: Noah Wardrip-Fruin and Nick Montfort. P. 614.

5. David Buckingham, *Más allá de la tecnología, aprendizaje infantil en la era de la cultura digital*, (Buenos Aires: Manantial, 2008). P. 14. Translation by the author of the paper.

6. David Buckingham, *Más allá de la tecnología, aprendizaje infantil en la era de la cultura digital*, (Buenos Aires: Manantial, 2008). P. 12. Translation by the author of the paper.

7. Christiane Paul, *Digital Art*, (London: Thames & Hudson). P. 8.

8. Michael Joyce. *Siren Shapes. Exploratory and Constructive Hypertexts.* In: *The New Media Reader*, (Cambridge, Massachusetts, 2003). Edited by: Noah Wardrip-Fruin and Nick Montfort. P. 617.

9. The artists that contributed with video tutorial are: Rubén Darío Chica, Janeth Viviana Gutiérrez, Pablo Darío Guzmán, Lindy María Márquez, Víctor Andrés Muñoz, Juan Pablo Tobón, Alejandro Vásquez Salinas, Juan Fernando Vélez, and Yéssica Fernanda Zuleta.

RESISTANCE IS FERAL: DIGITAL CULTURE, COMMUNITY ARTS, AND THE NEW CULTURAL GATEKEEPERS

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Abstract

The Community Arts sector in Australia has a history of resistance. It has challenged hegemonic culture through facilitating grassroots creative production, contesting notions of artistic processes, and the role of the artist in society. This paper examines this penchant for resistance through the lens of contemporary digital culture, to establish that the sector is continuing to challenge dominant forms of cultural control. It then proposes that this enthusiasm and activity lacks ethical direction, describing it as feral to encompass the potential of current practices, while highlighting how a level of taming is needed in order to develop ethical approaches.

Keywords: community arts, cultural gatekeepers, network power, ethics, cultural resistance, software studies, network materiality, Australia

Introduction

Community artists can be described as creative practitioners whose interest in nurturing creative expression among communities is, for many, motivated by a desire to redistribute power to the less empowered sections of society. They use creative learning techniques – described by Sefton-Green et al. [1] as "teaching for creativity" – to affect the economic and social development of individuals and community groups. The Australian community arts field is widely perceived as the state-funded nurturing of grassroots cultural practices: an avenue for social justice within governmental and institutional systems.

This paper draws on research findings that demonstrate that community artists' internet practices would benefit from increased awareness of the structures and dynamics of digital networks, in order to determine the emergent forms of cultural gatekeeping associated with digital culture. This idea is grounded in scholarly debates surrounding the relationship between human agency, and the agency inherent in network technology: the hardware and software that facilitates network activity.

This idea that technologies can operate as cultural gatekeepers has not been sufficiently dealt with by the community arts sector. Participatory media brings with it new barriers to creative expression, but what do we know about these new manifestations of cultural control? How are they affecting the most disenfranchised members of society (the target cohort of community artists)? Are they contributing to a new form of digital divide? This paper investigates these questions to help practitioners develop more nuanced understandings of resistance in the community arts context – specifically the interplay of human and non-human agency that turns network participation in to culture.

This paper suggests that the community arts sector should move beyond its "marveling at the phenomenon of user-created content" [2], to advocate for practitioners to investigate the ways socio-technical actors are shaping the norms and logics of internet participation, and how these forces are shaping culture. It maintains this position to help community artists continue the role of facilitating cultural resistance at the grassroots.

The Community Art of Cultural Resistance

The rationales associated with community arts and cultural development policy and practice in Australia have periodically been questioned and built upon since the field became a funding category of the Australia Council for the Arts in the early 1970s. These changes have taken place alongside significant moments of transition that have occurred in the broader cultural and technological landscape. These turning points include the influence of mass media on the formation of culture, shifting government policy, multiculturalism, the proliferation of personal computers and low-cost media production hardware, and the internet. These moments have contributed to reconfigurations of the field, exemplified by multiple name changes, policy shifts and the introduction of new practices. Regardless of these reconfigurations, the community arts field has persisted with its agenda of resisting dominant forms of cultural control, earning it a reputation of being a sector that is "hard to kill" [3].

Having established that the sector is still alive in Australia, this paper turns its attention to the reconfiguration of practices due to the bedding down of digital participatory culture. We are seeing this participatory paradigm changing the state of play in the sector, because the potential for disenfranchised people to participate as producers and promoters of culture has increased exponentially with the rise of social media networks. The dismantling of traditional cultural gatekeeping due to participatory forms of media has been a boon for community arts practice, a scenario that would have been difficult to predict in 1992 when cultural theorist Gay Hawkins posed the question "Is community arts a cultural programme whose time has passed?" [4]. Where once the sector attempted to counter the formation of cultural consciousness through television, radio and newspapers, to "retrieve the vernacular in the face of powerful and centralized forces" [5], now community artists are nurturing creative expression among participants who are able to self-publish, using digital platforms that are inexpensive or free and that have the potential to reach a global audience.

This rise of globally distributed "vernacular creativity" [6] has led to new forms of cultural resistance being devised by some community artists. Australian community arts organization CuriousWorks have developed a model they call their Cultural Leaders Program, which is based on the idea of 'training the trainer'. Interested and able participants of CuriousWorks' community arts programs are encouraged to learn professional media-making skills and the ethical foundations of socially engaged arts practice. The program implies that these cultural leaders will continue to produce engaging cultural messages that appeal to audiences beyond their own communities. CuriousWorks' rationale for this approach is to help people become the translators and disseminators of alternative narratives: stories rarely transmitted by mainstream media channels. This construction of alternative messages challenges the implicit social values and political interests permeating mass communication networks, a phenomenon Castells has theorized as "reprogramming networks" [7].

When we begin to critique the software services relied upon by community artists for distributed cultural production, we see that participatory platforms are shaping these new forms of cultural resistance. A point of departure for thinking about these emergent forces is the idea that technologies have agency, that they are actors [8]. Together with human agents – such as software engineers and corporate social media executives – technologies are increasingly, actively, mediating culture. This paper therefore advocates for new approaches to be developed that help community artists identify emergent ideologies and power

dynamics associated with participatory networks.

Network Materiality and Identifying Cultural Gatekeepers

This paper is positioned among discourses of material politics that are grounded in Internet Studies and Software Studies. This evaluation of relevant scholarly work is necessary to establish one of the central arguments of this paper: that network materiality must be considered in order for emergent cultural gatekeepers to be identified so that cultural resistance can be maintained through the design of appropriate technology. This idea is informed by an awareness of how the structures and dynamics of internet technology influence many aspects of our networked actions.

From network elements such as the wireless spectrum, to algorithms that make connections between people and companies on our behalf, there is an increasing need for community artists to engage with the materiality of an internet that is constantly, and not overly visibly, changing. The acknowledgement of networks as material encourages community artists to anticipate the potentiality of networks to form a richer view of what constitutes both cultural resistance, and appropriate technology, in the networked moment. It is also proposed to counter effusive rhetoric surrounding networked platforms and acts of participation within such networks.

In *Software Studies* [9], Manovich poignantly contextualizes software as an emergent power paradigm by casting our minds back to the 1990s, when the most powerful multinational corporations were those who produced and processed goods – shoes, burgers, and cola – attached to successful global marketing and branding strategies. He contrasts this with data from 2007 that positions Google as the most recognized brand in the world, before casting Apple, Amazon, Facebook, and Ebay, as "culture software" that carry "atoms of culture" in the form of media, information, and human interactions. This idea is further explored by Galloway and Thacker who describe how the process of globalization has "mutated from a system of control housed in a relatively small number of power hubs to a system of control infused in to the material fabric of distributed networks" [10]. Manovich suggested that software was invisible to most academics and artists interested in the social effects of ICTs (with the exception of the open source movement). He proposed that elevating software in discussions about the "network society" and "social media" was crucial to ensure the causes of societal changes are dealt with as thoroughly as the effects.

This paper's call for an engagement with the materiality of networks is partly responsive to the community arts sector's increasing use – some may consider dependence – on freely available proprietary software and network services. These services are not "merely facilitating networking activities"; rather, they offer users a particular construction of connectivity and participation [11], where algorithms mediating participatory platforms have "the power to enable and assign meaningfulness, managing how information is perceived by users" [12]. Free platforms capture, process, and archive both quantitative and qualitative information, and furthermore, they become the "curators of public discourse" [13]. The corporate entities that set the agendas for these social platforms "trade in the rhetoric of networked utopia" to develop the "necessary apparatuses of an idealised peer-to-peer economy" [14].

Trend [15] describes the efforts of these platforms to help citizens enhance communication as prompting an "endless cycle of hope and disappointment". Confusion over social norms, and identity performance, are blended with shifting defaults, policies, and politics surrounding privacy and 'opting out'. Often these functions "operate at a level that is anonymous" or invisible, which "makes them difficult to grasp" [16]. Most of the software functions, even if they were visible, would be inaccessible to most people: "few are equipped to understand it with fluency, and even fewer can reverse engineer object code to arrive at the higher-level languages with which it correlates" [17].

The invisible dynamics of software code create unequal patterns of distribution, revealing networks as ideal machines for control [18]. This concept manifests in the idea that with the emergence of defacto web standards, certain solutions are elevated over others, "threatening the elimination of alternative solutions to the same problem" [19]. When this idea is viewed through the lens of Barzilai-Nahon's [20] *Theory of Network Gatekeeping*, new forms of cultural control are revealed. If the process of "eliminating alternatives" is a byproduct of emerging global standards, then the promise of global cooperation resulting in cultural diversity requires deeper investigation.

The emergent nature of current sociotechnical change sees our literacy capacities challenged with every software upgrade, interface change, and networked social interaction. This has led to scholarly debates concerned with notions of a digital divide having moved beyond a focus on *access* to the internet towards discussions of *digital fluency.* Definitions of this term vary covering ideas such as critical information-seeking [21], knowing how to make "things of significance" with technology [22], and the idea that human agency is a central factor of digital fluency, as argued by Papacharissi and Easton [23]. Issues surrounding access have been overshadowed partly due to what DiMaggio et al [24] call the "differentiation principle" – when products and services become available to a broad section of society, the relatively privileged begin to create new systems that re-establish hierarchies. So as access to the internet increases, the social momentum of differentiation has the potential to create new kinds of inequality. This paper aligns itself with Papacharissi and Easton's conception of digital fluency, because their focus on human agency as a root issue more adequately deals with the idea that new manifestations of a digital divide are emerging – those caused by the manufacture of new systems of inclusion and exclusion.

Although community arts organisations like CuriousWorks promote the internet as an unprecedented platform for the distribution of diverse cultural messages, they also recognize that digital networks are challenging established notions of human agency and cultural capital, and the means by which they are nurtured through community arts. The company's director Shakthi Sivanathan, sees these changes as having a broad effect beyond the community arts sector: "Whilst radio took 50 years and television 20 years to reach an audience of 20 million, it took Facebook two years. The internet is still a baby – but like Godzilla, one that is making terrifying strides in its early years: spam, Wikileaks, Justin Beiber, SMS bullying, Egypt, LOLcats, Skyping an overseas family member, getting fired on FaceBook. It feels like digital technology has a hold on us; not the other way around" [25].

With this in mind, this paper does not propose that community artists become

systems administrators or dedicate their weekends to learning code. Rather, it suggests that having a critical view of the interplay between human and technological agents will help reveal the emergent forces shaping and gatekeeping digital culture. I offer this proposal in response to the idea that cultural resistance in the community arts field is *feral*. The word feral aims to capture the excitement of current practices, and the potential of future practices; but also implies that some taming of current practices is necessary, where taming describes the cultivation of critical practices that reveal the material nature of digital communications networks.

Conclusion

As cultural authorship is permanently contested territory, the critical position of Australian community arts continues to involve a pushing back against hegemonic cultural messages. However, for the sector to maintain cultural resistance in the internet era, it must identify new paradigms of inclusion and exclusion. In order to evaluate the socio-technical forces influencing the logics and norms of participatory platforms, community artists might consider the materiality of networks, as a way of revealing the associated politics and potentialities of the internet. This method is proposed to help the sector develop a more nuanced understanding of cultural resistance in the context of digital culture.

References

1. Sefton-Green, J., P. Thomson, L. Bresler and K. Jones. 2011. *The Routledge International Handbook of Creative Learning*. Abingdon: Routledge.

2. Banks, J. 2012. *Making Co-Creative Culture: Videogames and Social Network Markets.* Cambridge: MIT Press.

3. Eltham, B. 2012. Community Cultural Development Is Not Finished Yet: Community Arts in Transition. http://www.crikey.com.au/2012/11/09/arts-is-local-storytelling-digital-in-co-creative-communities/ (accessed 28.11.12).

4. Hawkins, G. 1992. *From Nimbin to Mardi Gras: Constructing Community Arts.* Sydney: Allen & Unwin Pty Ltd.

5. Hecks, R. 1985. Rethinking Community Arts. *Meanjin* 4:553-555.

6. Burgess, J. E. 2007. *Vernacular Creativity and New Media*, Creative Industries Faculty, QUT, Brisbane.

7. Castells, M. 2009. *Communication Power*. New York: Oxford University Press.

8. Latour, B. 2005. Reassembling The Social: An Introduction to Actor-Network-Theory, Clarendon Lectures in Management Studies: Oxford University Press.

9. Manovich, L. 2008. *Software Takes Command*: Available under Creative Commons license at http://lab.softwarestudies.com/2008/11/softbook.html.

10. Galloway, A. R. and E. Thacker. 2007. *The Exploit: A Theory of Networks*. Minneapolis: University of Minnesota Press.

11. van Dijck, J. 2013. *The Culture of Connectivity: A Critical History of Social Media.* Oxford: Oxford University Press.

12. Langlois, G. 2012. Participatory Culture and the New Governance of Communication: The Paradox of Participatory Media. *Television and New Media* 14: 479-493.

13. Gillespie, T. 2010. The Politics of 'Platforms'. *New Media & Society* 12 (3): 347–364.

14. O'Dwyer, R. and L. Doyle. 2012. This is not a Bit-Pipe: A Political Economy of the Substrate *Network. Fibreculture Journal* (20).

15. Trend, D. 1997. *Cultural Democracy: Politics, Media, New Technology.* Albany: State University of New York Press.

16. Galloway, A. R. and E. Thacker. 2007. *The Exploit: A Theory of Networks.* Minneapolis: University of Minnesota Press.

17. Hayles, N. K. 2006. The Traumas of Code. *Critical Enquiry* 33 (Autumn):136-157.

18. Lovink, G. 2005. *The Principle of Notworking: Concepts in Critical Internet Culture.* Amsterdam: HVA Publicaties.

19. Grewel, D. S. 2009. *Network Power: The Social Dynamics of Globalization.* New Haven: Yale University Press.

20. Barzilai-Nahon, K. 2008. Toward a theory of network gatekeeping: A framework for exploring information control. *Journal of the American Society for Information Science and Technology* 59 (9):1493-1512.

21. Bartlett, J. and C. Miller. 2011. Truth, Lies and the Internet: A Report into Young People's Digital Fluency. London.

22. Resnick, M. 2002. Rethinking Learning in the Digital Age. In The Global Information Technology Report: Readiness for the Networked World, ed. G. Kirkman. Oxford: Oxford University Press.

23. Papacharissi, Z. and E. Easton. 2012. In the Habitus of the New: Structure, Agency and the Social Media Habitus. In *A Companion to New Media Dynamics*, ed. J. Hartley, J. Burgess and A. Bruns. Hoboken: Wiley-Blackwell.

24. Dimaggio, P., E. Hargittai, C. Celeste and S. Shafer. 2010. From Unequal Access to Differentiated Use: A Literature Review and Agenda for Research on Digital Inequality: Prepared for the Russel Sage Foundation.

25. Community Partnerships Opinion Piece. 2011. http://www.australiacouncil.gov.au/artforms/community-partnerships/opinion_piece (accessed December 12).

FACING AFFECT/ SYNTHETIC INTERFACE & MEANING

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Abstract

This paper describes a practice-led research project that addresses issues of emotional creativity and affect. A series of three-dimensional works were developed to discuss and demonstrate an exciting moment of new tangentiality; and an understanding of the emotional face as interface evolved. With this research a crossover zone was explored, where computer technology affects the material realm and where digitally driven processes interact with traditional ones, describing a hybrid practice. The practice aims to reflect on an interdisciplinary research process, including the study of creativity and synthetic emotions. This research is carried out in collaboration with the Digital Media Research Innovation Institute at OCAD University in Toronto, and the Rapidform Print Research department at the Royal College of Art in London.

Keywords: Creative emotions, emotional creativity, feeling, affect, sensation and meaning, facial interfaces.

InterFaced and Thick Friendship are two distinct series of art works that speak to evolutionary biology, emotions and hybridity. The artworks derive from a database of human and animal faces and some discrete emotional faces that were scanned with a 3D scanner and combined to allow gestural and facial expressions of animals and humans to interact. The work suggests a discussion about feeling and consciousness that includes animal and human emotions, and posthuman and transhuman digital emotions.

The work series InterFaced speaks to a body of research considering emotional consciousness and, in particular, facial expressions of emotions. It is suggested that emotional consciousness expressed through the face can serve as a good model for understanding human consciousness. Gesture, touch and feeling were explored through a creative studio project that included a digital database, sensory computing and 3D print technology in addition to creative research and traditional studio production. The body of work is reflecting on new materiality, digital touch and new surfaces that derive from digital visualization techniques. This paper proposes the face to be the seat of emotional creativity. While the work InterFaced speaks about a trajectory of emotions from man to animal and their particular relationship, Thick Friendship aims for a historical reference. Both bodies of work remain in a realm of playfulness and masquerade, and while InterFaced combines the features of a young fox with a grinning man, Thick Friendship merges data from a buck head with sculpted busts of Schiller and Goethe, and here again 3D scanning was employed. Goethe and Schiller had an unusual emotional friendship that included all facets of emotions, from deep love to outraged hate.

Gabriele Buzzi (2007), in 'Expression and Dévisage: the face's signification from art to reality' [1], describes the face as the most analogical part of the body. She explains how difficult it is to recreate it digitally. This is probably the same challenge that artists have felt for centuries when trying to depict expressions in the human face. And yet we can read a face's expression from a very simplified drawing with just a couple of dots and lines. For the reading of an animal we usually need to also consider posture and context to be able to identify their emotional state. The fur and hair does not allow for an easy reading of an expression, and a speculative thought is offered here: that the human face is deliberately more exposed to allow for direct communication through facial expressions. This is obviously an anthropomorphic reading of the situation. A human being can certainly read the face of a dog exposing his teeth. Charles Darwin's focus in 'The Expression of the Emotions in Man and Animals' [2] was on emotions in other primates. His study included close observation of animals and humans. That emotions are observable in other primates is a defining characteristic of human emotions, and yet it is possible that there are some emotions that are unique to humans, even though there is no convincing evidence that that is the case. Naturally, our language capacity to express and describe emotions in words changes many aspects of emotional experience. Darwin's work unfortunately was not continued so we seem to rely on these early statements of the expressions of animal faces. I considered myself to be continuing along those lines of research when I introduced the animal face in this study of facial expressions.

For both bodies of works depicted here, the faces were not created from scratch but built up from a combination of digital scans of people and taxidermy animals. The manipulation of the faces happened on a data level and not on a surface level. The data was further manipulated with a haptic sculpting tool to emphasize some features and emotional expression for clarity. It was this hands-on manipulation of the hybrid expression that became a focus point for the research of synthetic facial expressions.

Mark Hansen [3] elaborates on the shift from the visual to the affective and the haptic. By exploring de Kerckhove's argument of the disembodiment of visual experience in Virtual Reality, Hansen engages the facialization of the entire body as an imagization of affection. In Hansen's term Virtual Reality is not simply the product of advances in technology and developments in computer graphics, but rather he insists that the experience of Virtual Reality is grounded in the biological potential of human beings; it is to be understood as a body-brain achievement. In that sense Virtual

Figure 1 *InterFaced* 2013, © Barbara Rauch. Photo © photo Georg Muehleck.

Figure 2 *Thick Friendship* 2013, © Barbara Rauch. Photo © photo Nick Grace.

Reality is not technologically but biologically grounded. This new digital Virtual Reality is therefore an adaptation to newly acquired technological extensions provided by New Media. It is important to understand that virtual reality experience is not a new human experience, but that it is built in; our capacity to experience dreams demonstrates this. This is further elaborated in my PhD thesis, where I argue for the dreaming brain to be understood as a natural virtual reality model [4]. Of interest here is Antti Revonsuo's 'threat simulation theory' [5], compared with Sherry Turkle's approach to online game environments where one can rehearse different aspects of self and other [6].

My work series InterFaced, under the umbrella of synthetic emotions, attempts to visualize an evolution of emotions on a scale that ranges from the abstract via animal emotion to the hybrid human body. This was possible as we developed an application that allowed us to morph the human face into an animal face and from here into an abstract shape. It equally allowed manipulation from the human face into an abstract shape. Looking closer at the visual representations on screen, the virtual digital face seems to suggest an image that does not refer to the Real, but rather describes an image that speaks to process and information that is made perceivable through embodied experience.

I here introduce Mark Hansen's use of a technical dimension of embodiment as human agency that has been expanded with contemporary digital technologies. While I agree with Hansen's use of the digital image as processual and interactive and in that sense highlighting its potential sensory and haptic qualities, I would assess the reading of a digital image as remote and distant. But it is through the digitization of a facial emotional image, to use Hansen's exemplary reading, that humans interface more directly with the digital as they perceive and feel with the body. Hansen uses the digital face to explain affect as interface. His use of the "digital image" is in fact a digitized image that represents emotional reality as fluid and accessible.

My recent studio works demonstrate this point. The sculptures are manipulations of data from digital scans and database. With the use of a haptic interface, digital data was modified on screen yet it was felt on my fingertips as if it was happening in the material world. The facial emotion expressed on screen was no longer detached but perceived by the processing body.

To elaborate further, affect functions outside of awareness, but manipulates and interfaces from within the body. This is in contrast to emotions and feelings which depend on specific cultural construction. Antonio Damasio [7], Paul Ekman [8] and others have spoken about emotions as evolving features as they are influenced by culture, context and behaviour. Emotions and the readings of emotions are therefore an interesting study for artists and cultural theorists as they reflect the Zeitgeist of the present culture. Furthermore, it is undoubtedly the case that Western and Eastern societies have changed with the use of recent technologies, and we might wonder whether our ability to read facial expressions will also slowly change with the new mobile communication systems that doesn't rely on the reading of a human face, or the reading of the voice, but use mere letters on a screen. I would propose that reading the meaning of a facial expression or body gesture needs a creative mind which can imagine beyond the surface of the skin. I conclude with a speculative idea and provocation: by reducing the exposure to these visual references, the brain will rewire and unlearn the complex signs of more subtle facial expressions. The overall contribution of the body of work discussed in this paper presents an exploration of emotional creativity and meaningful synthetic aesthetics by offering a translation of the digital hybrid image into an object with material and physical qualities.

References and Notes

1. Gabriele Buzzi, 2007. Available at www.vjtheory.net/web_texts/text_buzzi.htm

[accessed on 18th August 2013]

2. Darwin, C., 1872, 1998. *The Expression of the Emotions in Man and Animals*, introduction and afterword by editor Paul Ekman. London: Harper Collins Publishers.

3. Mark Hansen, *New Philosophy for New Media* (Cambridge, MA: MIT Press, 2004).

4. Barbara Rauch, Natural and Digital Virtual Realities: a practice-based exploration of dreaming and online virtual environments. (London, UK: University of the Arts London, 2006).

5. Revonsuo, A., 2006. Inner Presence: Consciousness as a Biological Phenomenon. Cambridge, MA: MIT Press.

6. Turkle, S. 1995. *Life on the Screen: identity in the age of the internet,* London: Phoenix, Weidenfeld and Nicolson.

7. Antonio R. Damasio, *Descartes' Error: Emotion, Reason and the Human Brain.* (London: Papermac, Macmillan General Books, 1994).

8. Paul Ekman, *Emotions Revealed: Recognizing Faces and Feelings to Improve Communication and Emotional Life* (New York: Henry Holt, 2003).

VIRTUAL TOUCH

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Abstract

The paper presents a general overview of how to apply haptics and tactile touch as an artistic material in the context of media art. It presents how touch can be used to form meaningful experiences on its own, and inside virtual and mixed realities using emergent, mobile technologies such as the smartphone.

Keywords: haptic, tactile, haptic language, touch, virtual and mixed reality, bodysuit, vibrotactile stimulation, geotagging, geolocative media, invisible sculptures, somaesthetics

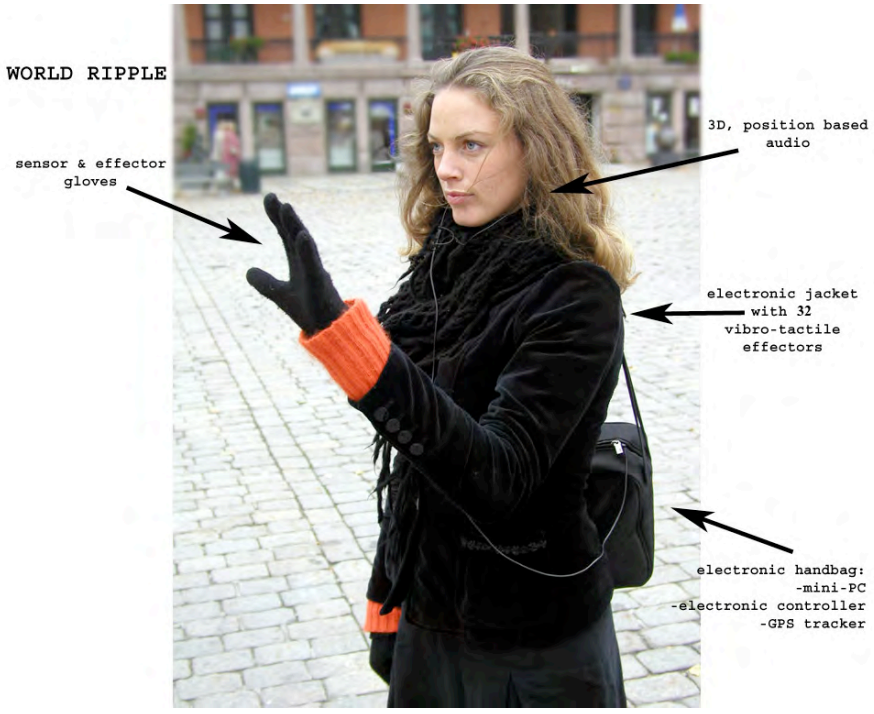
Introduction

'*In the electric age we wear all mankind as our skin.*'

- Marshall McLuhan

The use of touch in the contexts of art and electronic media is an underexplored area [1] [2]. McLuhan's statement above [3] on how we can sense mankind through our electronic skin is fascinating, but true only in an audiovisual sense. In current collaborative virtual environments we can see and hear each other anywhere and anytime across the planet, but we cannot reach out and touch for real. Still there is no corporeal bonding connecting the multitude of electronic galaxies and networks. We therefore experience what can be described as a somatic neglect [4]. It could be different. This paper presents open, artistic explorations of how it feels to touch and be touched in virtual realities. The paper title *Virtual Touch* is an oxymoron just like Virtual Realities, for if we understand virtual as 'almost', how can one almost be touched? Touch is experienced less as an objective feeling and more as an embodied phenomenon situated in the living, active and sensing body [4]. This is demonstrated in contexts of sensory deprivation: users of flotation chambers report that experiences similar to hallucinations occur when the body lacks sensory input. Without a constant flux of sensory information it starts to produce its own, imaginary ones [5]. This demonstrates how touch can be considered as an active sense which is, from a phenomenological point of view, always actively directed at something [6]. Our experiences of electronic media have changed since the introduction of the Smartphone/iPhone in 2007. The Smartphone gives us new ways to create an 'art of the recently possible'. This impacts upon us in ways that we could not have foreseen even a few years ago. This paper, therefore, presents the *World Ripple* project, which combines geolocative media with touch-based interaction through the use of wearable bodysuits.

Fig. 1. *World Ripple*, system layout of first version in 2005 (© Stenslie)



(Un)Thinkable Touch

Touch is a complex and multifaceted phenomenon. Consider the following exercise: imagine a touch you have never felt before; try to imagine how it would feel, then spend a minute describing it. This exercise is most certainly difficult and perplexing, posing us the notoriously difficult challenge of how to objectively and intersubjectively describe our inner, corporal sensations. This (un)thinkable touch is encountered by users of haptic bodysuits. Having little or no experience with mediated touch in virtual realities, we have to form new meanings and understandings for such new sensations. But first, how do we experience touch?

The complexity of touch

The seemingly innocent and simple question of how it feels to touch and be touched in virtual realities is not an easy one to answer. After all, what does it mean to feel [7]? How do feelings arise? How can they be manipulated, produced, duplicated, stored or even recalled? What 'meanings' can be formed using touch? Can touch possibly change the way we produce and experience art? It is outside the scope of this paper to answer all these questions. It does, however, aim to point out how touch can be considered a genuine artistic material and even medium in its own right by the mentioned brief overview of the touch based project World Ripple that explores the use of touch in experimental experience designs for geolocative media.

Touch functionality

Our sensation of touch can be analysed and described through the functionality of the human skin, which has at least five distinct sensors for registering touch on its surface [8]. Added to these are the sensors embedded inside the proprioception, vestibular and kinesthetic systems of the body, monitoring and registering the position and movement of our various joints and muscles [2], [8].

Thus, under investigation, it becomes apparent that our sense of touch is an even more complex phenomenon than it initially appears, as it cannot be separated from other senses. There are several intricate cross-modal relationships between touch and other modes of sensory expression [9]. Furthermore, not only is touch is shaped by our physiology, but our perception and understanding thereof is highly influenced by history and culture [18]. In the context of electronic media and art, it is an area open to, and in need of, exploration.

A shorter history of haptic art

Works of art which use technology to produce haptic and touch experiences are uncommon; however, there exists a milieu within which to discuss haptic arts genealogy. In 1921 the futurist Marinetti produced an essay on 'tactilism', in which he described the various values he associated with tactile sensations [1]. With this tactile 'vocabulary' he produced "the first abstract suggestive table". The tactile sensations can be imbued with symbolic values, something which Classen suggests points toward a day when touch comes into its own, and "the hands can be as knowing as the brain" [1].

One visual interface which simulates the effect of touch is *Telematic Dreaming* by Paul Sermon [10]. The installation is based on a videoconferencing system in which the participants lie on separate beds that dually function as screens, giving the visual illusion of lying beside one another in the same bed. In this intimate situation the users tend to (visually) touch each other and even report sensations of being touched [1].

Thecla Schiphorst's installation *Bodymaps* [9] works on a similar principle: visitors can 'touch' the image of a body, projected onto a reactive table covered in white velvet. The image (visually) reacts to the touching, rendering the viewer a participant in the work through the sense of touch.

Both Sermon's and Schiphorst's installations use touch to allow the user to interact with media; but how can an artwork 'touch the user back'? There are several haptic technologies in which two-way touch is used as a tool of communication. Furthermore, there are various force-feedback systems like the Reachin Desktop by Reachin Technologies, exoskeletal and external devices for exerting tactile pressure on the skin or haptic displays that simulate shape and texture in three dimensions [1].

Another such system is the InTouch project by The Tangible Media Group at MIT Media Lab [11], in which "two identical inTouch devices use three freely rotating rollers. Force-feedback technology synchronizes each individual roller to the corresponding roller on the distant mechanism" [12] – creating the opportunity to experience or interact, or corporeally or somatically be affected … in what way?

The *World Ripple* Project

The *World Ripple* project, which has been performed in Ljubljana (2010), Oslo (2011) and Malmö (2012), demonstrates recent developments in the use and experience of touch as an artistic material in multimodal and computer-based environments. The project represents i) how to apply inter-subjective touch as an artistic expression and material; ii) how it presently feels to be touched in such environments; and iii) an outlook onto our somatosensory future within mixed, augmented and virtual realities.

Fig. 2. The bodysuit from the *World Ripple* geolocative sculpture project performance, Ljubljana, 2010 (© Stenslie; photo © Stenslie).

The main aims of the project have been to investigate vibrotactile stimulation and corporeal interaction in media art through building functional prototypes of wearable, smart clothing for geolocative, mobile experience design, to show how touch can be used to construct meaningful experiences. The project has analytically framed and investigated touch through a phenomenological framework emphasising the user's sense of touch [8].

The research method used in *World Ripple* is built on the methodology of open exploration through critical physical inquiry [9] within practice-led artistic research. Often termed research through practice [13], [14], [8], this method involves the hands-on construction and testing of prototypes. This offers a solid ground for reflection-in-action [15]. Functional prototypes of bodysuits run by smartphones have been iteratively constructed and evaluated. Autoethnographic practices have been used throughout to evaluate the results [8].

System Description

The project is a mobile, smartphone-based, wearable and smart clothing system for geolocative haptic experiences. The project explores the use of touch in experimental experience designs for geolocative media. The users wear a Bodysuit with up to 80 variable, vibrotactile outputs to control physical stimulus (output) and up to 4 digital sensors to 'feel' the body of the user (input). The Bodysuit is controlled by a custom built Arduino interface connected to the systems SmartPhone.

Sensations and Experience

The users of World Ripple sensually experience invisible and immaterial structures. These structures are called 'sculptures'. The sculptures are geopositioned and databased structures that are physically experiential. They are made sensually senseable by a tactile, wireless, mobile bodysuit and binaural sound system. The sculptures are triggered by GPS coordinates. They are expressed as audio-haptic structures. These are a combination of vibrotactile, physical stimulations on the body and sound based compositions. The tactile pixels of the bodysuit give the sculptures texture, 'looks' and strength. The physical shape of the sculptures, like 'walls', 'borders', movement and consistency are rendered through different combinations and strengths in the vibrotactile effectors of the bodysuit.

The combination of physical stimulus with different sound patterns and binaural recordings enhances the crossmodal sense of touch, and gives a strong and immediate sense of physical consistency and spatial experience.

The sculptures of *World Ripple* are experienced in the open, outdoor landscape. As computer constructed, GPS-based structures, they can be endlessly large and dynamic experiences that can cross, be sensed around and even en-

compass the world. The users wear a transparent, bodybased system that is often hidden from the casual eye - a bodysuit which is thin enough to be worn underneath ordinary clothing, combined with a mobile-, sensor- and GPS-based system packaged in an Android-based mobile phone.

World Ripple, simply based on presence and users' navigation in space, can be experienced without any previous training or knowledge; users interact with the sculptures by simply walking around.

One of the goals of the project is to transform open and public spaces into sensual, transformable and invisible structures (sculptures). *World Ripple* can be thought of as a living structure worn as a skin of sensations. It lets the user sense an empty, geotagged space filled with haptic sensations. This is a new kind of experience that influences many aspects of users behavior. A common observation by users is that *World Ripple* influences them to behave differently from other people in public space. Users describe differences in the way they move with relation to walking, searching for structures, stopping, and sensing, and also in their physical reactions (exclamations, voice, utterances, etc.). *World Ripple* represents a 'different reality' that both challenges and expands our understanding of the world by overlapping (virtual) data with (physical) reality in order to make experiential fiction.

User observation and analysis

As part of the artistic research, feedback was collected from several participants by conducting informal interviews with them throughout all the iterations of the system [16]. In combination with direct observations, the following analytical results are based on a *World Ripple* trial in Malmö, Sweden in 2012 [16]:

1. Immersive closure of space: Walking around in the public square during normal daytime activities, users reported they were mindful of the suit beforehand, but once inside one of the suits they quickly became immersed in the experience and forgot the existence of possible onlookers. This indicates a closure of space, strengthening users' sense of an intimate, personal and 'inner' experience.

2. Multimodal strengthening of senses indicating the affective roles of haptics and audio in interaction: the cross-modal combination of sound and touch was experienced as intermingled, intertwined into a mutual strengthening of stimulus. Most users reported that they focussed mainly on the sound heard, and that this appeared as the strongest stimulus. However, they also commented that the touches experienced made them stay longer, thus intensifying the overall sensation of body and space.

3. Increase of spatial awareness: a higher degree of spatial awareness was both observed and reported. Users wearing one of the systems noticeably changed their movement in space, becoming more aware of how they were moving to find both new and previous zones of experience.

4. Behavioral change: as users were free to move around in the open space, we had tentatively predicted a systematic, grid-like search for the various interactive areas. However, once they entered the first interactive area they tended to move slowly before stopping; thereafter they were observed to move in an irregular, searching manner, moving back and forth, and returning to previous zones. Their quick adaptation to new movement and behaviour indicates how easily users can adapt to haptic technologies.
Outcomes: several outcomes have been generated by the project's various iterations, including new experience designs, variations of smart clothing, and interfaces for geolocative media / smartphones. New combinations of Open Source Arduino hardware and Open Source Android software have been made public. One of the most significant outcomes has been the investigation of a possible 'haptic language'.

Haptic Language

The vibrotactile stimulators of the bodysuit indicated that a range of haptic sensations and illusions [17] could be produced. One is the so-called TAU phenomenon, which describes a tactual illusion of movement [8]. When the bodysuit produces a series of short and discrete pressure sensations on the skin, they are perceived as movement between the points. Various patterns of vibration over time let the users form and distinguish between haptic messages.

Another of the project's open research questions asks what meanings are perceived. In relation to this concept of a haptic language, Thecla Schiphorst has worked on developing a 'semantics of caress' [9] that investigates how the meaning of touch can be applied to tactile interaction. Her system represents touch and movement as something meaningful, contributing to quality sharing. Having identified intrinsic values of haptic communication in systems with relatively low haptic resolution, one of the ongoing research questions is how this can be translated into functioning, wearable systems that produce a greater degree of tactile immersion?

Contributions

A central contribution of the paper is the indication that touch can be content in itself, and can form so called 'haptic storytelling' [8].

New in this approach are the combinations of the various theories on and about touch, from phenomenology to somaesthetics [4], but also the application of this to interactive arts, in which touch is a genuine medium. The paper aims to contribute to the definition of new practices of inquiry and knowledge-making within electronic and media art.

New uses of touch as artistic material bring about a convergence of our various, living and virtual realities. Simultaneously, it diverges from common ethical norms and practices. How do we want to virtually touch and be touched? Where? By whom? And why. These are some of the questions posed by the use of virtual touch.

References

1. Constance Classen. *The Book of Touch* (Berg, 2005).

2. M. Paterson, *The Senses of Touch: Haptics, Affects and Technologies* (Oxford, UK: Berg, 2007).

3. Marshall McLuhan, *Understanding Media: the extensions of man* (edition 1, McGraw-Hill, 1964 / edition 4, Taylor & Francis, 1987), p. 47.

4. Richard Shusterman, *Pragmatist Aesthetics: Living Beauty, Rethinking Art* (Rowman & Littlefield, 2000) p. 263.

5. Dennis Coon and John O. Mitterer, *Introduction to Psychology: Gateways to Mind and Behavior* (Cengage Learning, 2008).

6. P. Dourish, *Where the action is: The Foundations of Embodied Interaction* (Cambridge, MA: MIT Press, 2001).

7. R.W. Picard, *Affective Computing* (Cambridge, MIT Press, 1997).

8. Stahl Stenslie, *Virtual Touch – A study of the user and experience of touch in artistic, multimodal and computer-based environments* (Oslo: Oslo School of Architecture and Design, 2010).

9. T. Schiphorst, 'soft(n): Toward a Somaesthetics of Touch', in *Proceedings of the 27th International Conference on Human Factors in Computing Systems, CHI 2009, Extended Abstracts Volume* (Boston : ACM, 2009), pp. 2427-38.

10. Stephen Wilson, Information Arts (MIT Press, 2002).

11. The Tangible Media Group http://tangible.media.mit.edu/ accessed 1 July 2013.

12. inTouch http://tangible.media.mit.edu/project/intouch/ accessed 1 July 2013.

13. Christopher Frayling, ‘Research in Art and Design’, in *Royal College of Art Research Papers* (Vol.1. No.1. London: Royal College of Art, 1993).

14. Annette W. Balkema and Henk Slager. ‘Artistic Research’, in Lier en Boog: Series of Philosophy of Art and Art Theory. Volume 18 (Rodopi, 2004).

15. D. Schön, *The Reflective Practitioner* (New York: Basic Books, 1983).

16. S. Stenslie, D. Cuartilles, T. Olsson and A. Göransson, ‘Mobile Haptic Technology Development through Artistic Exploration’, in Charlotte Magnusson, Delphine Szymczak and Stephen Brewster (eds.), *Proceedings of the 7th International Conference on Haptic and Audio Interaction Design (HAID'12)* (Berlin, Heidelberg: Springer-Verlag, 2012), pp. 31-40.

17. Vincent Hayward, ‘A Brief Taxonomy of Tactile Illusions and Demonstrations That Can Be Done In a Hardware Store’, in *Brain Research Bulletin*, Vol. 75, No 6, 2008, pp. 742-52.

18. J. Gibson, *The Senses Considered as Perceptual Systems* (Boston: Houghton Mifflin, 1966).

NAM JUNE PAIK, CYBERNETICS AND MACHINES AT PLAY

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Abstract
Nam June Paik's playful, imperfect and often ambiguous use of cybernetics has left an important legacy for contemporary media art. Paik's works demonstrate that it is essential to temper aesthetics with ethics in order to question the utopian dreams of the very materials electronic artists work with. Paik's works also suggest a new way to think about the machine in art. This paper focuses on the impacts of communication and control in the machine (and subsequently the network) in Paik's *Robot K-456* and suggests a reconceptualization of Paik's cybernetic machine as a machinic process enmeshed in communication systems.

Keywords: Nam June Paik, Cybernetics, Systems, Art, Machine, Machinic Assemblage, Deleuze and Guattari, Norbert Wiener, Jack Burnham

There are many recurring figures in the histories of electronic art. Two of these form the focus of this paper. The first is the figure of cybernetics: an idea of systems and relationships of communication and control pervasive through science since the Second World War, but never fully articulated as an independent discipline. The second figure is the maverick artist Nam June Paik, whose ongoing influence on contemporary electronic art and media is evidenced in numerous critical essays and exhibition catalogues [1]. Together the historical concepts of cybernetics, and art works by Nam June Paik, have influenced how electronic art is conceptualised today. This paper seeks to reveal why this is the case by tracing a third figure: the machine. The figure of the machine contains differing meanings in the way that it has been employed within cybernetics and by Paik.

Machines in cybernetics are operations and systems of relationships. Machines for Paik were expanded playful beings that were simultaneously constructed objects and temporary networks. The difference between the concept of the machine within cybernetics and Paik's machines suggest a call and response between the machine and the broad field of the machinic. The machinic is a concept attributed to the philosophers Deleuze and Guattari by which they counter what they understand to be the stability and striations of the machine with an emphasis on process and flow: machinic connectitivies. The machine as employed by both Paik and cybernetics shares much with Deleuze and Guattari's machinic. All three approaches suggest that the machine when it intersects with art is not fixed but dynamic, not isolated but networked. A close study of one work by Paik lays the ground for a definition of the art machine as a machinic process generated within an ensemble of technical and social machines.

Part One: Cybernetic Systems and Art

In 1965 at the New School in New York, in his first solo show in America, and amidst his electronic TV and colour TV experiments, Paik presented one of many performances by *Robot K-456*. Rearticulating his works performed only a few years earlier in Wuppertal, Germany, Paik combined an experimental music aesthetic with the technical and performative concerns of the new electronic media. He called the exhibition "Nam June Paik: Cybernetics Art and Music" [2]. Paik was certainly not the only artist to be concerned with the machines and systems of cybernetics in the 1960s and 1970s. In 1971 artist Hans Haacke named a caged mynah bird after the founder of cybernetics Norbert Wiener. 'Norbert' the bird was trained to speak the catch phrase, "All systems go!" Despite its failure to be realised, the work lives on as an evocative example of art's engagement with real-life and real-time systems. Paik and Haake were humanising systems and technology.

Jack Burnham was one of a number of curators who connected this kind of systems thinking directly with art practice. Burnham looked for ways to further open up the properties of the art object to relationships of time, control, biology and communication, writing:

> "While the system is a fundamental concept of cybernetics, its value as an artistic idea lies in its power to cope with kinetic situations, and particularly the connecting structures of evolving events."[3]

Burnham realised that Norbert Wiener's description of cybernetic systems as evolving relational events tempered by feedback, offered a challenging concept by which art could inhabit new environments, new machines and new materials. At this moment cybernetics and ecologies were considered interchangeable.

Jump forward several years and in his 1998 commemorative lecture for the Kyoto Prize "Norbert Wiener and Marshall McLuhan: Communication Revolution" Paik wrote that Wiener "construct[ed] the technical interior of the electronic age"[4]. In 1950 Wiener had famously defined cybernetics as the science of communication and control between humans and machines, and/ or machines and machines. The relationships he described were more than ones of simple stimulus and response; they were circular and occurred in a variety of environments through an assemblage of systems. Wiener identified systems as organic and artificial, human and non-human. Occupying the systems were machines. These machines used "sensory members" to respond to and monitor feedback [5]. The slippage here is crucial to the way that artists in the 1960s and 1970s developed concepts from cybernetics. If feedback was regulated through sensory members, this could potentially mean that machines had 'senses' or equally, that humans and other sensing beings *were* machines. The flux suggested between a human as a machine and a machine as a human presented fertile ground for imaginative couplings [6]. There was not a straightforward one-to-one relation between art and science, human and non-human, feedback and response. As systems themselves, art and cybernetics were infracted in each other. For example, in Paik's *TV Buddha* (1974) and its multiple variations, a seemingly closed and meditative cybernetic system is interlaced by a viewer captured in the process of observation. In this and other works Paik extended possibilities within which the relationship between human and machine became more than one of feedback; it became systemic and aesthetic.

Cybernetics grew out of a need to understand and map complexity and organisation, both social and biological. When moved into art, it did so in very narrow and specific ways. In 1968 and 1970 two exhibitions across two major centres of art production further tested the boundary regions between the science of cybernetics and the practices of art. Jasia Reichardt's *Cybernetic Serendipity* at the ICA in London and Burnham's *Software, Information Technology: Its New Meaning for Art* at the Jewish Museum in New York, were propositional, asking in what ways aesthetics and technology could be

considered together. Relationships of communication and control pointed towards a shared place for humans, objects, and machines. Although they had quite different agendas, together these early exhibitions suggested a future for relationships between art and cybernetics, and prefigured an artworld that would become concerned with ethical and ecological relations between human and non-human entities. Humans, objects and machines were seen to enter into new kinds of relationships. Echoing the discourses of first order cybernetics Burnham writes:

> "the computer is part of a continual system and, as such, it processes information metabolically...[the computer] is a means by which information is directed incrementally toward the maintenance of a constant level of stability, a function similar to that of the human nervous system."[7]

Works by Nam June Paik were included in both Burnham's and Reichardt's exhibitions. Paik's art practices had already repeatedly engaged with and questioned ideas of communication and control in the machine. His works in *Cybernetic Serendipity* and *Software* bought together a commitment to indeterminism, a deep knowledge of information systems, and a playful attention to the materials of communication. To *Cybernetic Serendipity* Paik contributed two works: a series of manipulated television sets and the *Robot K-456.* Paik describes his works for *Cybernetic Serendipity*:

> "I wanted to make an electronically controlled robot and work with a color television set. I made a set with three cameras, feeding colors onto the same screen. I also made a spiral generator with Shuya Abe, the Japanese engineer, where you see a spiral on the screen. Since 1963, Mr. Abe has been my major collaborator in TV art. I cannot thank him enough" [8].

Physicist Norman Bauman writes in the catalogue "Mr. Paik has reworked the television sets to give the viewer a bit of control"[9]. Bauman describes the experience of holding a magnet to a television, and the thrill of seeing magnetic fields in motion. "When you learn to play a Paik TV, you are forced to see these patterns of technology in terms that are different from those you learned in physics"[10].

Key here is that despite his reflections on their work, Paik's machines are *not* the same as those described by McLuhan or Wiener. Nor do they offer a straightforward illustration of Reichardt's or Burnham's concerns. Bauman and the others who engaged with Paik's electronic and magnetic manipulations, suggest that they offer a very specific experience. For example, McLuhan's machines were about communication: media and message. Paik's on the other hand are machinic systems that behave like bodies, types of bodies that operate, organise and articulate with other bodies, mechanical and non-mechanical. Paik presented "art for cybernated life" rather than models of that life aka Wiener [11].

Part Two: Art Machines at Play.

> "Cybernated art is very important, but art for cybernated life is more important, and the latter need not be cybernated"[12].

Paik described the impact of cybernetics as "the exploration of boundary regions between and across various existing sciences" [13]. In the 1970s machines were recognised as combinations of things and objects that had actions that were their own, independent of their makers. This was the first moment where the definition of the machine becomes a new kind of figure: something that would later be called machinic. For Paik a machine was not defined by being part of a singular closed system, it was rather an "open circuit" [14].

In this definition, machines are always in action, generating inter-relations between form and un-form. Monitoring (observation) and further action mean that internal error, noise and external forces can very quickly also become integrated within the machinic system. This definition of a machine formed from its relations influenced Gilles Deleuze and Felix Guattari's notion of a 'machinic assemblage'[15]. The machinic assemblage is not only formed from relationships of control and communication; Deleuze and Guattari open up the potential set of relations to include actions and energies that transform the bodies and machines involved. Highlighting one of his key influences, Felix Guattari comments that Francisco Varela "characterise[s] a machine by 'the set of inter-relations of its components independent of the components themselves'"[16]. Following Deleuze and Guattari's emphasis on open reformation of assemblages, the cybernated artwork can thus be understood as a machinic assemblage formed through transforming sets of inter-related components (both human and machine). Paik's assertion that "we are all in open circuits" anticipates the continued place of cybernetics within art that exploits boundaries of feedback and noise. In short-hand, let us call this cybernated machinic assemblage of art the 'art machine.'

In this working definition the art machine is a particular assemblage of materials, audience and architecture located within the specific domain of art. In one sense the art machine is a different kind of machine to those considered by Varela and Wiener; formed from a group of abstract operations including not only the artist and the artwork, but also viewers and the art gallery within which the work is housed. In Paik's hands the art machine is not just process, it is formed from objects, and it is noisy, relational, and unpredictable. Paik's art machine suggests different ways to think aesthetics within the art gallery and, because of the way that it forms audiences, it has the potential to shock audiences out of measured pre-existent relationships with art objects.

To move away from the generalities, let's look more closely at a portrait of a particular art machine. Originally built in 1964 in Tokyo, *Robot K-456* was a collaboration between Paik and Shuya Abe and named after Mozart's relatively unknown piano concertos, the Köchel versions. In some senses it was itself a musical variation [17]. Like any Frankenstein-ian creature the robot stripped bare had many manifestations. For *Cybernetic Serendipity*, *Robot K-456* inhabited the interior of the gallery alongside other similar creations by engineers and scientists. Although the other roboticists in *Cybernetic Serendipity* seemed to strive for verisimilitude, Paik was more interested

in *Robot K-456*'s uncanny ability to stop traffic. Having already premiered in 1964 in his solo exhibition at the New School, and there walked the streets of New York, now in London *Robot K-456* was given a starring role on the poster, and roamed the gallery spouting pre-recorded political rhetoric and defecating beans. Later, in 1982, when she/he returned to America, *Robot K-456* was removed from her pedestal at the Whitney and guided by the artist down Madison Avenue where she walked out into the street and was 'accidentally' hit by a car (*Robot K- 456* was initially gendered female, by 1982 her provocative rotating breasts had been removed at which point she becomes gender-neutral). The staged accident was shocking but not a death. When interviewed at the scene by a television reporter Paik said that *Robot K-456* represented "the catastrophe of technology in the twenty-first century. And we are learning how to cope with it"[18].

The behaviour of the machine robot is both within and outside the network. It is both technology and the catastrophe of technology. In an age where it is essential to temper aesthetics with ethics, and when visual data are quickly distributed via multitudes of networks, *Robot K-456* asked many questions of the systems and behaviours of the materials artists work with. As Paik said: "the real issue implied in 'Art and Technology' is not to make another scientific toy, but how to humanize the technology and the electronic medium"[19]. Paik's *Robot K-456* is an art machine that is the result of an equation between cybernetics and the machine. It corrupts and celebrates the connectivity of the network where technology is an enabling rather than determining factor.

The impact of describing *Robot K-456* as an art machine is two-fold. This first is the problem of the cybernetic machine. What might characterize an art object as "cybernetic" as opposed to just being an art object in relation to other art objects? Wiener's original concept of cybernetics focused on processes rather than objects. This raises the problem of the particularity of objects. Relationships transform because of the objects/ materiality through which they occur. *Robot K-456* enacted a process that continues today. Cloned and roaming the halls of galleries in Korea and America, *Robot K-456* is more than just a relational object. *Robot K-456* is cybernetic because it is an object enmeshed in the material processes and open circuits of the machine.

The second articulation of the art machine is found in Levi Bryant's reading of Deleuze and Guattari's machines. Deleuze and Guattari's definition of the machinic highlights a focus on process rather than object. Bryant draws on their definition to offer a counter to his usual object-orientated fellows. Bryant writes:

> "What we need is not a conception of being composed of objects, but rather of machines. Nor is it a pan-psychism, organicism, or vitalism that we need, but rather a pan-*mechanism*. To be is to be a machine. Rocks are machines, stars are machines, trees are machines, people are machines, corporations are machines … And if a generalized machinism is so necessary, then this is because it brings *precision* to what we're doing when we analyze substances, entities, and how things interact."[20]

Bryant calls for a precision that arrives when art machines such as *Robot K-456* are let out to play. There is clearly a connection here between the practice of thinking cybernetics and ecology together, as it was in the 1960s and 1970s, and an approach to art machines that highlights the contribution and role of both the environment and viewer to the emergent processes of systems. As Burnham said in 1970 "it has been the very nature of the machine that it could always be connected with other machines to perform a complex array of work motions"[21]. Constructed from human and non-human parts, these human-machine systems also suggest that systems, technology and the human mediate each other. They connect. The connect not only with one another in the same exhibition spaces, but with viewers across time. In describing *Robot K-456* Burnham writes that Paik showed us:

> "if the names of Rauschenberg, Wiener, John Cage and Marshall McLuhan are repeated with enough fervency and juxtaposed with random mathematical symbols then the age of the electronic humanoid plugged in for instant global communication will be upon us"[22].

It might seem as if Burnham is parodying or belittling Paik's ability to grasp at multiple sources. However, his fervency was central to the way that Paik identified the way that Wiener's "sensory members" contributed to art machines that could inhabit the forces of entropy and the realm of the more-than human. Formed from a combination of aesthetic flux and cybernetics Paik's playful and more-than human art machine known as *Robot K-456* suggests productive affinities that continue to be developed by artists questioning straightforward aesthetic relationships with objects. Paik's art objects have endured and entered the space of pan-mechanism where they are rewritten daily through viewing.

Paik thought outside of the divisions between systems and aesthetics and materials and information. The information systems that Wiener developed led to the increased power of the American military industrial complex and simultaneously influenced global developments in biology, sociology and art. It was Paik and the other artists included in *Software* and *Cybernetic Serendipity* who explicitly addressed this bifurcation. Without a direct engagement between art and technology, the violence of the cold war and its antecedents goes unaddressed. In Paik's *Robot K-456* and other works that embraced the relational concerns of cybernetics there is a careful critical embrace of the technologies of systems aesthetics, which anticipates again and again the more-than human art machines of the twenty-first century formed from the ongoing ecology of cybernetics.

References and Notes

1. See, for example: Lee, Sook-Kyung, and Susanne Rennert, eds. *Nam June Paik.* (Liverpool and Dusseldorf: Tate Publishing and Museum Kunst Palast, 2010). Hanhardt, John, and Jon Ippolito, eds. *The Worlds of Nam June Paik* (New York: Solomon R. Guggenheim Museum and Harry N. Abrams, 2000). Stooss, Toni, and Thomas Kellein, eds. *Nam June Paik: Video Time, Video Space* (New York: Harry N. Abrams, 1993). Mellencamp, Patricia. "The Old and the New: Nam June Paik." *Art Journal* 54, no. 4 (1995): 41-47.

2. "The New School Presents Nam June Paik" 1965. Paper printed on both sides, folded leaflet for publicising the performance on 8 January 1965, 41.2 x 19.7cm John Kaldor Archive, Sydney.

3. Jack Burnham, *Beyond Modern Sculpture: The Effects of Science and Technology on the Sculpture of this Century* (New York and London: G. Braziller, Allen Lane, The Penguin Press, 1968), p.318.

4. Nam June Paik, "Norbert Wiener and Marshall McLuhan: Communication Revolution." 1998 http://www.inamori-f.or.jp/laureates/k14_c_paik/img/lct_e.pdf and http://www.inamori-f.or.jp/laureates/k14_c_paik/ctn_e.html

5. Norbert Wiener, 1954 [1950]. *The Human Use of Human Beings*. 2nd ed. (Boston, MA: Houghton Milfflin), p.24-25.

6. Pamela M. Lee, *Chronophobia: On Time in the Art of the 1960s* (Cambridge, MA & London: MIT Press, 2004), p.62.

7. Jack Burnham, "The Aesthetics of Intelligent Systems," in *On the Future of Art*. 95-122. (New York: Viking, 1970), p.97.

8. Douglas Davis interview with Nam June Paik. *Art and the Future.* n.d. http://cyberneticzoo.com/?p=3437

9. Quoted in Jasia Reichardt, (curator and editor). 1969. *Cybernetic Serendipity: the computer and the art. A Studio International Special Issue.* (New York: Frederick A. Praeger), p.42

10. Reichardt, [9] p.43.

11. Nam June Paik, "We are in Open Circuits" in Dick Higgins, ed. *Manifestos-A Great Bear Pamphlet* (New York: Something Else Press, 1966).

12. Nam June Paik [11]. See also Mari Dumett "Nam June Paik's 'Art for Cybernated Life': An Evolution in New Media," *NJP Reader #2, Ecological Thinking*, ed. Seongeun Kim, (Gyeonggi-do: Nam June Paik Art Center, 2011) pp.80-109.

13. Paik quoted in Carolyn Kane, "The Cybernetic Pioneer of Video Art: Nam June Paik." *Rhizome* Wed May 6th (2009). http://rhizome.org/editorial/2009/may/6/the-cybernetic-pioneer-of-video-art-nam-june-paik/

14. Nam June Paik [11].

15. For an excellent discussion of the machinic assemblage in these contexts see: John Johnston, "Machinic Vision." *Critical Inquiry* no. 26 (Autumn 1999): 27-48.

16. Félix Guattari, *Chaosmosis: An Ethico-Aesthetic Paradigm*, trans. Paul Bains and Julian Pefanis. Bloomington & Indianapolis: Indiana University Press, 1995. p.39.

17. Stephan von Wiese "'You MARTYR of July 20, 1964' Paik and Beuys in a Media Duet" in Lee, Sook-Kyung, and Susanne Rennert, eds. *Nam June Paik*. (Liverpool and Dusseldorf: Tate Publishing and Museum Kunst Palast, 2010). p. 131.

18. Paik cited in John Hanhardt "Chance in a Lifetime" *ArtForum* April 2006 http://artforum.com/inprint/issue=200604&id=10623

19. Paik cited in Gene Youngblood *Expanded Cinema* (New York: E.P. Dutton, 1970), p.306.

20. Levi Bryant "Machine Oriented Ontology Towards a Pan Mechanism, 21 June 2012. http://larvalsubjects.wordpress.com/2012/06/21/machine-oriented-ontology-towards-a-pan-mechanism/

21. Burnham [3] p.317.

22. Burnham [3] p.351.

LIFEMIRROR

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Abstract

Crowdsourced filmmaking is still largely unexplored as a creative process and as a social phenomenon. In recent months it has started to spread rapidly throughout the arts community as a cheaper and more democratic mode of expression than traditional filmmaking, and often manages to ignite unexpected tangential narratives and new meanings. The *Lifemirror* project is a crowdsourcing tool and cinematic system designed to enable collective creativity and filmic argumentation based on geo-time tracked video through mobile phones.

Keywords: crowdsourcing, cinema, mobile phone, video, mass-creativity, communication

Introduction

By the time anyone has read this, NASA's Cassini spacecraft will have sent us a new natural colour and high resolution image of ourselves from behind Saturn's rings, almost a billion miles away. As a moment of recorded history it follows the 1968 'Earthrise' image and the 1990 'Pale Blue Dot', a photograph which, at Carl Sagan's request to turn the Voyager 1 camera back on ourselves, created an image 'about a new recognition, still slowly overtaking us, of our coordinates, our place in the Universe' [1]. Seeing ourselves in new ways is an essential part of our evolution and conscious development. The interesting aspect of this new photo shoot is that we know in advance that our picture is being taken, indeed NASA are inviting us to send photos of ourselves waving back to the camera. This raises some interesting issues about how we might treat our recorded image in a technologically evolved society.

In terms of collective self-reflection, it is my view, that back here on Earth, although we often know 'what' we are filming, it is sometimes the case that we do not know 'why' we are filming. *Lifemirror* is a practice-based research project which aims to reframe how and why we choose to film ourselves and our environment, by placing the mobile recording process in the context of cinema.

The ongoing dance between system development and theory is constantly informing the project and reflecting the process back on itself in the form of never-ending and ever-changing film sequences. In this paper I will give a brief overview of the theories informing the system, explain how the current prototype is working, and finally suggest a few possible theories for its future.

Theory

My own interactions with crowdsourced filmmaking, and designing for a process that facilitates its production, has brought me into contact with some diverse speculations. While many of the theoretical texts were written in the context of more traditional practices such as early theatre or traditional cinema, many of their philosophies seem to support the generation of crowdsourced video as an extended practice of cinema. The initial impetus informing the development of the project began with Deleuze and Guattari's rhizomatic model of systems in *A Thousand Plateaus* [2]. This led to Deleuze's own reconceptualisation of film theory in his *Cinéma* books, and then on to Ranciere's extension of an image theory in the form of the 'sentence image' and the 'Great Parataxis' [3]. While these theories discuss various aspects of cinema in detail, especially with regard to the spectator's cognitive processes in reaction to the moving image, they appear to generate new meaning when thinking in terms of mobile-sourced video. The physical aspect of fragmentation seems to mirror the cognitive functions found in the Deleuzian schizoanalysis of cinema [4] that infuses much of the thought and design of *Lifemirror*. These ideas also point towards a reconceptualisation of films that can be ongoing, fragmented yet side-by-side, and, if ignoring the traditional hierarchical film production models, may evolve and fluctuate as naturally as an organism.

Temporal thinking behind the design came from readings around Heidegger's 'Dasein' [5] and the study of Zen, in particular the nature of the flow and the ongoing Koan [6]. This inspired me to think about the possibility of making 'films with no end', and brought to mind two questions: could the opening and closing door of reality be transposed more realistically onto the cinema screen, not to replace it, but to fortify it with the cameras of the people? and can narrative be based on a natural progression of seemingly opposing forces related by ideas?

While much is written and relevant in the realms of participatory video, the theoretical focus of the *Lifemirror* project was more a reaction to the conceptual evolution of film, and the provocations of filmmakers such as Harmony Korine, who claimed that cinema is stuck in the birth canal [7]. Indeed, he is also reported to have said that his first film was an excursion into 'a new film grammar, a kaleidoscopic mix of realistic and surrealistic scenes not necessarily connected to one another'. Such resistance and sparks were also drawn from Trevor Stark's essay on the potential of militant cinema, which provided an historical context for framing cinema as a tool for change and reflection. While the Medvedkin Group brought cameras and processing equipment to remote communities on a train, YouTube enabled Kevin MacDonald to make *Life In A Day* on July 24th 2010 [8], the first commercially available crowdsourced film. Stark's essay discusses a time in film history when 'class consciousness (and the cinematic tastes) of the masses inevitably lagged behind the vanguard works ...' [9], though in these cinematically educated times it could be suggested that a co-existing of filmic ideation on the big screen might present a balancing force, a collective self-reflection as suggested, or at least make for some interesting flicks.

In the process of examining how this social cinema might manifest I also looked at the origins of theatre and in particular the idea of parabasis, which is the 'stepping forward' of the chorus in Greek comedies. This device allowed the author to represent parties not directly entwined with the narrative; often his own voice, or that of the gods. While Aristotle's second volume of the *Poetics* is lost, the origins of comedy and irony and their political inclusion in a connected world are informing the concepts of audience participation and elliptical authorship on which the project is based.

System

Lifemirror is currently at a prototype stage, and working in three parts. Firstly, the mobile phone app allows users to suggest film titles and vote on them. They can also choose how long the clips in the film should be (1-5 seconds), and provide a short description in which they can give a textual direction. At the moment this process refreshes daily, with the winning film going into the next day's production. The second part allows participants to take clips and store them in a library, then decide which clip to send to the day's film idea. Users can send one clip per film/day. Finally, the films are screened back to an audience through a system that allows the clips to be sequenced according to the collected metadata, which anticipates location and

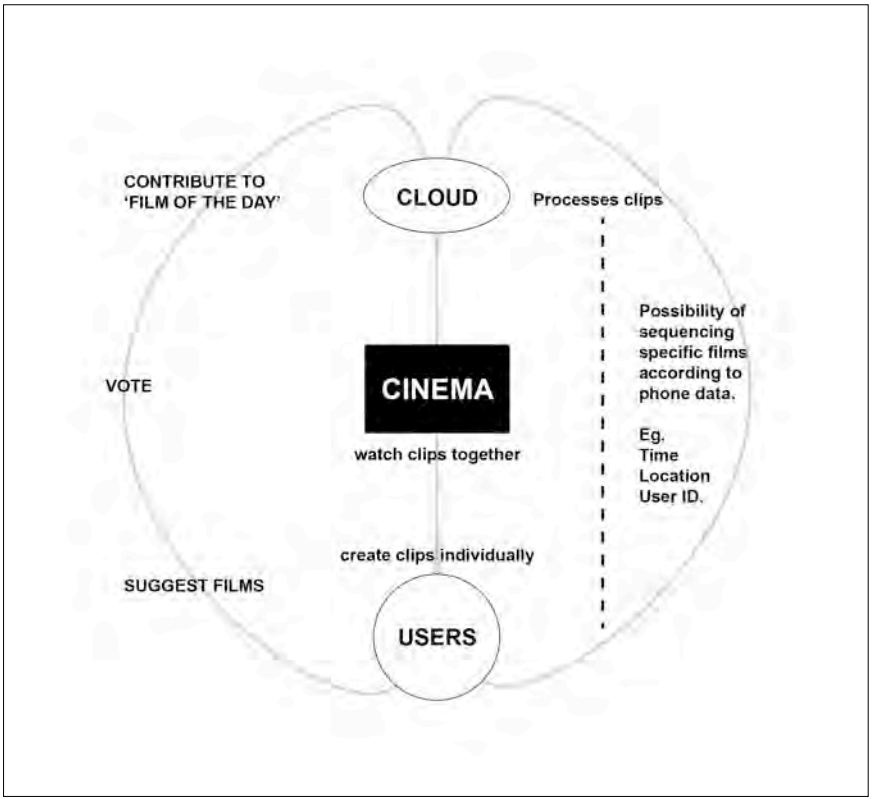

Fig. 1. The system is based on a cycle filtering clips according to relevant data from the phone, ie. user ID, location, time, gyroscopic (© Lifemirror)

audience-specific screenings that can be filtered further by textual data. We have tested this in two real cinema scenarios, and are in the process of building virtual cinemas in which a community can also watch them together.

Cinema

While initial use of the system involves a relatively small number of participants, we received enough clips to make two community screenings. The primary feedback came from those who could not attend and so wanted some way of watching the films online, thus demonstrating that engagement relies heavily on participants having open access to the media they create. Drawing from this feedback, we are now designing virtual cinemas with the view that content can be screened back using audience-specific filters (the films can be generated according to those in the room). This is an important development, as the intention of *Lifemirror* has always been to further understand and develop the idea of 'cinema as community', and to see what potential it might have as a tool for societal change. It also proposes that a collective observer effect could be a means of forming new communities in both real and virtual spaces.

Some participants contributed video without going to screenings. The main feedback from these users was that they enjoyed the daily film challenge, and found that using the camera in this context inspired them to think of new ways to film and to interpret ideas. There was also a distinction between recognition of moments that would contribute to the cinema, and 'scene creation', in which users would set up a scene for filming. This may lead to discussions around the nature and nurture of the moving image, and how this distinction might affect a collectively realised narrative. Much feedback reported a sense of anti-narrative, and more a catalogue of perspectives; some, however, did comment that they felt a 'sense' of narrative, in that the clips were held together by a community, an idea, and a cinema screen.

Due to technical limitations, some would-be participants were not able to use the app, but still came to the screenings as they were curious about what they might see. General feedback was that an audiovisual catalogue is being created, rather than a body of films. This came about through discussions on the nature of narrative, and how our expectations of cinematic flow might change should a film be treated as a concept by a collective cinematographer. An interesting note is that the people who were able to suggest films and see them made were curious in a very different way, as if they had a level of expectancy and excitement that the non-participating audience couldn't share. Contributors, in the same way, were curious to see their own clips in a new context, and this provided the audience with a feeling that perhaps 'new meanings are being created'. These comments seem to strengthen the idea that 'connected' cinema can provide a community space which is still largely unexplored and fertile in the digital realm.

The films, as intention-based deconstructions of the moving image, are ordered time-sequentially. They present a stream of consciousness which is at once familiar in cinematic form, yet also surprising and mysterious, in that we cannot expect the next scene, as in a traditional cause-and-effect model of narrative, but rather gain data-driven time-space awareness. In the post-screening discussions, audience members related that they could see the value in creating an open forum for idea sharing in this form for the simple enjoyment of watching the film format, while not feeling like they can be judged for their creative intention in any way. Both Deleuze's suggestion that cinema is the natural medium for philosophical discourse, and his view that film is a very powerful speech act in itself, in the sense that it has actual power to do something (or to 'operate in reality') [10], offer useful frameworks for interpreting these clips. The manner in which they come together also brings to mind Ranciere's concept of the Sentence Image, '… the unit that divides the chaotic force of the great parataxis into phrasal power of continuity and imaging power of rupture. As sentence, it accommodates paratactic power by repelling the schizophrenic explosion' [11].

Analysis

At the two screenings held so far, the audience reported that they believed this film system offers a new way of looking at ourselves, and provides a thought-provoking and entertaining way of seeing our everyday words and thoughts. While there is not enough space or time to cover all the theories and diverse outputs of the project so far, I would like to present these findings by looking at three of the resulting films.

The film *Green* became a focal point in discussions, as it was at once so familiar

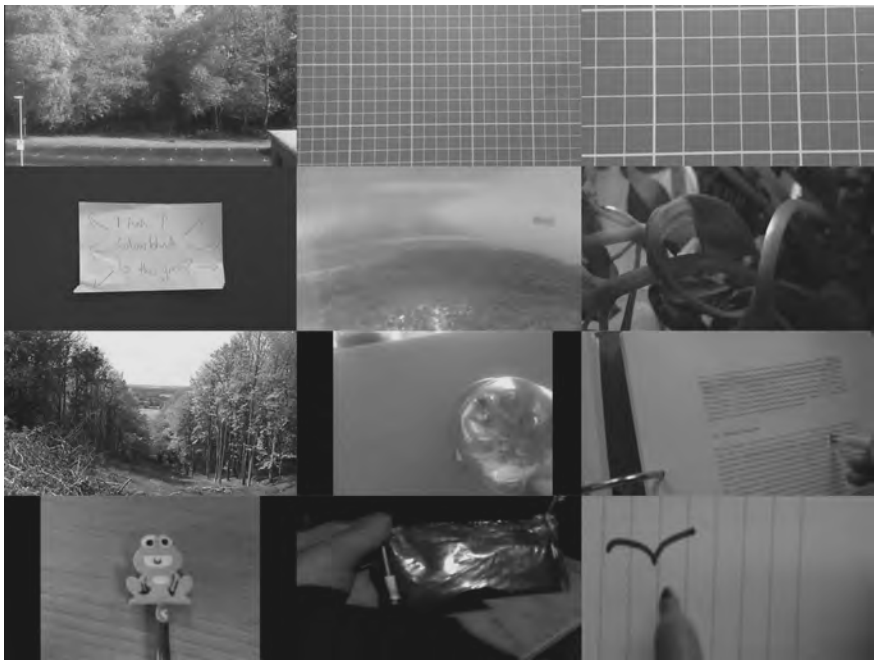

Fig. 2. *Green* (16th May, 2013) (© Lifemirror)

yet such a curious thing to watch. As a parabatic voice we find a certain community articulation of the colour green. Trees from a window, revealed through an auto-exposure adjustment … a track forward into the grid on a cutting board … a handwritten note saying 'I am colour blind' on a red background … a tealeaf falling in water … a plant … a camera beep and exposure adjustment to reveal trees in another location … a green bottle … a sentence highlighted … a rubber frog … a tobacco pack accompanied by loud music … a drawing of a green bird … . As the first film made in the project, it reveals many accidentals, found material and 'shots-to-hand'. In the middle of this collage of green sits a question, a set-up shot proclaiming colour blindness. While this got some laughs at the screening, it also serves to reinforce the idea that crowdsourced cinematics could provide a way of recognising ourselves in extremes as well as similarities, a suggestion that visual koans can be created quite naturally.

The next film, *Philosophy*, begins with a pan revealing the message 'I'LL BE BACK', then a mandala-like diagram with a voice saying 'The philosophy of Carl Jung' … a flame on a red background, though it isn't a flame, but light from a garden seeping through fingers … a light piano in the background, a book opens to reveal the question 'Who are we?' … pan from a chicken to an egg and back again … a page turned of handwritten notes … a ringing sound over trees, and a pan down into a spiral-patterned singing bowl … a young man scratching his chin, filming himself in the mirror, eyes obscured by an Apple logo … a slow zoom on a microchip, asking in a hand-drawn speech bubble 'Can a micro-chip think?'

Fig. 3. *Philosophy* (24th May, 2013) (© Lifemirror)

In this film the clips are sequenced in upload order, with the final clip added manually for an eager participant with a non-compatible phone. It is interesting to note the use of camera movement to express certain ideas, the panning between two objects, the track out to reveal, the wobble to imitate flame; the movements suggest that the body, and awareness of the camera-in-hand, can be used to express more than a single captured image or word. Recalling the nature/nurture of moving image production, it is interesting to note that all the clips in *Philosophy*, our means of questioning thinking and being, were physically set up and executed with consideration and thought, so creating a montage of questions within a question.

The film *Look Left* shed light on a potential interaction perspective of the process, while revealing something reminiscent of artist Tony Hill's multi-location, hyper-perspective video installations [12]. Kitchen, airport, park, beach, street, park. Flickering visions of a camera ballet come to mind when imagining these interactions. Filmed in one-second clips, it becomes fluid (if a little dizzying), and as it is shot in one day, somewhat more compelling. It seems to give a sense of Earth as our shared environment, and in time sequence, a new perspective from our technologies.

Cinematic Futures

With the proliferation of video-enabled mobile phones and the soon-to-be-released Google Glass, it seems more important than ever for us to try to understand why we record images, and what contexts we can create for them, so they can be of use and/or interest to others.

A key element gleaned from the research so far is that the receptive side of

Fig. 4. *Look Left* (31st May, 2013) (© Lifemirror)

the collective filmmaking process, the real and virtual cinema spaces where co-creations are projected, should be considered carefully in terms of our emerging mixed reality communities. The real space of the cinema, which is only completely real until the film begins, is a transformative space by nature, and by allowing user-led feedback through the screen could give us an increasing awareness of the potential to affect, and be affected by, it; the entertainment space would become a discussion space in which mutual and new understandings of narrative and form occur simultaneously.

If considered as an evolving boundary object, *Lifemirror* could be seen as a channel of information and context which is capable of translating, transferring and transforming knowledge between communities of practice [13]. For example, it could function in disused high street shops as collective installations. Communities could project ideas for the spaces onto elements of the environment, thus giving new potential avenues for what could 'live' there in the future. The fragmented, yet still organic, multi-perspective stream of audiovisual consciousness could therefore replace more antiquated systems of appeal, competition and judgment that often imbue the process of environmental or societal change. Likewise, this schizoanalytic means of giving voice to communities could be seen as a mediation tool for group discussion, and as therapy for individuals. Being inclusive of environment and each other, on both the creative and receptive levels, makes crowdsourced cinema potentially useful to communities which cannot always be together in time and space.

The cinema, then, could act as a guide to co-evolution in a globalised society, and, through connection via mobile cameras, offer new ways to communicate – perhaps like a visual koan, reflecting back our harmonies and discords and asking us to consider them together. As a new perspective on ourselves, crowdsourced cinematics might offer a way forward; however, designing for such media requires a metaphysical lens both drawn from, and projecting, nature, with the mobile phone acting as a channel or window into nature, rather than 'capturing' or 'shooting' it. In this way we could operate individually, yet sing and be sung to side-by-side, a chorus brought together in the cinema.

References and Notes

1. Carl Sagan, *Pale Blue Dot: A Vision of The Human Future in Space* (Random House Publishing Group, 2011).

2. Giles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia* (London: Athlone Press, 1988).

3. Jacques Rancière, *The Future of the Image* (London: Verso, 2007).

4. Giles Deleuze, *Cinema 2* (London: Continuum, 2012).

5. Stephen Mulhall, *Routledge Philosophy Guidebook to Heidegger and Being and Time* (London: Routledge, 2005).

6. Toshihiko and Toyo Izutsu, *The Theory of Beauty in The Classical Aesthetics of Japan* (London: Martinus Nijhoff Publishers, 1981).

7. Harmony Korine, *A Crackup at The Race Riots* (Drag City; Reprint edition, 2013).

8. Kevin MacDonald, *Life In A Day* (2011), film.

9. Trevor Stark, '"Cinema in the Hands of the People": Chris Marker, the Medvedkin Group, and the Potential of Militant Film', *October* No. 139 (2012) pp. 117–150.

10. Patricia Pisters, 'Delirium Cinema or Machines of the Invisible?' in Ian Buchanan and Patricia MacCormack ed., *Deleuze and the Schizoanalysis of Cinema* (London: Continuum, 2008).

11. Jacques Rancière, *The Future of the Image* (London: Verso, 2007) p. 46.

12. See *Downside Up*, Tony Hill (1984), film, <http://www.tonyhillfilms.com/films>

13. Paul R. Carlile, 'Transferring, Translating, and Transforming: An Integrative Framework for Managing Knowledge Across Boundaries', *Organization Science* **15** (2004), pp. 555-68.

ALBERTI'S WINDOW V2.0: A VISION MACHINE FOR EXPANDED SPACES OF REPRESENTATION.

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Abstract

Alberti's Window v2.0 is a novel interactive cinema platform for the expression of stereoscopic 3D panoramic and multi-viewpoint spaces of representation, in which participants embark on an embodied journey of discovery. In this paper, the author outlines the conceptual and technical framework, exemplified through a work specifically made for this platform, the interactive cinema project *Juxtaposition*. An introduction to the history of immersive imaging, presentation modalities and innovators contextualises this work within the wider field.

Keywords: interactive cinema, expanded cinema, panorama, immersion, narrative space.

Introduction

Since Leon Battista Alberti's first scientific study on perspective as an instrument of artistic and architectural representation [1], the term 'Alberti's Window' has become a metaphor for linear perspective. Version 2.0 is an interpretation and extension of the conceptual 'window to the outside'. It utilises modern technology and digital imaging to create a vision-machine, which allows for: the spatial correspondence between the real and the representational space, the expansion of the perspectival model, and an interactive experience where participants embark on an embodied journey of discovery.

Panoramic, Multi-viewpoint and Stereoscopic 3D Representation

Panoramic and multi-viewpoint representation have a long tradition in the arts, from Zhang Zeduan's twelfth century depiction *Along the River During Qingming Festival* to the large-scale painted panoramas in the eighteenth and nineteenth centuries.

With the emergence of photography and later digital imaging, panorama photography is now widely adopted. Modern digital cameras are now capable of stitching panoramic images from multiple source images within the camera's processing unit.

Artists working in traditional media rarely use strict linear perspective. The ability to control and manipulate perspective in an image allows the artist to explore a broader range of expression. Projection models that go beyond linear perspective can be a useful tool to alter a viewer's perception of a scene, and to manipulate spatial relationships within it.

By constructing a picture in central perspective, in which the orthogonal lines converge at the vanishing point, there is theoretically only a single point of view from which the perspective is perceived as correct. Outside this 'sweet spot' the picture appears to be distorted, as the converging lines are outside the observer's line of sight.

This exclusivity to a single observer is overcome in the panoramic image. As Oettermann [2] put it, the panorama constituted a more 'democratic perspective', as it allows multiple viewers to observe the image at any given moment. This might be one of the reasons why the panorama quickly gained popularity in the nineteenth century, and is still en vogue today. Massumi [3] noted: "The painted panorama liberated the horizon line".

It is important to note the difference between cylindrical-panoramic and multi-viewpoint [Fig.1] representation. The panoramic (or cylindrical) projection can incorporate an up to 360-degree horizontal field of view, and is usually constructed by stitching multiple images captured from a panning camera. A multi-viewpoint scene, on the other hand, is generated from a collection of photographs or video of a roughly planar scene, such as a landscape or city street. After processing, the horizontal field of view is only limited by the number of images, and not by the projection geometry; it can extend into infinity.

Stereoscopic 3D imaging offers another expanded model of representation; here the image is transformed into a volume, and the screen frame into a window. Stereoscopic depth perception is based on the principle of binocular vision, and the cognitive process of stereopsis, in which the brain estimates depth within the visual field based on the disparity of two slightly dissimilar images presented to the visual cortexes by both eyes.

Working with depth in stereoscopic 3D imaging is technically challenging, but more importantly, it is a creative choice. Not unlike framing a shot, in 3D a scene can be shaped to appear shallow or deep, and an object can extend beyond the screen plane to share the space with an observer. The screen or projection plane forms the link between the virtual, stereoscopic world and the environment in which the images are viewed.

Presentation Modalities

In 1787, Robert Barker was granted a patent 'La Nature à Coup d' Oeil', in which a panoramic view could be depicted on a 360-degree circular canvas in correct perspective, and perceived as undistorted for an audience located in its centre. In 1793, he opened the London Leicester Square Panorama, a circular building designed to exhibit these large-scale panoramic paintings. This spectacular immersive visual entertainment flourished throughout the nineteenth century, making it a mass medium [Fig. 2].

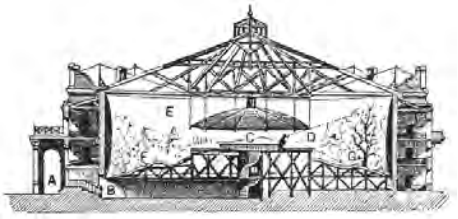


Fig. 2. Cross-section of a panorama with a faux terrain, 1790.

Fig. 1. Example of multi-viewpoint representation, generated with slit-scan extraction (© Volker Kuchelmeister)

Digital versions of the panorama are now established as immersive 360-degree cylindrical projection environments, some able to present in stereoscopic 3D, such as the *AVIE* (Advanced Visualisation and Interaction Environment) [4] [Fig. 3].

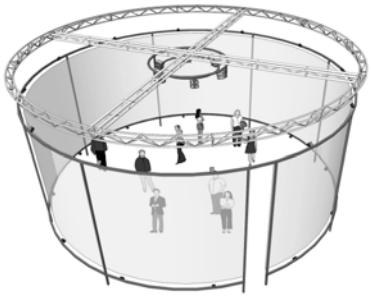


Fig. 3. Illustration of *AVIE* (Advanced Visualisation and Interaction Environment) at the iCinema Centre for Interactive Cinema Research, UNSW Sydney.

Another form of pre-cinema entertainment was the moving panorama for multi-viewpoint representation. In 1840, John Banvard started to work on a large-scale painting of a journey on the Mississippi river, which depicted a continuous view of the scenery. In its final stage, this painting measured 3.6m high and 800m long. In the moving panorama, the long strip of canvas was wound between two vertical rollers and unrolled before an audience, accompanied by a narrator describing the scenes [Fig. 4]. The moving panorama quickly established itself as a popular spectacle, particularly as an itinerant medium outside the cities.

Fig. 4. Illustration of a moving panorama apparatus, John Banvard, 1848. The long strip of painted canvas was mechanically unrolled with the help of a crank handle.

Huhtamo [5] notes "Circular Panoramas emphasized immersion into a place or event, while moving panoramas relied more on narration and combination of different means of expression."

Expanded cinema applications, or the elimination of the frame

In film and television, with its constraints of standardised spatial formats, the viewer is always looking through the eye of the camera into the narrative world that unfolds within the frame. Even as the image in the window is moving, it is clear that it is the director and editor who control the movement on screen, while the audience is restricted to passive consumption of the medium. Friedberg [6] described "... the paradox of the mobility of the image versus the immobility of the spectator".

Today, we have control over what we view on a television set and can change channels whenever we want, but this does not allow us to change the point of view or take on an alternative perspective. And by looking beyond the frame, the surrounding reality always contradicts the depiction on screen, one reason why cinema theatres are kept dark.

In experimental art practices, which work with cinema as a context and frame of reference, the notion of the passive viewer is overcome by either a non-linear narrative model, or more interestingly, an altogether different framework of representational space.

In 1977 Michael Naimark [7] noted: "I began to wonder why movie cameras move and movie projectors do not." In his work *Displacements* (1980), Naimark placed a 16mm film camera on a motorised turntable, capturing a 360-degree panning shot of a model of an archetypal American livingroom, set up in a gallery space. After filming, the entire room was spray-painted white and the camera replaced with a film-loop projector, projecting the scene back onto the livingroom interior. As the movie frame physically moved across the walls, the images inside the frame stayed stationary, appearing locked in place. Naimark observed "Just as when audiences of the [sic] Lumiere's film of an oncoming train ducked in 1895, seeing these unusual forms for the first time caught viewers by surprise." Today the same principle is applied by artworks mapping digital projection onto building facades.

Another example of practitioners working with the correlation of imagery and representation is the 2004 interactive immersive video installation, *There is still time … Brother* by NYC experimental theatre company *The Wooster Group*, created in collaboration with Jeffrey Shaw and the author [8] [Fig. 5]. This work is rooted in the recording of a performance developed to be viewed within a 360-degree projection environment. The installation offers the viewer control of a narrative displayed within the video panorama.

Seated on a revolving stool in the center of the space, audience members take turns to control a virtual 'window', to highlight discrete aspects of the story. With each viewing, a new cinematic experience is spun out of the choices of the individual audience member.

Fig. 5. Installation view of *There is still time … Brother*, The Wooster Group, 2008 (© Volker Kuchelmeister)

This model of spatial correspondence between the virtual and the representational space breaks with the paradigm in conventional film and television by substituting the frame with a virtual window, by overcoming the immobility of the spectator, and by challenging the traditional notion of linear narrative.

Fig. 6. Excerpt of image collage created for *Juxtaposition*, here shown in anaglyph 3D (© Volker Kuchelmeister)

Juxtaposition

In the work *Juxtaposition* (Volker Kuchelmeister, 2011-13) [9] and its modalities of representation, the aforementioned perspectival paradigms of stereoscopic 3D panoramic and multi-viewpoint imaging are integrated with the concept of the moving panorama, spatial correspondence between the depicted and the representational space, and Alberti's metaphorical window.

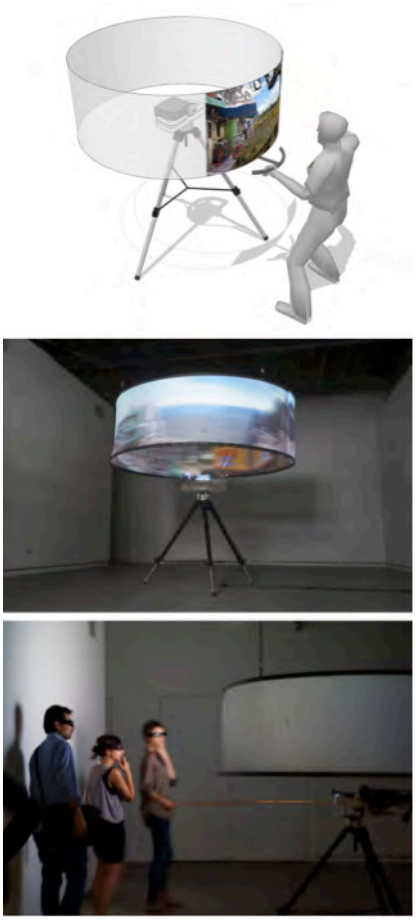
Juxtaposition is an interactive installation that invites its participants to make an embodied journey in a landscape of 3D panoramic photographic scenes. It explores place and representation by interconnecting two radically different environments: the Tasmanian wilderness vs extreme urban development in Hong Kong. The segments link together as a collage of open landscape and dense urban setting, whereas the points of contact are shaped as seamless transitions [Fig. 6].

The outcome is a seemingly endless (80 megapixel) extended image, with its beginning and end connected to form a continuous space of representation. Since the images present no recognisable landmarks, and their spatial order does not follow a rule of progression, the inherent narrative unfolding is subjective and unique to each viewer. It is an exploration and voyage of discovery.

Juxtaposition is presented within a custom-built, 360-degree revolving projection platform [10], comprised of a suspended 2m (diameter) cylindrical rear-projection screen with a rotary projection platform at its centre. The device utilises electrical slip-rings for continuous power supply, a rotary sensor for angular data, and a computer interface. A 3D projector with a wide-angle lens and a Mac Mini is fitted onto the platform [Figs. 7, 8, 9].

The operator manually rotates the platform, and therefore the projected image, following its circular path. This rotation of the virtual viewing window around the panoramic screen continuously reveals new and discrete sections of the image. The spatial correspondence between imagery and the representational space (the angular position of the window) is fixed; the image appears to be stationary. With this tactile and intuitive user interface, a viewer's proprioceptive actions in the real space have direct concurrency with their movements in the virtual space.

The viewer is involved in an immersive process of discovery in which their chosen point of view creates the dramaturgy of the piece, and literally activates the story. Or as Massumi [11] puts it "The viewer is seeing actively ..."



Figs. 7, 8, 9. Custom-built revolving projection platform, illustration (top image) and situated in a gallery (bottom two). (© Volker Kuchelmeister)

Evaluation

Observations of people interacting with *Juxtaposition*, plus a survey conducted during its exhibitions, indicate that utilising stereoscopic 3D imaging in this context challenges a viewer's perception. The virtual window into the 3D world 'behind' the screen surface, or as Friedberg [6] put it "the membrane of where surface meets depth", is no longer a fixed entity but a dynamic frame, in which uncanny interactions occur between the space depicted and the reality of the installation space.

This effect can activate a viewer's sense of balance by gently throwing it off, but at the same time, opening up another layer of interaction and resulting in an impactful embodied experience [Fig.10].

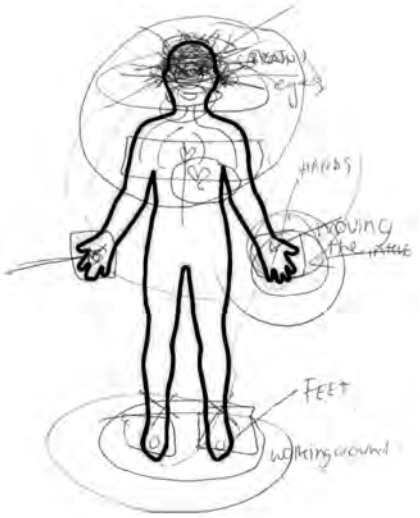


Fig. 10. Embodied experience *Juxtaposition* - result of a survey conducted during exhibition at Screenspace Melbourne, Feb 2013 – image composited from 23 responses to: "Where on your body did you experience the work? Please point/draw to body-parts in the diagram." (© Volker Kuchelmeister)

References and Notes

1. Leon Battista Alberti (1404-72), *De Pictura* (1435).

2. Stephen Oettermann, *The Panorama, History of a Mass Medium* (Zone Books New York, 1997).

3. Brian Massumi, 'PANASCOPIA The Panoramic Photography of Luc Courchesne' (2003), <www.brianmassumi.com/english/essays.html>.

4. Matthew McGinity, Jeffrey Shaw, Volker Kuchelmeister, Ardrian Hardjono and Dennis Del Favero, 'AVIE: A Versatile Multi-User Stereo 360 degree Interactive VR Theatre' (ACM Siggraph, Vol. 25, 2007).

5. Erkki Huhtamo, *Illusions in Motion, Media Archaeology of the Moving Panorama and Related Spectacles* (MIT Press, 2013).

6. Anne Friedberg, *The Virtual Window: From Alberti to Microsoft* (MIT Press, 2006).

7. Michael Naimark, 'Two Unusual Projection Spaces', in *Presence* journal (special issue on Projection), MIT Press, 14.5, October 2005.

8. Volker Kuchelmeister, 'Stereoscopic multi-perspective capture and display in the performing art', in *Stereoscopic Displays and Applications* XXII, Proc. SPIE Vol. 7863 (2011).

9. *Juxtaposition*, Volker Kuchelmeister (2011-13), <http://kuchelmeister.net/prj_juxtaposition.html>.

10. 360-degree revolving projection platform, Volker Kuchelmeister (2013), <http://kuchelmeister.net/prj_turntable.html>.

11. Massumi [3].

EYE SPY: ART, VISIBILITY AND GLOBAL WAR

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Abstract

Since the end of last century the US military has been transforming into a modern fighting force. High speed communications systems and real time imaging have changed the face of war but new weapons are only one factor driving change. New leaders and new policies also play an important part.
This paper looks at the transformation of the US military and specifically the increasing use of unmanned aerial vehicles (UAVs) or drones. It also discusses my own work TRACKER and reflects on the role that art can play in raising awareness about surveillance and war.

Keywords: art, surveillance, robotics, drones, war, politics.

Introduction

The events of 9/11 signalled the start of a new phase for the United States military. Weapons and strategies developed during the Cold War were ill suited to the 'war on terror.' Since 2001 the US military has increased its "ability to surge quickly to trouble spots across the globe" [1]. This strategic shift, which aims to counter what is perceived as a geographically dispersed threat, has also impacted on intelligence, surveillance and reconnaissance (ISR) activities. These activities, which were also intense during the Cold War, are now more multi-focused and global in their scope. Surveillance today is also aided by a wide range of high-tech equipment supplied by a select number of powerful defence contractors.

Lockheed Martin, Boeing and Northrop Grumman are three of the biggest weapons manufacturers in the US. All three companies develop advanced weapons systems, including the spy planes or drones that have been used in Iraq and Afghanistan. Drones play an important part in the Obama administration's national security strategy but many people are concerned about the lack of transparency surrounding the drone program. It is not possible within the scope of this paper to properly weigh concerns about privacy and the violation of human rights against the need to maintain national security. Instead I will outline some of the findings of the research I have conducted that has informed my artwork *TRACKER.* This work explores the idea of surveillance by using three robots that follow viewers in the exhibition space and which also download the stock prices of the abovementioned weapons manufacturers.

Persistent surveillance

The military use of unmanned aircraft is not new. However in WWI and WWII unmanned planes were used as air torpedoes, delivering bombs to predetermined targets in a war zone [2]. Today's drones or spy planes provide 'persistent surveillance', which is an altogether different type of strategy. A crucial road along which a convoy will travel can be watched in advance to establish the normal, everyday patterns of activity. Unusual activity just prior to the convoy's departure might signal preparations for an ambush. Drones are commonly used in war zones for this kind of surveillance and the drone program has expanded during President Obama's term in office. Over the same period drone strikes have also increased dramatically. The London-based *Bureau of Investigative Journalism* estimates that somewhere between 2,500 and 3,500 people have been killed by US drones in Pakistan since 2004. This includes between 475 to 900 civilians [3]. The military argues that drones provide contextual information about what is happening on the ground and therefore reduce the number of civilian casualties. However, many are concerned that without judicial oversight the drone program is open to abuse.

John O Brennan, who has been dubbed 'Mr Drone', is one of the key architects and defenders of the US drone program. In January 2013 President Obama nominated Brennan as director of the CIA. Congress confirmed Brennan's appointment in March (81 in favour/16 against) but his nomination sparked debate on the legality of using drones. Obama was forced to release two classified documents outlining the legal justification for killing American citizens abroad who are deemed to be terrorists. It is believed that these documents relate to the targeted killing of Anwar al-Awlaki in Yemen in September 2011 [4]. Obama has also recently released guidelines for lethal strikes [5] in a bid to counter criticism about the lack of transparency surrounding such important decisions.

Echoes of the past

There has been intense public debate in the US about surveillance especially when Americans fear that they themselves are being watched. After recent revelations about the National Security Agency's PRISM program, the intelligence community was accused of acting like the secret police and engaging in activities reminiscent of Cold War style domestic spying [6]. While a great deal of secrecy surrounds US surveillance programs, clearly the political landscape has changed since the 1950s. Today non-state actors have influence and capabilities that previously would have been only available to states. Transforming the US military to meet these challenges has not happened overnight. Harvey M. Sapolsky and his co-authors note in their book *US Military Innovation Since the Cold War,* that over a decade before the September 11 attacks, the 1991 Gulf War revealed the effectiveness of America's military transformation [7]. They cite stealth aircraft, thermal sensors, GPS navigation, laser guided bombs, satellite communications, night vision equipment and radar surveillance as evidence of America's technological innovation. However the ground campaign that followed the air bombardment of Baghdad has also been described as a 'left hook' manoeuvre, not dissimilar to that "conceived by General Grant's 1863 Civil War campaign at Vicksburg" [8]. This suggests that in the Gulf War the US fought with new weapons but old tactics. Since 2001, the US military has looked outside itself to see how best to meet the challenges of the 21st century.

Transforming the US military post 9/11

Vice Admiral Arthur K. Cebrowski played a key role in transforming the US military into a modern fighting force. In the months following the September 11 attacks, Cebrowski was appointed by former Secretary of Defense Donald Rumsfeld to head the newly established Office of Force Transformation. Cebrowski is well-known for advocating what he called Network-Centric Warfare, an approach that looked at and tried to learn from what was happening in society at large and especially in the business world. Peter W. Singer in his book *Wired for War* says that, in his article *Network-Centric Warfare: Its Origin and Future* [9], "Cebrowski wrote with an admiration bordering on obsession of the many wonders of the new technology companies whose stock prices were then soaring and the triumphant business models that were seemingly changing the fabric of business and society. He cited lessons from Cisco, Dell, and even American Airlines, as to how information technology was giving American businesses newfound advantages,

which, in turn, presented a new model of fighting and winning wars" [10]. Cebrowski notes however that transformation is not just about adopting new technologies. One of the key areas he identified as needing a new approach was military intelligence. "The key change is that we're moving away from the concept of information ownership into one of information sharing" [11] he said in an interview. When asked if the net-centric approach to things had impacted the notion of command-and-control, Cebrowski was unequivocal. "Absolutely. For example, we've seen a profound compression of time to plan very complex operations" [12]. Using the model of a network, lines of communication became more horizontal. Information was shared between different echelons instead of just being distributed through a top down structure.

The changes that Cebrowski brought about helped to reshape the US military into a more versatile fighting force and have enabled it to continue to project its strength and interest globally. Paul Virilio argues that technologies, and the new coalitions and practices they bring about, have far reaching consequences. He argues that the field of perception, in terms of its spatiality and temporality, has changed. When interviewed in 2009, Paul Virilio says "From now on, the battlefield is a global one. It is not worldwide anymore in the sense of the First or Second World War. It is global in the sense of the planet, the geosphere" [13]. The shift to a global battlefield has increased, in the eyes of some governments, the need for worldwide and persistent surveillance and the Obama administration has made its fleet of drones one of the centerpieces of its national security program.

Legal frameworks

The legality of using drones is still being debated. Meanwhile new UAV's with expanded capabilities continue to be developed. The X-47B demonstration unmanned combat air vehicle (UCAV) built by Northrop Grumman was successfully launched from an aircraft carrier in May 2013. Human Rights Watch has cited the X-47B as "one of several weapons that represent a transition toward development of fully autonomous arms" [14] or 'killer robots' that can make targeting decisions without a human in the chain. Christof Heyns, a United Nations human rights investigator, is calling for a moratorium on "killer robots" which he says are being tested by "United States, Britain and Israel without debate on moral and legal issues" [15]. There have also been renewed calls for more transparency about US foreign and domestic surveillance following revelations by Edward Snowden, the CIA intelligence analyst who blew the whistle on the NSA's PRISM program. Americans were shocked when it was revealed that their government approved the warrantless, mass collection of telephone and internet communications. Only two weeks after the Guardian published its story based on Snowden's revelations, FBI director Robert Mueller's admitted that the agency was using drones "for surveillance on US soil" [16]. This prompted Democrat Senator Dianne Feinstein to say that drones are the "greatest threat to the privacy of Americans" [17]. The American Civil Liberties Union says "drones, like any other surveillance tool, should only be used with a warrant and that any images they record should only be kept if there is reasonable suspicion they contain evidence of a crime, or are relevant to an ongoing criminal investigation" [18]. Clearly, new weapons systems are being developed faster than the legal frameworks required to protect human rights and privacy.

Fig. 1. TRACKER (2013) installed at Articulate Project Space in Leichhardt, Sydney. (© Margaret Seymour. Credits: Patrick Barnes: electronics, Michael Gratton: robot programming, Dr Andrew Burrell: video programming. Photo © Peter Williams.)

TRACKER

My art project *TRACKER* (2013) aims to raise awareness about drones, albeit in a non-didactic way. The work comprises three robots that sense people in the exhibition space and follow them. The robots are relatively compact industrial looking objects. Each robot is linked by wifi to the New York Stock Exchange and downloads the share price of one of three weapons manufacturers in the US: Lockheed Martin, Boeing and Northrop Grumman. These companies make the UAV's or robot spy planes that are used in Afghanistan. As the share price of one of the companies goes up, the robot assigned to that specific company moves more quickly and gets closer to its target. Each robot also displays a short interactive video showing a different pair of feet walking. Filmed in low light to echo the look of film noir, the videos are based on my memory of scenes from films in which a private eye pads the dimly lit backstreets chasing down a lead.

I shot the videos in a style reminiscent of film noir for a number of reasons. Firstly, secrecy is a common trait of characters in film noir. The protagonist in these films is often an outsider who lives by his wits. Events in the narrative are often not as they first seem. Common plot lines include double identity and double crossing. The motivations of the characters in film noir are never clear, enmeshed as they are in complex webs of deceit. Secondly, screenwriter, director and film critic Paul Schrader in his 1972 essay *Notes on Film Noir* argues that the distinctive tone and look of classical film noir movies of the 1940s and 1950s began with films made in the late 1930s during the Great Depression like Fritz Lang's *You Only Live Once* (1937). He argues that this interest in dark cinema was only blunted by the intervening war period with its propaganda films. After the war, film noir movies became

"markedly more sardonic – and there was a boom in crime film"[19]. While film noir movies reflect uncertain times, Schrader says the theme of self-doubt is submerged in mannerism and style [20].

If, as Schrader argues, the distinctive look of film noir mirrors the disillusionment in the US at the end of the Great Depression, the more recent global financial crisis has also undermined confidence in America's economic superiority, with big companies like Enron and Lehman Brothers collapsing. While it would be tempting to draw a straightforward analogy between the Great Depression and the 2007-08 financial crisis there are clear differences. For example, following the stock market crash in 1929, commodity prices fell and unemployment was high. The American government's decision to introduce tariffs worsened the depression by reducing foreign trade. In the 1930s a deflationary spiral set in, whereas monetary policy implemented in the wake of the 2007-08 financial crisis has eased deflationary pressure. Despite these differences both events have had a significant impact on America's self image.

Linking *TRACKER*'s robots to the stock market comments on the grim financial situation in the US as it tries to reduce its budget deficit after being forced to raise the debt ceiling. It also points to US anxiety about other countries with growing economies like China taking their place on the world stage. This anxiety is echoed by what viewers interpret as a nervous energy in the robots. Viewers most often voiced this idea when the robots scanned the room attempting to get a fix on the next target. When each robot follows a viewer it simultaneously downloads the stock price of one of the abovementioned US weapons manufacturers. A large drop in the stock price as a result of uncertainty in the market causes the robots to slow down and keep further away from their target person.

While changes in the stock market are reflected in the movement of the robots, it will also be interesting to watch, in a broader sense, how the weapons manufacturers react to defense budget cuts. It would be easy to be cynical. Despite the cuts, an extra $US 8.4 billion has been requested during the next fiscal year for Lockheed Martin's F-35 Joint Strike Fighter program [21]. The F-35 is the most expensive weapons program in military history and is already substantially over budget. Defence analyst Peter Singer observes that, in tough budget times established defense programs are likely to have "stronger support from Congressional members protecting existing factories and jobs in their district" [22].

Art and dissent

The serious nature of the issues explored in the work *TRACKER* raises questions about art's efficacy in bringing about social change. My stated aim at the beginning of the project was to raise awareness about drones, but clearly artworks operate very differently from protest movements. Jacques Rancière in his book *Dissensus: on politics and aesthetics* rightly argues that works that assume a direct link between an artist's aims and the political import of an artwork rely on an outdated model of the efficacy of art which he describes as pedagogical [23]. Instead Rancière sees art operating in the aesthetic realm, which suspends "every determinate relation correlating the production of art forms and a specific social function" [24]. He calls this paradoxical form of efficacy *dissensus* because it disconnects the aims and actions of the artist, the 'sense' or intention of the artist, from the "sensory forms, the significations that can be read on them and their possible effects" [25]. Rather than negating the political efficacy of art, Rancière sees dissensus "at the heart of politics, since …(politics) consists in an activity that redraws the frame within which common objects are determined" [26]. Dissensus undoes the 'natural' logic and instead "re-frames the given by inventing new ways of making sense of the sensible" [27]. Art and politics, says Rancière, are both forms of dissensus but there is no direct link between the artist's intention realized in an artwork and "a capacity for political subjectivation" [28]. Instead Rancière argues that artists "reconfigure the fabric of sensory experience" [29] by intertwining several logics and inventing "novel relationships between things and meanings that were previously unrelated" [30].

Returning to Schrader's observations in *Notes on Film Noir*, he argues that film noir foregrounds style instead of a moral or message. In doing so, he says these films are less pedagogical than the propaganda films made during WWII and also less socially conscious than other films made during the Great Depression [31]. If any message is to be read into film noir, Schrader says it is that film noir "tried to make America accept a moral vision of life based on style" [32]. Although this final statement by Schrader might seem at first to contradict his earlier argument, a vision of life based on style suggests that style, with its openness to interpretation, is both a means and an end in its own right. There cannot be a direct correlation between the aim of the artist and the sensory form of the artwork, nor any predictable effect arising from a work of art.

Conclusion

Finally, it is important to reflect on the transparency of a primary resource used in my research, that is the daily news. Much of the information I have referenced has been reported in the mainstream press, which is often criticised for being pro big business. Despite the fact that these reports are readily available in the US and other western nations, news reports also have their own specific type of invisibility. They are quickly replaced in the mind of the reader by the next news story. Walter Benjamin, writing about the news media of his time, noted that the "freshness of the news, brevity, comprehensibility and, above all, lack of connection between the individual news items" [33] contributes to a situation whereby the individual is unable to 'take hold' of their experiences, to "assimilate the data of the world around him by way of experience" [34]. In contrast, artworks stimulate imagination rather than simply imparting information. They also provide a relational interaction that encourages participation, interpretation and the exchange of ideas with others in the gallery. My artwork *TRACKER* provides a space for this kind of interaction and encourages the viewer to make conceptual connections that incorporate past and present experiences as well as individual and collective meanings.

References and Notes

1. United States Department of Defense, *Quadrennial Defense Review Report*, February 6 2006 p. v. http://www.defense.gov/qdr/report/report20060203.pdf, accessed 30 June 2013.

2. John Sifton, *A Brief History of Drones*, The Nation, 7 February 2012, http://www.thenation.com/article/166124/brief-history-drones#, accessed 30 June 2013.

3. AFP, *Guidebook for targeted killings: Exemption allows CIA to target Pakistani militants*, The Express Tribune, 21 January 2013, http://tribune.com.pk/story/496838/guidebook-for-targeted-killings-exemption-allows-cia-to-target-pakistani-militants/, accessed 30 June 2013.

4. The attack also killed Samir Khan, the editor of the militant group's internet magazine *Inspire*. Both men were American citizens.

5. Lisa Millar, *Drone strikes: Barack Obama sets new rules for lethal force*, ABC News, 24 May 2013, http://www.abc.net.au/news/2013-05-24/obama-releases-new-rules-for-drone-strikes/4710038, accessed 30 June 2013.

6. Daniel Ellsberg, *Edward Snowden: saving us from the United Stasi of America*, *The Guardian*, 10 June 2013, http://www.guardian.co.uk/commentisfree/2013/jun/10/edward-snowden-united-stasi-america, accessed 30 June 2013.

7. H. M. Sapolsky, B. Rittenhouse Green and B. H. Friedman, 'The Missing Transformation' in Harvey M. Sapolsky et al., ed., *US Military Innovation Since the Cold War: Creation Without Destruction* (London and New York: Routledge, 2009), p. 2.

8. Beyond Broadcast Curriculum Guide, the Gulf War Timeline, Frontline, WGBH Educational Foundation, http://www.pbs.org/wgbh/pages/frontline/teach/gulfguide/gwtimeline.html, accessed 30 June 2013.

9. *Network-Centric Warfare: Its Origin and Future* was written with retired air force pilot John Garstka and published in January 1998 in *Proceedings*, the U.S. Navy's official journal.

10. Peter W. Singer, *Wired for War: The Robotics Revolution and Conflict in the 21st Century* (New York: Penguin Books, 2010), p. 180.

11. Arthur K. Cebrowski interviewed in *Arthur K. Cebrowski on Transformation of Defense*, published in *Ubiquity* web-based magazine by Association of Computing Machinery (ACM), August 2004, http://ubiquity.acm.org/article.cfm?id=1022362, accessed 30 June 2013.

12. Arthur K. Cebrowski [10].

13. Paul Virilio interviewed in James Der Derain, *Virtuous War: mapping the military-industrial-media-entertainment network* (New York: Routledge, 2009), p. 64.

14. Reuters, *UN investigator seeks 'world moratorium' on killer robots*, ABC News, 24 May 2013, http://www.abc.net.au/news/2013-05-24/un-investigator-seeks-world-moratorium-on-killer-robots/4710276, accessed 30 June 2013.

15. Reuters [13].

16. Ben Knight, *FBI director Robert Mueller admits spy drones being used in skies over America*, ABC News, 20 June 2013, http://www.abc.net.au/news/2013-06-20/fbi-says-using-drones-in-us-airspace/4767340, accessed 23 June 2013.

17. Senator Dianne Feinstein quoted in Ben Knight [15].

18. Ben Knight [15].

19. Paul Schrader, *Notes on Film Noir* in Barry Keith Grant ed., *Film Genre Reader* (Austin: University of Texas Press, 1986), p. 171.

20. Paul Schrader [18] p. 177.

21. Sharon Weinberger, *F-35 Joint Strike Fighter battles for future*, BBC, 11 April 2013, http://www.bbc.com/future/story/20130411-f-35-fighter-battles-for-future/2 (accessed 30/06/13)

22. P W Singer quoted in Spencer Ackerman [19].

23. Jacques Rancière, *Dissensus: on politics and aesthetics*, trans. Steven Corcoran (London and New York: Continuum, 2010), pp. 135-136.

24. Jacques Rancière [24] p. 138.

25. Jacques Rancière [24] p. 139.

26. Jacques Rancière [24] p. 139.

27. Jacques Rancière [24] p. 139.

28. Jacques Rancière [24] p. 141.

29. Jacques Rancière [24] p. 140.

30. Jacques Rancière [24] p. 141.

31. Paul Schrader [18] p. 171.

32. Paul Schrader [18] p. 182.

33. Walter Benjamin, "On Some Motifs in Baudelaire," in Walter Benjamin, *Illuminations*, H Zohn, trans. (London: Fontana Press, 1992) p. 155.

34. Walter Benjamin [25].

THE SOUND OF MEMORY | AN AUDIENCE DERIVED AUDIO VISUAL EXPERIENCE

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Abstract

The ubiquitous and portable nature of recording devices has changed the way society remembers and communicates. The prosthetic nature of device located memories in the form of text, still and moving image media constructs a digital self and not exclusively a clone of the organic self. The digital memory of this digital life is the entity that is under musical examination with The Sound of Memory, which intends to create a sonification of the digital life of the audience.

This paper discusses the interdisciplinary space being investigated by The Sound of Memory project. This project aims to develop an interpretive compositional framework to generate music from the digital memory of, that is the digital media carried by, the audience. The project deals with music, issue of memory in contemporary technological ecology, the democratisation of creativity, questions around creative authorship and also explores the notion of a digital life.

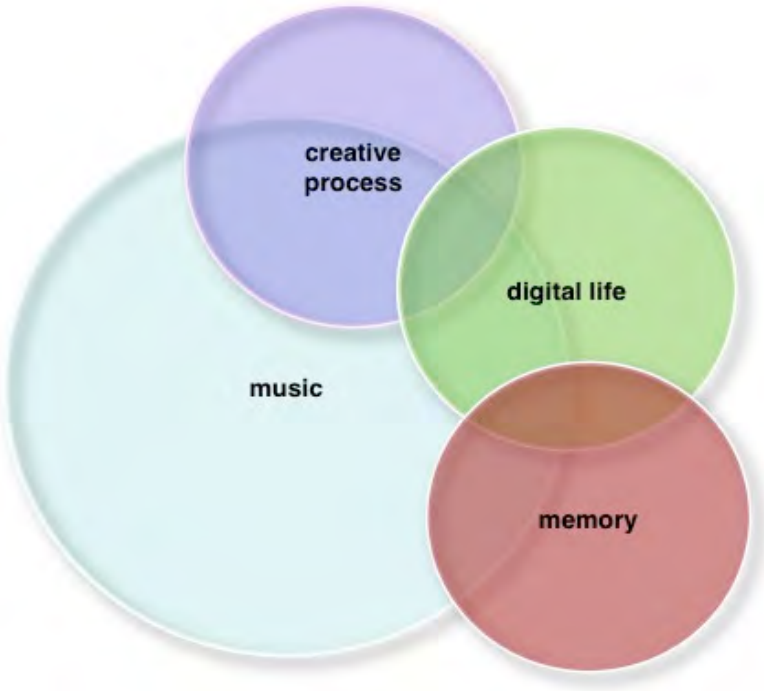
Keywords: music, composition, sonification, memory, audio-visual, mobile media.

Introduction

'The Sound of Memory' (TSOM) examines the possibility of the personalisation of music by observing, interpreting and responding to the digital memory of an audience, in the form of images, video and text. In essence, the project develops a way to compose music from images. The method of enquiry for this is the development of a compositional framework, to produce 3 musical audio-visual works that are unique to each audience. The outcome will then be fed back into the audience's digital memory, leaving the audience with the resulting media artifact. These creative works are intended to provide a meaningful musical response to the audience's photographic contributions and reveal new experiences. These new experiences are made possible by the shift of paradigm from a traditionally pre-determined musical experience that is crafted, rehearsed and performed, to a musical experience which is derived from the audience's supplied material, which creates a sense of ownership by the audience.

I have not been alone in the quest to interpret images in a musical form. As long ago as 1938 Evgeny Muzrin invested considerable time and resources into developing the ANS synthesizer. Named after the composer Alexander Nikolayevich Scriabin, who's own work delved into visual associations within compositional systems, the ANS would interpret an image etched onto a glass plate into music. Black putty was used to define the negative spaces and the etched image would allow light to pass through the glass and trigger corresponding harmonics in the synthesis engine, over time, to create the musical response.[1]

Fig. 1. The Interdisciplinary Flower



Whilst this advance in light to audio interpolation is significant for its time, as you can hear when using this instrument, the output lacks the emotional connection to the input image that I am seeking with TSOM.

The Three Proposed Creative Works are:

Individual Engagement – to develop the framework on a defined scale with an audience of one either as an installation or software experience
Group Consultation - to expand the framework and include repeated feedback/development cycles with periodic contact
Theatre Show – to engage a large audience in a traditional format

In terms of this paper, I will explain the interdisciplinary nature of this project in relation to music, memory, creativity and the creative process and the notion of a digital life, as indicated by the crossover regions of the interdisciplanary flower (fig.1). With each discussion is an example of works in the field that highlight some of the creative processes and outcomes proposed for TSOM.

Music

The three works proposed for TSOM are creative responses to a visual seed, which is the material shared by the audience, from their digital memory. This material is unseen until the time of the performance. This proposition raises significant and unique technical and creative challenges. The fundamental creative issue arises from the desire to devise a compositional structure that can provide a mood-defining outcome, yet take direction from an element of chance, the audience. This becomes a matter of how you organise sound and manage the interpretation of the audience material, which is at the core of the project.

There is a long tradition of utilising chance elements in composition dating back to the late eighteenth century with *Musikalisches Würfelspiel*, [2, 3] a musical dice game where the selection of phrases to be played is made by rolling dice or choosing one at random. This notion of using chance or non-authored elements was strengthened in the twentieth century, but gained prominence in the 1950's with works by John Cage (Music of Changes, 1951), Pierre Boulez (Éclat 1965), Karl Stockhausen (Klavierstück XI, 1956) and Iannis Xenakis (Pi-

thoprakta, 1955) amongst others. This approach to music composition is known as aleatoric music. As described by Meyer-Eppler, "a process is said to be aleatoric ... if its course is determined in general but depends on chance in detail" [4].

It is from this tradition that I will draw to approach the compositional architecture of the project. The input, digital visual media, is indeterminate, resulting in a meaningful and unique musical response.

An aleatoric work of particular note and one that is commonly thought to be the dawning of the minimalist aesthetic, is Terry Riley's *In C* [5]. This piece presents a starting point for my compositional form, which aligns to the challenge of creating a tonal and musically informed outcome from a source that is external to the sphere of influence of the composer. *In C* is a collection of 53 musical phrases of differing lengths, but in a common key and meter.

The players determine the size of the ensemble, the instrumentation, and the order and number of repetitions of the phrases. The result is an unpredictable combination of the composed phrases of indeterminable length.

In a similar vein, computer game music has a similar agenda, to generate real time music that matches the visual narrative, in an adaptive manner. It is from this perspective that elements of ludology (videogame theory) and generative music will help inform the intelligence of the system.

The Listening Machine, by Daniel Jones and Peter Gregson with Britten Sinfonia 2012 [6] is similar in many ways to the proposed technical structure of TSOM, but the significant difference to TSOM is that it explores conversation, not memory. 500 English tweeters are being channeled into the machine to be filtered, interpreted and passed on as musical instruction to a compositional engine. The crowd sourcing of narrative data, the breakdown of that data into meaning, the re-interpretationof that data into musical language and the musical machine built on thousands of musical fragments recorded by the orchestra, represent a good proof of concept for a TSOM flow chart. Importantly, the composers managed the potential for the input to overwhelm the system and create an incomprehensible cacophony, through their filtering and averaging process. In addition to the subject matter, *The Listening Machine* is also distinguished from TSOM by the lack of feedback to the audience to allow reflection and further input.

Memory

We are what we remember. We are how we remember. If we consider memory as an agent of the present, then we could embrace Burnham's position that "the act of recollection is a fundamentally creative act, as well as an existential act, it is at once self expression and self constitution" [7]. In the context of this paper, this theory is being applied to historic works, specifically a detailed analysis of Schubert's late instrumental works like the String Quartet in G Major (D.887), and an observation of memory creation and recollection as an important compositional process in these works. I'm using this fundamental pretext to underlie TSOM: it is the process and context of the remembering that has an affect on the memory.

A dominant theme of this project is the role of memory within music, and music within memory, placed in a new media environment. It is not an examination of memory from the perspective of cognitive psychology or neurology, but rather involves treating memory as an agent of the present, like music, as an ephemeral experience. It is in the act of remembering that we create the memory.

This idea has been inspired by and has become possible as a result of the emergence of behaviours surrounding the ubiquitous penetration of media recording devices in the developed world. The portability of such technology has fundamentally changed how we remember events, people and emotions. The moments that are recorded and eventually shared are re-enforced. Conveniently, unlike biological memory, which is shared through speech or the written word, these digital memories can be shared without re-interpretation from the author. The digital memory becomes a media memory.

Media Memory is a term that crosses a number of disciplines but is referred to by Neiger, Meyers and Zandberg as "the systematic exploration of collective pasts that are narrated by the media, through the use of the media and about the media" [8]. Importantly for this project, this illustrates that the memory exists in the media. Through the act of looking into the media, which is the material of these prosthetic memories (as referred to by Reading [9]) I seek to find new meaning, context and emotion that has not been communicated in the act of recording and sharing. In the digital media landscape there is no meeting of the author, no interview, lunch, coffee, conversation or walk, but an unbiased presentation of the media, in this case, the encoded memories. Eisenberg believes in "an online ecology whereby creative production and expression are inseparable from social communication" [10]. With TSOM, I aim to provide an environment to observe this.

Augment me (2011), by Brad Miller[11] is a visually stunning piece that treats memory in a similar manner to TSOM. In this work Miller reflects on his own process of digitising his memory over an 11-year period. The photos he has taken of his physical life build a multi-dimensional digital memory of place, occasion and time. These all get brought into an interactive audio-visual installation context, such that the images are streamed in a manner that is influenced by the physical interaction of the (mostly oblivious) audience. Technically, a meta-tagging system is used to add an interpretive layer to the images to inform the display intelligence – again another similarity to what is proposed for TSOM whereby meta tags are attached to the incoming images and matched to the tags on dynamically exhibitable music objects.

Creativity and the Creative Process

The creative premise of TSOM engages a shift in the executive authorship of the work by using media contributions from the audience to drive the compositional framework. This ground up approach establishes a democratisation of creativity. This key observation of the structure of TSOM is inspired by the surge in the democratisation of news media through the proliferation of networked recording devices. In essence, the behaviours being studied in relation to Media Memory are what I hope to emulate in my creative process.

When someone records and shares a local event, the media representation? of that event may spread around the world without intervention from the traditional channels of distribution and control. The executive editor is removed, but the news is still distributed. Likewise, in TSOM, it is the unbridled sharing of memory by the audience that bypasses the composer's traditional role of complete control of the music the audience hears. In some sense it is a means of crowd sourcing content, within a defined context. The creative process commenc-

es when the audience commits the image to their device and decides not to delete it. They thereby curate their prosthetic memory and then share it with TSOM.

With the *Descriptive Camera* (Matt Richardson, 2012[12]), a descriptive photographic process was created which looks into an image for the story and prints out descriptive prose. It utilises crowd sourcing – whereby people have subscribed to participate in the project, to provide an analysis and interpretation of the image to then be sent back as prose. This project highlights the swell of global participants seeking to interpret meaning beyond the media.

Digital Life

All of the discipline areas being explored by TSOM can be encompassed within the notion of having a digital life: the digital you. The digital you often resembles the organic you, or parts thereof, but is an external construct of who you are either by design, circumstance or habit.

In the rapidly evolving personalised digital life ecology, our digital behaviours shape how the digital world sees, identifies, categorises and interfaces with us. This population and personalisation of the digital ecology is a notion that has been historically well defined by Negroponte:

"True personalization is now upon us. It's not just a matter of selecting relish over mustard once. The post-information age is about acquaintance over time: machines' understanding individuals with the same degree of subtlety (or more than) we can expect from other human beings, including idiosyncrasies (like always wearing a blue-striped shirt) and totally random events, good and bad, in the unfolding narrative of our lives" [13].

Negroponte outlined a roadmap of being digital in 'Being Digital' (1995) – a tome that has influenced my practice, and in particular, the theme of personalising one's digital life. The field of personalisation has grown well beyond Negroponte's early musings to infiltrate everyday life. Ultimate personalisation creates an audience of one: the content is for you alone. In an audience environment however, you become a collective one. Pariser warns of the degree of personalisation in the contemporary information ecology and that your digital life may already be excluding you from knowledge. He warns of the perils of being trapped in your own *filter bubble*, [14] a world where information is not free, but rather it is captive to your perceived tastes, background and interests. Information is bound to the image of the digital you. He famously demonstrated this in his 2011 TED talk whereby 2 demographic twins searched the same topic in Google, yielding vastly different results. Likewise with TSOM, no two instances of a work would yield the same musical response. In contrast, a work with a fixed musical outcome but variable visual audience content is *Museum of me*, which was created by Intel in 2011[15]. This promotional web based experience taps into the participants' shared Facebook content, images, comments and videos as a source for the Museum of Me displays. It presents your digital life in a museum audio visual metaphor, with a fixed rate walk-though to see the art that is your life, including some virtual kinetic pieces containing versions of word art, set to a predetermined piece of music. This slick presentation merely scratches the surface of what is possible in this space but provides a unique and entertaining 'remembering' experience.

Conclusion

This paper presented a macroscopic view of the development of TSOM, which maps the path I intend to follow to build the compositional machine. The starting point for the architecture of the compositional machine presented in this paper will be built as a test framework. This built framework will then facilitate the mapping of emotional connections between the visual and aural senses of the audience participants. The next design phase will require investigations into cognitive models that will inform this mapping process design, to produce the basis for the first work.

References and Notes

1. Kreichi, S. ANS Synthesizer. 10 Nov 1997 [cited 2013 30 March]; Available from: http://www.theremin.ru/archive/ans.htm.

2. Noguchi, H. 1990; Available from: http://www.asahi-net.or.jp/~rb5h-ngc/e/k516f.htm.

3. Durham, A.L., Random Muse: Authorship and Indeterminacy, The. William and Mary Law Review, 2002-2003(44): p. 64.

4. Meyer-Eppler, W., Statistic and Psychologic Problems of Sound. Die Reihe 1957. 1 (1 (Electronic Music)): p. 7.

5. Riley, T., In C1964.

6. Jones D, G.P. The Listening Machine. 2012 [cited 2012 20/5/12]; Available from: http://www.thelisteningmachine.org/.

7. Burnham, S., Schubert and the Sound of Memory. The Musical Quarterly, 2000. 84(4): p. 655-663.

8. Zandberg, E., O. Meyers, and M. Neiger, On Media Memory - Collective Memory in a New Media Age2011, Hampshire: Palgrave Macmillan.

9. Reading, A., A. Hoskins, and J. Garde-Hansen, Save As... Digital Memories, 2009, Palgrave Macmillan: Hampshire.

10. Buckingham, D., Youth, Identity and digital Media2008, Boston: MIT.

11. Miller, B., Augment_me- An algorithmic Memory, Absence and Presence in the Cloud. 2011.

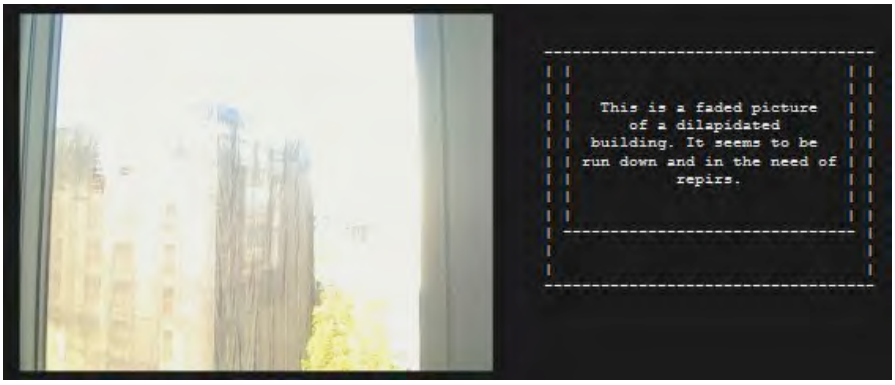
12. Richardson, M. Descriptive Camera. 2012; Available from: http://mattrichardson.com/Descriptive-Camera/.

13. Negroponte, N., Being Digital1995, New York: Alfred A. Knopf Inc.

14. Pariser, E. Beware Online Filter Bubbles. TED talks 2011 [cited 2012 24/5/12]; Available from: http://www.ted.com/talks/eli_pariser_beware_online_filter_bubbles.html.

15. Museum of Me. 2012; Available from: http://www.intel.com/museumofme/en_AU/r/index.htm.

Fig. 3. Descriptive Camera – © Matt Richardson (2012)



MAKING WORLDS IN ART AND SCIENCE FICTION

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Abstract
Why do some artists make worlds while others make works? This article considers the renewed attention to world-making as a key trope in contemporary artistic practice in relation to the world-making tactics of science fiction. Nelson Goodman's 1978 book Ways of Worldmaking provides the entry point for this enquiry.

Key Words: Contemporary Art, Science Fiction, World Making, Nelson Goodman, Mondialisation

This paper argues for a link between the 'world-making' enterprises of science fiction writing and a renewed attention to world-making as a key trope within the field of contemporary art [1]. Although world-making has long been recognized as a major tactic in science fiction writing (critics and fans often focus on the texture of a world, its unique language, its holistic appearance, the extent of the gadgetry or societal structures proposed), it also plays a significant role in the generation of visual and temporal experiences by contemporary artists, particularly in works of contemporary art that foreground *immersion* within specifically constructed spatio-temporal environments. The questions I want to ask are: what distinguishes works from worlds, and what specific criteria might a 'world-making' enterprise entail?

This inquiry hinges, in part, on the idea of 'inhabitation' – the inhabitation or immersion in a world versus an encounter with a work. Positioning contemporary art as a world-making exercise forces us to think about the ways in which we are able to inhabit works of art, or how works become amenable to processes of inhabitation. We might argue that part of what makes a work of art inhabitable is its believability: the manner in which the imagined world is able to convince or entice a spectator to either dwell within its ethos or commit to its conceptual alliances (an imperative I will return to later on). If this is the case, then considering the differences between the making of textual worlds and the worlds materialized in durational, time-based works of art can potentially generate new understandings of the role of narrative in representational forms.

The starting point for my thinking around this issue is Nelson Goodman's now canonical book *Ways of Worldmaking*, published in the United States in 1978. As is well known, Nelson Goodman was an American philosopher and a major proponent of analytic philosophy in the United States. He completed his PhD at Harvard in 1941, and during his lifetime published numerous books that addressed, from a philosophical stance, the relationship between perception and knowledge, most often with regards to linguistics, but also in relation to aesthetics. Although Goodman was not an art historian and had no academic art historical training, he was a serious scholar of perception and cognition, a keen collector and patron of the arts, and for a time he was also the Director of the Dance Center at Harvard University in the 1970s and 1980s [2].

Perhaps one of the important elements of Goodman's legacy for the discourse of contemporary art is his rephrasing of the question 'what is art' to 'when is art'? In other words, in the name of what temporal conditions are the borders of art maintained? When does art appear; how is it marked out and distinguished in time? These are questions that I find myself returning to constantly in my work on time-based contemporary projects. These are also questions that many contemporary artists are now asking themselves, against the backdrop of an art world in which temporary projects and intermittent displays are becoming increasingly prevalent, while the *timing* of a work's exposure (on the market, in an exhibition, biennale, art fair, etc.) is fast becoming a measurable indicator of its subsequent 'success'.

So, to return to Goodman: right at the start of his book *Ways of Worldmaking*, Goodman argues that all worlds, no matter where and how they are made or the form they might take, are made from the stuff of other worlds. The creation of a world relies, in other words, on processes of recycling. He writes:

> The Many stuffs – matter, energy, waves, phenomena – that worlds are made of are made along with the worlds. But made from what? Not from nothing, after all, but from other worlds. Worldmaking as we know it always starts from worlds already on hand; the making is a remaking [3].

For Goodman, this idea of 'making as 'remaking' enables the construction of numerous, contradictory worlds. It is important that his thesis is called '*ways* of world-making', as it is in part an attempt to reconcile how two or more contradictory states can share a claim to reality.

Although Goodman outlines several tactics or approaches to world-making in light of this goal, what is most interesting to me about his argument is not so much his identification of world-making processes, but his attempt to evaluate the criteria for success in making a world [4]. In other words, how do you make a good one? Or, as Philip K. Dick asked, 'how do you build a universe that doesn't fall apart two days later?'[5]

Is 'truth', for example, an essential component in creating a world and maintaining its stability? Does a world need to have a quantifiable truth-value in order to be properly inhabitable? According to Goodman, the answer is no, and I agree with this. 'In a scientific treatise', he explains, 'literal truth counts most; but in a poem or novel, metaphorical or allegorical truth may matter more and … For non-verbal versions, truth is irrelevant' [6]. With respect to art, truth is not a satisfactory benchmark for evaluating the success of a world-making enterprise, for artists make worlds metaphorically as well as literally, and their construction is often contingent upon factors that elude mimetic or cognitive categorization. 'We risk confusion', Goodman writes, 'when we speak of pictures or predicates as 'true of' what they depict … they have no truth value and may represent or denote some things and not others' [7].

Instead of 'truth', then, Goodman introduces the idea of 'rightness' as a determining factor. He further suggests that this 'rightness' is discernible and measurable in terms of four qualities: coherence, cogency, compactness, and comprehensiveness. Together, these make up what he calls 'the 'informativeness and organizing power of the whole system' [8].

When I first read this description I was immediately struck by its similarity to Nicolas Bourriaud's insistence on what he called the 'pressing need' for contemporary art not simply to offer a reflection of the world in which we live, but to actively shape the way in which we inhabit it. As Bourriaud wrote:

> The role of artworks is no longer to form imaginary and utopian realities, but to actually be ways of living and models of action within the existing real, whatever the scale chosen by the artist [9].

What Bourriaud concludes from this shift is that artists are now directly involved in a process of 'learning to inhabit the world in a better way instead of trying to construct it based on a pre-conceived notion of historical evolution' [10]. What is directly apparent about this argument (and also Goodman's) is that it is staked out across the territory of ethics. Striving for a 'better way' of inhabiting the world implies a value judgment that some worlds are better than others, and further implies that there are criteria for 'success' that can be attached to world-making processes.

The second conclusion we can reach from Bourriaud's statement is that contemporary art works can offer possible models of inhabitation which, importantly, can be carried *across* from the immediate environment of the art work and subsequently applied to the real business of being and living in the world. This is what Bourriaud means when he uses the word 'models', or 'models of inhabitation'; a model being like a smaller version or a metonym for a future endeavor. A model is a both a proposal for and an abstraction of the world. It is a translation or remaking – in precisely the same way that Goodman implied when he argued that all world-making involves a kind of remaking ('worlds are made … from other worlds') [11]. The art-work-as-model is then a carrier for a broader scenario: it is a seed for a potential future.

Martin Heidegger famously described our individual perspectives as 'world pictures': 'each world picture, potentially irreconcilable with others', was understood as a 'form of creative projection that lays out a world' in front of the subject [12]. World-making as a literary tactic can also be characterized as a process of aesthetic and political projection, albeit one with a narrative impetus. In science fiction novels, for example, the creation of the fictional world is most often designed as a platform to support the plot of the story. This is one reason why science fiction writers are so often critiqued when the 'worlds' they create appear to have been given more care and attention than the characters that inhabit them. An author can spend much time inventing alien languages or providing detailed blueprints for the organization of inter-galactic government structures, but even the most die-hard SF fans still tend to want to get something out of the characters and the plot of the story. It is not, then, simply through the application of 'texture' that a world is rendered inhabitable.

Some examples of renowned 'world-makers' in the literary realm include George R.R. Martin (*Game of Thrones*); J.R.R. Tolkien (who mapped out in great detail the worlds of his novels well before he sat down to write them up); J.G. Ballard (a significant reference point for contemporary artists working in the mode of the 'science fictional') and the American writer H.P. Lovecraft. One of the reasons why Lovecraft was so successful at making worlds is because, firstly, the mythology he invented to support his narratives (a whole history and cosmos of mythics beings; 'the old ones'; alien gods and alternate histories) was so detailed and comprehensive that it became a major attraction for his readers in its own right, over and above the plots of his individual stories. And secondly, Lovecraft deployed his mythology in a *serial fashion*. What I mean by this is that Lovecraft's mythology was used by readers to interpret his texts in relation to each other, as a series that was extended to include all of his work, even those texts that did not refer explicitly to what has since become known as 'The Cthulhu Mythos'.

A series is a linking principle; it is a sequence made out of a constellation of fragments, with each fragment projecting the totality of a whole. The serial deployment of a world across disparate formats and contexts makes it amenable to inhabitation because it leaves something open for readers or participants to hook onto and adapt. In order to remain durable, a world needs to be shared, and it needs to be built upon. It needs, in other words, to be paradoxically complete but fragmentary. It needs to have a modular frame.

What happens when we shift this world-making discourse across to the field of contemporary art? James DiGiovanna, in his 2007 article 'Worldmaking as an Art Form', proposes four criteria for determining whether or not world-making is a goal of a particular art work or series of works:

1) In the ideal case, there will be a series of works that use the same world
2) That world should differ noticeably from 'our' world
3) That world should have a geography and history of its own
4) That world can be enhanced in its difference by having physical laws different from our own [13].

This last reference to 'physical laws' ties in with Goodman's categorization of 'rightness', and it leads DiGiovanna to his most significant observation: that 'worldmaking is more concerned with creating the truth conditions for fictional texts than the creation of the texts' themselves [14].

I see so much of contemporary art reflected in this claim, particularly as contemporary art continues to grapple with the changing status of the object and the image as viable carriers of meaning. It is not hard to see that most artists working today are involved in much more than the generation of discreet objects or singular texts. They are also heavily invested in interrogating and indeed shaping the conditions by which one text can come into visibility at a certain time, while another simply cannot: a governing process that Jacques Rancière calls the 'politics of visibility', another way of pointing to the 'truth conditions' of an art work. Philip K. Dick knew this, writing in his journal in 1978 that 'We live in a condition, not a world', and admitting that what he liked to do most was to demolish the conditioning principles of 'reality' [15].

This is not, simply, then, a question of style. It is not a question of how artists handle their materials or choose their subjects or arrange their concepts in space and time. Inhabiting a work of art instead relies on an engagement with the 'truth conditions' that enable the work to come into existence in the first place – an engagement with the conceptual platform or the sensible structures that permit its exposure. This is perhaps why Bourriaud continues to insist that, 'What really good artists do is to create a model for a possible world, and possible bits of worlds' [16].

If Bourriaud is right, and I believe he is, then the key question to ask of contemporary art is now: could I live in the world that this work creates? What kind of world is it a model for? There is however one problem with this line of questioning. Although the world proposed by the art work does need to be sufficiently different from that of the viewer's to 'be' another world, the world is in itself so heterogeneous that the 'difference' posited in DiGiovanna's schema may be impossible to chart. How then, do we distinguish worlds from works?

Although DiGiovanna does provide some examples of art works to illustrate his claims, these are primarily role-playing collaborative fantasy worlds or online shared gaming spaces: forms with a limited application to my argument. I suggest that world-making is easiest to see in the works of artists that are 'comprehensive' and 'consistent' and 'cogent' (following Goodman's use of the term) – by which I mean works that are governed by a set of rules. These rules might be procedural, aesthetic, political (or all three), and their affects will be evident even if their existence remains completely unknown or opaque to the viewer.

There are numerous works that could serve as examples here (I think of works by Mike Nelson, Robert Smithson, David Lynch, Gordon Matta-Clark, or James Turrell), but I want to single out contemporary German artist Thomas Demand for particular mention. As is well known, Demand's process predominantly involves remaking found photographic images into life-sized three dimensional paper and cardboard models, which are then re-photographed and exhibited to scale as large glossy prints. This is a world produced entirely out of cardboard and paper, a world that resembles our own but is, to use DiGiovanna's words, 'sufficiently different' so as to constitute its own reality. Demand's world is serial; it has a history of its own, and its difference is 'enhanced' by the consistent application of alternate physical (and conceptual) laws.

A contrasting example might be found in Pierre Huyghe's *Untilled* (2012),

installed at Documenta 13. Built on a compost site as a weird counter-park in a park, *Untilled* generated a strangely addictive immersive environment in which natural and human-made elements were charged equally with an intense and un-locatable sense of intentionality. A dog and a human inhabited the grounds; psychotropic plants were hidden amongst the undergrowth and pollinated by a hive of bees living on a sculpture of a reclining nude. In constructing this other-worldly landscape, Huyghe located turtles and trees, imported ants and tadpoles, found concrete slabs and blocks, filled containers with water, and shaped earth and rocks. More important than these individual formal elements, however, was the work's creation of an atmosphere: an atmosphere so distinct, so clearly a fragment of an alternate reality, that entry into the grounds was like opening a portal to another dimension. This was clearly a world in and of itself, with its own gravitational pull, and its own laws of engagement. As Huyghe has admitted: 'As I start a project, I always need to create a world. Then I want to enter this world and my walk through this world is the work. What takes me a long time is to create the world' [17]. The rest is simply detail.

But perhaps the most urgent question that remains to ask of art as a world-making exercise is: why? Why is it important, right now, to distinguish worlds from works, and why are artists adopting the principles of world-making in their praxes? One possible factor might be that the world, as a singular entity or a representable form, no longer exists. This is certainly the answer that Jean-Luc Nancy would give – as he wrote in the beginning of his book *La Création du Monde ou la mondialisation* (2002), globalization has pluralized world vision to the point that the world has destroyed itself. For Nancy, the term 'the world' no longer has any sense application [18]. It has instead become an homogenizing fiction that disguises plurality and masks dissensus – the same dissensus marked out by Nelson Goodman's multiple worlds.

A second possible factor, closely related to the first, brings us closer to the intersection of art and science fiction. Science fiction is, at its core, both a conduit for world-making and a mode of thought. It is motivated by an ongoing acknowledgment that the sensible world – the world in which one lives and breathes – is mutable, and as such can be changed. This is the realm that artist Martha Rosler calls 'the what if': the world as a speculative proposition, a realm purpose-built for extrapolation.

For numerous contemporary artists, confronting the 'what if' or the 'mutability' of worlds often begins not with a question of delineation but of navigation: how to work with rather than work out the powerful tension between a limitless fantastical wilderness and the real business of being-in-the-world. The drive to generate and create science-fictional encounters, sensations and experiences, rather than simply illustrate science fiction narratives, has pulled science fiction off the page or the screen and into the here and now. In contemporary art, 'science fictionality' is often articulated in real space, in real time [19]. It unfolds amongst durations and spaces as a principle of engagement and of affect that questions the very platforms that permit its existence. Working through overlaps between fiction and non-fiction, the real and the imagined, science fiction is here valued for its capacity to construct alternate realities and affects out of the very stuff from which the present is made.

That art disorients in productive ways is critical, and speaks also to one of the founding definitions of science fiction by Darko Suvin: the theory of cognitive estrangement. In the early 1970s, Suvin suggested that one of the most revolutionary elements of SF is its ability to render *thought itself* strange, revealing the fragility of perception in the making of meaning [20]. Although this idea would no doubt have appealed to Goodman, it is clear that this kind of aesthetic and cognitive dissonance is not always a rigorously intellectual or even theoretical process. It is more often recognizable as a sensation, a kind of sensual, vertiginous pleasure invoked by the opening of chaos or the creation of a hole through which another reality might emerge. The new worlds of art, then, can they be accessed through the delirium of estrangement, through the vortices of science fiction, in 'no-knowledge zones'? [21]

Dealing with things not yet to come, with images charged with a state of future potential or spaces infused with a radical temporality, puts us in touch with the ability to imagine, and with the imaginary's capacity to build new worlds. This is an explicitly political process. As Australian contemporary artist Tom Nicholson has noted, world-making is 'something that is not only really important to art, but also to our behaviour politically. We need not accept the world as it is because we can imagine it – and reshape it – otherwise' [23].

References and Notes

1. On this topic see Amelia Barikin and Helen Hughes (eds.), *Making Worlds: Art and Science Fiction* (Melbourne: Surpllus, 2013). For an alternate reading see Terry Smith, 'Currents of World-Making in Contemporary Art' *World Art*, 1.2 (2011), pp. 20-36.

2. Curtis Carter, 'Nelson Goodman Remembered', http://www.aestheticsonline.org/memorials/index.php?memorals_id=6, accessed in 1 June 2013.

3. Nelson Goodman, *Ways of Worldmaking* (Indianopolis, Cambridge: Hackett Publishing Company, 1978), p. 6. For an alternate view on making as remaking, see Philippe Parreno: 'Are we confined to ways of describing whatever is described? Does our universe consist of these descriptions rather than of a world or of worlds? … There are people. There are stories. The people think they shape the stories, but the reverse is often closer to the truth. We can have words without a world but no world without words … So we are dealing with visions rather than descriptions'. Phillipe Parreno, 'The Invisible Ape Boy', in Daniel Birnbaum and Jochen Volz (eds.), *Making Worlds: 53rd International Art Exhibition*, (Venice: Marsilio Editori: 2009), p. 249.

4. Goodman [3], p. 17.

5. Philip K. Dick, 'How To Build a Universe That Doesn't Fall Apart Two Days Later', in Lawrence Sutin (ed.), *The Shifting Realities of Philip K. Dick: Selected Philosophical and Literary Writings* (New York: Vintage Books, 1995), p. 259.

6. Goodman [3], p. 19.

7. Goodman [3], p. 17.

8. Goodman [3], p. 19.

9. Nicolas Bourriaud, *Relational Aesthetics*, trans. Simon Pleasance (Dijon: Les Presses du Réel, 2002) p. 13.

10. Bourriaud [9], p. 13.

11. Goodman [3], p. 6.

12. Martin Heidegger, 'The Age of the World Picture', *The Question Concerning Technology and Other Essays*, trans. William Lovitt (New York and London: Garland Publishing, 1977), pp. 115-154. See also James DiGiovanna 'Worldmaking as Art Form', *The International Journal of Arts in Society*, 2.1 (2007), pp. 115-122, especially p. 116.

13. DiGiovanna 'Worldmaking as Art Form', p. 116

14. DiGiovanna, 'Worldmaking as Art Form', p. 116. Emphasis mine.

15. Philip K. Dick, in Pamela Jackson and Jonathan Lethem (eds.), *The Exegesis of Philip K. Dick* (Boston, New York: Houghton Mifflin Harcourt, 2011), p. 429.

16. Nicolas Bourriaud, 'Nicolas Bourriaud interviewed by Karen Moss', in *Stretcher* http://www.stretcher.org/features/nicolas_bourriaud_and_karen_moss/, accessed May 28, 2013.

17. Pierre Huyghe, in 'Romance', *Art21*, http://www.art21.org/artists/pierre-huyghe/videos, accessed 2 June 2012.

18. Jean-Luc Nancy, *La création du monde ou la mondialisation*, (Paris: Galilée, 2002).

19. Jean-Luc Nancy, 'Nothing but the World: An Interview with Vacarme', *Rethinking Marxism: A Journal of Economics, Culture & Society*, 19:4 (2007), p. 531.

20. On the idea of 'science-fictionality', see Istvan Csicery-Ronay Jr: 'This widespread normalization of what is essentially a style of estrangement and dislocation has stimulated the development of science-fictional habits of mind, so that we no longer treat sf as purely a genre-engine producing formulaic effects, but rather as a kind of awareness we might call science-fictionality, a mode of response that frames and tests experiences as if they were aspects of a work of science fiction'. Istvan Csicsery-Ronay Jr, *The Seven Beauties of Science Fiction* (Conneticut: Wesleyan University Press, 2008), p. 2.

21. Darko Suvin, 'On the Poetics of the Science Fiction Genre', *College English*, 34.3 (Dec. 1972), pp. 372-382.

22. No-knowledge zones: the term is Pierre Huyghe's. See Amelia Barikin, *Parallel Presents: The Art of Pierre Huyghe* (Cambridge, MA: MIT Press, 2012), 207, 218.

23. Tom Nicholson, in Ryan Johnston (ed), *Raafat Ishak and Tom Nicholson Proposition for a Banner March and a Black Cube Hot Air Balloon* (Shepparton: Shepparton Art Museum, 2012), 35.

VIRTUAL PUPPETRY ASSISTING THE ELDER'S LIFE REVIEW

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Abstract

This paper will describe "VoicingElder", an expressive storytelling platform for the senior population, using virtual puppets. VoicingElder combines reminiscent oral storytelling with virtual puppetry to develop a deeper understanding of self-worth. This form of storytelling through puppets is inspired by traditional Korean shamanistic ritual and the philosophy of han. VoicingElder aims to fuse Korean shamanistic ritual and twenty-first century virtual interactive technology to examine the current state of elder hood in Western culture, and to contribute in positive ways to the new elder hood that we face today.

Keywords: aging, mixed reality, virtual puppetry, reminiscence, life review, therapy, multimedia performance, interactive media.

In the United States and elsewhere, we are being challenged to develop a whole new phase of life called "elder hood." Today, millions of people can expect to live 25 or more years in relatively good health after retirement. This change in life expectancy inevitably coincides with great cultural change, and it is critical for our society to think about how to shape elder hood in ways beneficial to both the individual and community [1].

The stories told by seniors are rich material, full of memory, feelings, life lessons and wisdom. Many elders are skilled storytellers, recounting cultural knowledge gained from a lifetime of experiences. The written text of their stories would lack the kind of emotional connection and interpersonal interaction that oral storytelling can generate [2].

VoicingElder supports oral storytelling by using voice-activated virtual puppets that lip-sync with the user's spoken words in real-time, drawing the user into a transformative state of telling their own stories. The virtual puppets take the form of digital avatars that can be manipulated as projected images on a screen to help seniors recall their distant memories, feelings, and hidden emotions in their storytelling. VoicingElder follows the spirit of the Korean shamanistic ritual that sometimes use puppets as virtual mediators in the same way that VoicingElder creates digital virtual mediators. By using virtual puppets, VoicingElder enables seniors to give new voice to their own stories, exploring a rich state of mixed reality in their consciousness. It seeks to restore oral storytelling traditions in the digital age, adding the seniors' lifetimes of wisdom to a contemporary society. VoicingElder employs a methodology previously developed in other virtual puppetry projects, expanding the scope of the project to therapeutic interventions and community engagement. The project shifts the focus of virtual puppetry. Instead of a performance undertaken by professional storytellers, VoicingElder is a resource that is available to diverse audiences as a form of entertainment, self-expression and healing. In future versions, the system may become available as an open source product.

The conceptual background of the project draws from many fields, including the psychology of aging and Korean culture. The project explores the transformation of emotional states and identity in the context of ritual. Adaptations of Korean shamanistic rituals prompt certain emotional and reflective states in the user, as happens to the shaman's consciousness in a traditional ritual setting. The integration of ritual elements with virtual interactive technology creates a participatory, multimedia form of reminiscent storytelling, intended to promote therapeutic effects. Through its exploration of seniors' psychology through new interdisciplinary applications, Voicing Elder has the potential to connect with fields such as psychology, gerontology, education, and social work.

Virtual Interactive Puppet

In the previous version of our Virtual Interactive Puppet, the user controlled the puppet through their voice and by shifting their weight balance. When the puppeteer spoke into the microphone, their voice changed the mouth, body and facial expression of the 3D virtual puppet in real time. The live sound data was applied to the puppet's mouth, body and texture with different types of sensitivity and controls. These expressions continuously helped the puppeteer to improvise in his or her oral storytelling.

As the puppeteer controlled the virtual puppet in real time, the puppet seemed to come alive. The illusion of language adds significantly to the life-like aspects of the puppet. The sign system of speech is vitally important to allow people to imagine that the puppet possesses life [3].

During the performance, the puppeteer carefully watched the puppet's interactive response on screen. The performer "faces" the puppet, as the puppet's response gradually motivated the performer's storytelling inspiration. The audience should be located between the performer and the puppet, thus placed physically, and

Fig. 1. Example of Virtual Puppet Installation. (© Semi Ryu. Photo ©Rosemary Jesionowski.)

spiritually, between this spiraling inner dialogue of the puppet and the puppeteer.

In VoicingElder, the current iteration of this project, we add a new kind of facial recognition to the puppet. Facial recognition allows the puppeteer (the senior) to be immersed more fully into an emotional connection with the puppet. The virtual puppet may look like the puppeteer's younger self, a member of his or her family or an imaginative character. The puppet's face can take on any appearance the senior wishes, thereby allowing the user to play different roles. This stimulates his or her memory in the life review process of reminiscence therapy.

In future versions, the software could generate a generic idea of the dialogue topic through a combination of speech recognition and simple text classification. This opens the possibilities for appropriate graphic and acoustic feedback for perceptual developments in the human psyche.

While exploring variation in virtual interactive space and computer techniques supporting oral storytelling, VoicingElder actively incorporates objects or props from actual space (such as photos, candle light, or a chair) that create mixed reality performances to assist the elder's oral storytelling process.

VoicingElder is currently being implemented at A Grace Place Adult Care Center in Richmond, Virginia. We plan to start working there in Fall 2013, with the seniors acting as storytellers. The seniors may also be given opportunities to perform in various public locations beyond the senior center, such as public libraries, elementary schools, auditoriums, and theatre and gallery spaces.

The Aging Psyche and Mode of han

In Korean culture, han is the most important characteristic of the mind and emotions [4]. Han is a paradoxical state of consciousness that combines an extreme state of grief caused by physical or mental constraints with a great hope and strong desire for overcoming the situation [5]. Korean shamanistic ritual begins by recognizing inevitable constraints. In the moment of recognizing this irremediable distance, we confirm our own tragedy in the mode of han, with extreme grief but with a strong will to overcome. Han thus drives the process of ritualistic transformation. Han initiates the process of ritual where polar opposites begin to interact and interpenetrate, eventually transforming into each other.

VoicingElder considers the experience of seniors as being at least akin to han, and seeks to mediate the distance between the true self and the socially constructed image, between the lived body and the biological body, between the ageless body and the aging body, and so forth [6] [7]. VoicingElder facilitates transformation of seniors by using a contemporary ritual object: the virtual puppet. In the case of traditional rituals and of VoicingElder, the process does not lead to a resolution of the issues being explored. Rather, it returns seniors back to the starting point: the reality in which it seems nothing has been changed at the material level. However, a crucial change has occurred in human awareness. In VoicingElder, the hope is that seniors and their audience (their family and others) will be left with a greater awareness of the value of lived experience.

Han informs the human dilemma of living in a society of controls, confronting the separation and distance of everyday life [8]. We can find han in the consciousness of elders when they begin to feel a discrepancy between their perceived identity and social identity suggested by society [9]. Seniors live in mixed reality between phenomenological and social layers of their body and identity. The unavoidable limitation the elder experiences as he or she perceives daily life activates important realizations and potentialities. The emotions that arise in such a limbo state might be confusing and paradoxical: a chaotic mixture with rich tensions. The mixed emotions found in old age are similar to the emotional character of han. The mixed emotions of seniors may actually bring them more stability and a stronger sense of well-being if they have the opportunity to express and ritualize their experiences through their storytelling. VoicingElder can provide the platform for this transformative process. When human beings are aware of their limitations, time constraints and bodily constraints, the emotional experience is rich and complex, like joy and gratitude mixed with sorrow [10]. An acceptance of complex emotions has the potential to generate a desire for self-actualization, as shown in the Korean notion of han.

If a senior has the ability, and the resilience, to tolerate the tensions of his or her chaotic and unanswered states, then VoicingElder can offer the chance to use those tensions for creativity. VoicingElder facilitates the exploration of the layers of mixed reality between a virtual puppet as virtual body and the puppeteer as actual body. The puppeteer faces the virtual puppet, and the puppet mimics precisely the puppeteer's voice and facial expression. The virtual puppet constantly speaks and sings back to the puppeteer through real-time echoes and mirror reflection. The puppet's response gradually motivates the puppeteer's storytelling inspiration. The puppeteer is dynamically transformed into the puppet, creating a complex reality state of neither virtual puppet nor puppeteer.

Korean experiential reality emerges from understanding han. It is about lightening the weight of actuality in order to open the infinite space of full potentiality. Although the popular assumption in the West is that old age means disempowerment and marginalization, Bianchi suggests that the opposite is true, that seniors can live in a more authentic experiential way than when they were younger, because their expectations have changed [11]. Older people's understanding of their lives, their bodies, and of time, is different from that of younger people, in ways that may make them more open to a sense of wellbeing [12]. This renewed understanding of one's own life and experiences echoes aspects of Korean experiential reality and Korean shamanistic ritual. In the Korean shamanistic ritual, han is required and even celebrated. If one continuously "fills" oneself, one becomes overloaded—too heavy to fly. Taoist Lao-Tze tells us to empty ourselves until we are light like a feather, and then "being itself" will find its place in the void. Emptiness will take us up to the sky, to the infinite space of meta-reality where we may find being itself— in potentiality [13]. In this space, emptiness will shift into fullness. The void will be filled. This is the paradoxical state of Heo-Lyeong-Chang-Chang—completely empty and completely full [14]. It is the Korean experiential reality in continuous conflict between the actual and the virtual; the chaotic state of neither here nor there—a quantum state of paradox. This state is what the author calls an "active void," an ontological journey of taking flight—continuously dreaming, desiring, and eventually transcending the sky.

Reminiscence and Oral Storytelling

For seniors, telling a story has many dimensions: It heals their mind through remembering, expressing, re-contextualizing and being listened to by another person. Storytelling is an important channel for their communication with the community. Reminiscence therapy is one form of treatment that is known to reduce dementia and Alzheimer's disease through the life review process. Reminiscence helps the patients to remember and play with their memory, giving them a sense of relatedness and connection [15].

Furthermore, storytelling and reminiscence are enormously important processes in old age because they nurture intergenerational sharing and communication, and allow seniors to express and strengthen their identities as they review their lives through their memories [16]. When seniors tell stories and share

reminiscences, they share themselves. Past events and experiences are brought into the present day, not with historical or factual accuracy, but in a warm, lively, engaging way. Younger people can gain from the wisdom of older people, learn about the past, and even begin to imagine themselves in old age. The process has emotional benefit for older and younger people.

VoicingElder offers diverse ways for an elder to search for their memory. The primary way is the virtual interactive puppet speaking the user's speech. Other ways would vary by situation: text, visuals or sound feedback provided randomly or activated by some spoken words, content or emotional tone of the live speech. In some cases, the virtual puppet might be customized and programmed with information from the puppeteer prior to the performance, involving the collecting of user's items: photos, music, letters, and so forth. Those materials could be digitized and appear as a part of the virtual space, triggering the user's memory during the live performance. For example, faces in photos could be tracked and captured by computer and placed on top of the virtual puppet as texture. Text from a letter could be digitized and appear on screen during the performance. Music could be played and generated, evoking certain events and places. Pictures of objects might be displayed in virtual space, triggering different aspects of memory. The use of objects is known to be especially useful to prompt memory when working with people who have dementia [17].

In primitive oral cultures, the elder's oral storytelling functioned as an intergenerational education process, delivering experiential knowledge, values and passion from generation to generation [18]. In a similar vein, VoicingElder uses virtual interactive technology to nurture intergenerational relationships, benefiting seniors and younger people and the society as a whole.

References and Notes

1. E. Bianchi, "Living with Elder Wisdom," Journal of Gerontological Social Work (The Haworth press, 2005), p.45.

2. J. Archibald, Indigenous Storywork: Educating the Heart, Mind, Body, and Spirit (UBC press, 2008) p.93.

3. S. Tillis, Toward an Aesthetics of The Puppet: Puppetry as A Theatrical Art (Greenwood press, 1992) p. 24.

4. S. Choi, "Korean Psychology of Shim-Jung: Phenomenological understanding of Jung and Han," Dae-Wei Symposium (Seoul: Korean Psychological Association, 1993) pp. 7-8.

5. Semi Ryu, "Searching for Love Impossible" Technoetic Arts, Vol. 8, No.2 (Bristol, UK: Intellect, 2010) p.235.

6. Eileen Fairhurst, "Growing Old Gracefully" as opposed to "Mutton Dressed as Lamb": The Social Construction of Recognizing Older Women. In the body in everyday life, S. Nettleton and J. Watson, eds. (London: Routledge, 1998) pp. 258-275.

7. C. Faircloth, Aging Bodies: Images & Everyday Experience (Oxford: Altamira press, 2003) p.81.

8. Semi Ryu, "Searching for Love Impossible," Technoetic Arts, Vol. 8, No.2 (Bristol, UK: Intellect, 2010) p.233.

9. C. Faircloth, Aging Bodies: Images & Everyday Experience (Oxford: Altamira press, 2003) p.81.

10. J.E. Roberts, & I.H. Gotlib, "Temporal Variability in Global Self-Esteem and Specific Self- Evaluation as Prospective Predictors of Emotional Distress: Specificity in Predictors and Outcome," Journal of Abnormal Psychology (1997) p.106, pp.521-529.

11. E. Bianchi, "Living with Elder Wisdom," Journal of Gerontological Social Work (The Haworth press, 2005), p.322.

12. M. Ross, "Relation of Implicit Theories to The Construction of Personal Histories," Psychological Review (1989) p.96, pp.341-357.

13. Yong-Oak Kim, Noja and 21st Century vol.1 (Seoul: Tongnamu, 1999) p.192.

14. Sang-Il Kim, Donghak and process philosophy (Seoul: Jisik press, 2001) p.279.

15. R. Coaten. "Exploring Reminiscence through Dance and Movement," Journal of Dementia Care (The Benevolent Society, Sept/Oct 2001)

16. Reminiscing Manual version 1(The Benevolent Society, 2005), ABN 95 084 045: 3.

17. Reminiscence Therapy Kits: manual for divesional therapists and activity coordinates(St. George Regional Museum ,2004).

18. J. Archibald, Indigenous Storywork: Educating the Heart, Mind, Body, and Spirit (UBC press, 2008) p.93.

RE-FRAMING NATURE

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Abstract

This paper is focused on historical human interventions in the environment, questioning: Why have we not learned from crucial precedents? Are we able to 're-Frame Nature', to mend, to any extent, some of the damage done? It proposes an underlying correlation between the diversity of perspectives as a way of indexing Humankind's relationship to Nature on a social and cultural basis. Nowhere is this more apparent than in Eco-activist art, which is able to re-Frame complex issues so that they maintain essential meaning, while the process itself facilitates changes in social attitude towards the environment, mainly through positive social innovation.

Keywords: nature, ecology, interventions, eco-activism, Eco-Activist art

In 1982 Agnes Dienes planted a 2-acre wheat field in downtown Manhattan. Her work fittingly illustrates the notion of 're-Framing Nature', in this case reaffirming a rural landscape in an urban setting. The act retains its resonance over three decades later, and is in line with the contemporary Eco-Activist (also described as Environmental Activist) Art movement. In keeping with the notion of 're-Framing', this text refers to human intrusion in Nature, and active reaction to this by art activists. While the history of environmental concerns dates back hundreds of years, a wider awareness emerged out of the Industrial Revolution in the nineteenth century, and led to contemporary social movements.

re-Framing can be defined as the process of changing the way a concept is presented so that it maintains its essential meaning but foregrounds a far more intricate situation. In this context, Nature may be considered as the world of living organisms and their environment. In a wider sense, Nature can also be understood to include particular aspects of space and time. Visual perspectives on Nature form a very specific thread that begins with the earliest depictions of Nature, continuing in various guises throughout time, and expressed today by significant art works. While today the media as well as the general public seem preoccupied (and rightly so!) with current ecological disasters, climate change has been a compelling factor in social collapse around the world for many centuries.

Over twenty centuries ago, Aristotle's pupil Theophrastus speculated on how "the draining of marshes had made a particular locality more susceptible to freezing, and he hypothesized that lands became warmer when the clearing of forests exposed them to sunlight" [1]. Only lately, however, has it been recognized that social communities have often destroyed the sustainable basis of environmental resources on which their own societies depended. A number of famous historical examples eloquently described by Jared Diamond include Easter Island, the Mayan Empire, locales in the Middle East, and the Viking colonies in Greenland [2]; and we know that, due to ill-considered planning, many of the great forests of the Middle East practically disappeared nearly two thousand years ago; the great cedar forests of Lebanon, for example, mentioned in the Bible and other contemporary accounts, simply no longer exist [3]. The trend to clear-cut (to log an area by removing all of the trees) still persists. Between 2000 and 2008, more than 150, 000 square kilometers of rainforest were cleared in the Brazilian Amazon [4]. Clear-cutting in California's world famous Redwood forest began in the early twentieth century. By the 1950s, mills were sawing more than a billion board feet of lumber a year, a level maintained until the mid-1970s; today less than 5 percent of the roughly two million acres of virgin forest remains, mostly in parks and forest reserves [5]. Jared Diamond also notes that past peoples were not ignorant, bad managers who deserved to be exterminated or dispossessed' they were people like us, facing problems broadly similar to those that we can't solve today, and were prone to succeed or fail depending on circumstances somewhat similar to those we now face.

The risk of an impending ecological collapse is an increasing concern on a wider level, especially as the environmental complexities confronting us today include some of the same factors that ruinously destabilized societies in the past. From this perspective, questions still remain to be answered. What made some societies especially vulnerable? What were the solutions that succeeded in the past? For instance, Aboriginal people in Australia, as Bill Gammage discovered, managed the land in a far more systematic and scientific fashion than European colonists and their descendants realized [6]. What can we learn from bygone cases, and from the messages (and warnings) that arise in the present? These questions remain important to us, and are being partially answered by artists interested in eliciting reflection on the fragile nature of Nature itself.

The dramatic shifts in representation of Nature over centuries have often been linked to complex religious, commercial and social considerations, the details of which are outside the scope of this text. Since the second half of the twentieth century there has been a critical transition from passive representation to art which 'fashions' nature, including Land Art. Lately, a critical discourse has emerged concerning environmental damage caused by some famous Land Art projects. Robert Smithson's celebrated Spiral Jetty, for instance, inflicted considerable, and permanent, damage upon the landscape. Glenn Harcourt noted, in his essay on the Ends of the Earth: Land Art to 1974 exhibition (MOCA, Los Angeles): "Artists like Robert Smithson and Heizer, for example, must always have been aware that their contest with the earth and its entropic forces was an asymmetrical one, in which even the displacement of 240,000 tons of rubble was in the end but a doubly negative and heroically impotent gesture" [7].

Patrick Blanc's vertical garden [8] is one among the thousands of ecological art projects reminding us of the ways in which we need to take increasing responsibility for our interventions in the natural environment, by re-Framing our perspectives, and our relationships with the world around us.

What is the direction of new art that seeks to acknowledge both the tensile strength and the hard fragility of the natural landscape? How are artists moving forward in limiting our impact on the landscapes around us, while celebrating their unique panoramas as a frame of conceptual analysis? Returning to the Redwood clear-cutting issue, Julia 'Butterfly' Hill, a well-known E-activist, spent 738 days over 180 feet off the ground, on a tiny, hand-built platform in an ancient California Redwood tree, to prevent loggers of the Pacific Lumber Company from cutting it down [9].

From New Zealand to Estonia, Eco-Activist Art has attained global visibility over the last decade. Many of the artworks, of various sizes and diverse materials, are presented outside the 'white box' of conventional gallery space.

The full range of these initiatives is outside the scope of this essay; sufficient to note that from "A Laboratory On The Open Fields" in the Czech Republic [10]

to the “Micronation/Macronation Project” by The House of Natural Fiber in Indonesia [11], Eco-Activist artists are continually and consistently producing and exhibiting, and remain fully engaged with the public.

These initiatives both question and confront the ways in which we have interfered in the natural environment. They remind us to remember, reflect, reconsider and ultimately re-Frame how we relate to the world around us. Moreover, such artists increasingly take on the role of alternative knowledge producers, involved in developing different models and presenting issues that are marginalized in mainstream culture. While Eco-Activist art is finding a foothold within the artistic domain, the question remains is this enough? Presently, I (along with many others) don’t find simple answers to these burning questions.

References and Notes

1. Theophrastus, *Enquiry into Plants* 1926 Vol. II. Loeb Classical Library, pp. 390-433

2. Diamond, J., *Collapse: How Societies Choose to Fail or Succeed*, London, England: Penguin Books Ltd., 2005

3. Lebanon Cedar http://www.blueplanetbiomes.org/lebanon_cedar.htm Accessed September 7, 2013

4 .Clear cutting http://en.wikipedia.org/wiki/Clearcutting Accessed September 7, 2013

5. Redwoods http://ngm.nationalgeographic.com/2009/10/redwoods/bourne-text/5 Accessed September 7, 2013

6. Gammage B., *The Biggest Estate on Earth*, Sydney, Australia: Allen and Unwin, 2011

7. Harcourt, G., *Ends of the Earth: Land Art to 1974, Michael Heizer: Actual Size and Actual Size: Munich Rotary, Michael Heizer: Levitated Mass*

http://x-traonline.org/article/work-site-world-rethinking-michael-heizer-through-ends-of-the-earth/ Accessed September 7, 2013

8. Patrick Blanc, Vertical Garden http://www.verticalgardenpatrickblanc.com/ accessed September 7, 2013

9. Butterfly Hill, J http://www.juliabutterfly.com/en/ accessed September 7, 2013

10. ALOTOF SummerLab <http://www.summerlabnantes.net/> accessed June 30, 2013

11. HONF House of Natural Fiber ‘Micronation/Macronation’ http://ix.natural-fiber.com/ accessed June 30, 2013

A thousand tiny interfacings: fertile acts of resistance.

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Abstract

This paper examines the process of interfacing between organic and technical objects and how this might be utilized as a tactic to promote invention within new media art events. Raphael Lozano-Hemmer's Relational Architecture is examined in relation to concepts of parasitic action and folding to show how the work develops a complex ecology of relation through interfacing.

Keywords: Interface, parasite, folds, concretization, ecology, autopoiesis, relation.

1. Introduction

These spaces between are more complicated than one might think…less a juncture under control than an adventure to be had. Michel Serres [1]

Philosopher Brian Massumi has argued that the interface is an unsustainable concept within a process-centered world. As a 'privileged site of mediation' within a system, he argues, [2] the idea of the interface as a prime site of creativity and interaction denies what in process philosophy might be seen as the relational nature of all entities. Massumi's philosophical stance emphasizes the 'primacy of processes of becoming over the states of being through which they pass' [3], that is, the fact that any entities that are interfacing with each other are themselves composed of relations. As such, discrete interfaces are problematic in that they might be seen to imply a world inhabited by ideal, internally stable objects, between which interactions occur. The interface's role, in such modes of thinking, is to rejoin entities that are by implication discrete, and the complexity of continued unfolding and relation to the dynamic virtual or potential is then greatly diminished.

There is indeed much to be critical of in the privileging of the interface. As Massumi notes, it can promote a naïve excitement in 'the joy of connection' and undifferentiated flows of information, an unquestioning, utopian promotion of 'interface, for interfaces' sake' [4], that fits in perfectly with Capitalist models of circulation and surplus-value [5]. To this one might add the cybernetic conflation of biological and technical of which Simondon is so dismissive [6], which Massumi describes as the 'industry philosophy' [7]. This extension of the 'prosthetic function' of the interface is utilized as a method of controlling 'a relay point in the dissemination of human ordering activity into space…transform[ing it] into a realm of expansion onto which the human projects itself', with real difference erased as the body 'disappears behind a techno-logical shield' [8]. This subjectification of the technical object, Munster has pointedly termed 'interfaciality', a codification as face to face, rather than body to machine relation [9].

Nevertheless, the primary sticking point for any level of discussion of the interface within process philosophy remains that its distinctive identity relies on it being a privileged site of interaction within an otherwise inert representational system. In this paper I want to attempt to show some ways in which one might think through the process of interfacing as a creative force within an art event without succumbing to the type of static, representational models of which Massumi is justifiably critical.

To do this I am going to examine a particular incidence of interfacing that occurred in Raphael Lozano-Hemmer's work *Re:Positioning Fear: Relational Architecture 3*, (1997), in order to consider ways in which some unplanned interfacings between a public and the technical assemblages of the work helped to develop a greater level of both self organization and openness in the event. But, while I am certainly going to suggest in this paper that an interesting shift in agency in the work occurred, moving from those preconceived by the artist to a new shared and emergent agency developed through an interfacing of a public bringing their own intentions and tonalities to the event, I do not wish to overstate the uniqueness of the case. Certainly, as Lozano-Hemmer has said, the events were significant in his rethinking of the ways in which he staged further *Relational architecture* iterations [10], however this does not necessarily imply that the occurrences were particularly out of the ordinary for such large-scale interventions, which are necessarily always composed of multiple and often contradictory intentions and forces, and can potentially head in numerous directions, both predictable and surprising. Rather, the example provides an opportunity to consider some of the creative potential of interfacing and its ability to complicate the event. I want to use this work to rethink the place of the interface within the paradigm of process philosophy, and to put it to productive use as a differential tactic within an art process. Here I will propose that the interface might provide a logic of self-regulation capable of internally driving the creation of intensities of resonance or disturbance through connection.

2. Interfacing

I propose to begin by thinking temporally rather than spatially, by thinking of these interfaces as moments rather than points of action or relation. This suggests that the interface might now be thought of more as a process of interfac*ing*, as an unfolding or contingent process within a larger nexus of relation, as an in-action moment of intensity of disruption, contrast and invention rather than a privileged or static position within an art event.

Here I will briefly consider the idea of an art event as a machine producing transductions of forces, before attempting to unpack the creative role of interfacings in *Re:Positioning Fear* by suggesting that interfacing might productively parasite, fold or concretize; three different, though sympathetic, concepts concerned with intensive organization and creativity.

2.1 Differential machines

In this paper, I am going to use the terms 'body' and technical object' in specific ways. Following Katherine Hayle, the 'body' referred to here is in no way limited to the subject or to a fixed or post-individuated stable entity, but can be taken to be always in-process, corporeal and enactive rather than 'the body' in any coded sense [11]. This is in sympathy with Deleuze and Guattari's notion of a body as 'a discontinuous, non-totalized series of processes, organs, flows, energies, corporeal substances and incorporeal events, intensities and durations' [12]. Similarly the term 'technical object' as used here implies not a fixed object in the material sense, but is used to address a technical or non-biological entity that is itself capable of becoming, leaving the term 'machine' open for another use.

Machines, as Guattari tells us, are any systems that produce an effect; they function immanently and pragmatically

[13]. Massumi, in expanding on this notion, explains that they are 'not subordinate to utility or laws of resemblance' [14]. Guattari's concept gives us three potentially useful ideas that help to expand the concept of the machine, in a decidedly non-humanist direction. Firstly, the need for an understanding of the role that the wider ecology in which technical objects are embedded (or with which they unfold) has in determining what potential is actualized. Machines here are 'proximity grouping[s]… [of] man-tool-animal' [15]. Secondly, an understanding Guattari perhaps shares with Simondon that machines inherently contain potential beyond their immediate actualization, 'ontogenetic elements' [16]. That is, they are held together not so much by any physical bond, but by a shared virtual milieu, as an 'assemblage of possible fields' [17] that develops through the process of concretization. Thirdly, that we must consider machines not through utility or representation, that is, as not being 'limited to [their] materiality or functionality' [18], but in terms of their productive capabilities. Guattari's conception of the machinic here shifts the assemblage from 'what is it composed from/what is it an aggregate of?' to 'what does it produce?'

Such machines, as Munster states, operate to produce and regulate flows between the poles of movement and organization, between the qualitative or diagrammatic and concretization [19]. Thus perhaps one might propose that they are producers of the transduction of force: of a process by which such 'an activity sets itself in motion' at the same time as it generates 'processes of modification' [20].

2.2 Transduction

It is perhaps common to think of interfaces as translators of code, points of information exchange, from digital to analogue or visa versa, or as a 'point of contact where humans and machines meet in order for exchange to take place' [21]. However to assert the primacy of the flow of forces rather than the secondary exchanges of text, transduction, I would argue, is a better way to fully think the event of interfacing. That is, as this paper will discuss below, transduction positions interfacing as the integration, through the flow of forces of differing viscosities, of formerly disparate things within a becoming-concrete system [22].

An art-event might be such a machine: regulating and producing affectual flows, a 'machinic of expression rather than a signifying apparatus' [23], a producer of movement or difference [24]. This, I want to demonstrate, positions interfacing as a prime creative force-form, for, as Deleuze states, 'difference, potential difference and difference in intensity [is] the reason behind qualitative diversity' [25]. Seeing interfacing as a machinic action implies a shift in the design of art events to emphasis their machinic potential: their productive capacity or capability to produce difference, rather than for their aesthetic qualities. It is this operation of the interface as a *differential machine* that the rest of this paper addresses through an unpacking of *Re:Positioning Fear: Relational Architecture 3*.

3. *Re:Positioning Fear*

Re:Positioning Fear consisted of an orchestrated shadow dance composed of a projected conversation thrown onto the architecture of the city that was made visible within participants' shadows that were also cast on the surface, creating silhouettes of differing sizes depending on their distance from the light sources.

As Andreas Brockman writes [26], the work initiated a dynamic 'social interfacing', constructing a 'fragmented and heterogeneous system of engaging different publics in a variety of specific ways' [27]. Here Lozano-Hemmer, as he often has, employed the bodies of the participants as disruptive 'performed' interfacings [28] within a machine composed otherwise of technical objects. This melding of technical objects with the unpredictable input of a public presents one possibility of providing the technical elements with an expanded potentiality, with the interfacing body playing the role of 'transducer between machines' [29]. Here the connection between biological and technical objects was a tactic to *generate* difference, not collapse it, to produce ruptures or gaps in the process of 'dephasing', (in which a stable identity is delineated from ongoing processes of becoming).

3.1 Parasitic noise

But in the case of *Re:Positioning Fear,* a more interesting and radical disruption occurred in the unfolding of this work (which was already primed for playful intervention and evolution). It was in this catalyzing moment when, through parasitic action, a new and more complex machine was produced. Alongside the positioning of their shadows on the façade to activate the hidden text, participants began to synthesize a different work out of the components by engaging specifically in play between their projected silhouettes. Here they utilized the potential to radically alter the size of their shadows to engage creatively with one another. For example, a wheelchair bound participant created a giant image of himself and ran down everyone else [30], while other participants played with puppet mastering smaller shadow bodies and with the making of multi-limbed combinatory beings [31].

The 'parasite' as described by Michel Serres, is an inherent noise in a system of relations that forces into existence new logic, new combinations, and new orders of exchange [32]. It disrupts as it produces something else (excessive) through its (mis)translation of relations, composing an indeterminacy within any event of relation.

This free shadow play was, I would suggest, a kind of parasitic noise feeding off the energy already flowing through the work to create new paths, expressively [33], and to creatively bifurcate relations. That is, it was an action that both continued to qualitatively express something of the original relation (moving shadows revealing text on the building's surface), while at the same time producing a new relation through the same initial forms. The contemplative and reflective rhythm of movement in the large-scale text was overlaid with the noise of a quick and teasing play of shadows, creating a tension, a clash of intentions and tonalities: gaps and miscommunications.

These parasitic actions existed on multiple levels, at different scales; they operated throughout all the transductions of form-force taking place, wherever interfacing occurred, producing excess. For example, as bodies overtly disrupted light to create new imagery, there was also a more subtle disruption of intention, with the artist's intentions (or perceived potential

of the work) interfacing with the participants' disparate motivations to create a third, more mobile position, composing an indeterminacy within prescribed events of relation.

Parasitic machinics produced not a linear evolution of the work, but rather enabled 'processes of connectivity and interpenetration...[and] the fostering of specifically transversal connections' [34]. This parasitic action of interfacing was an agent of difference in that it continued to re-express (transduce) relation. It kept the event always on the point of splitting and moving into multiple new forms, suspending it in unfolding differentiation. Again, this is not unusual within works such as this designed to accommodate interference. Perhaps what is notable here is the degree to which such disruptions overtook the original structures.

3.2 Folds - the vibration of the incompossible

If parasitic action was in a sense a continual performed splitting of relation, the interfacing that occurred in *Re:Positioning Fear* might also perhaps be thought of as producing difference through connecting, through incitation or a 'dynamics of infection' [35] that worked to prolong and complexify. That is, through a folding of technological objects and bodies in interfacing something new was produced (art). As Murphie writes, this is a doubling that technologies can perform [36], in this case the body becoming-with the lights, the façade becoming-with shadows, portraits becoming-with movement and so on. This folding, rather than collapsing difference to produce a new homogenous history or façade, produced through multiplication new singularities that were performed alongside, throughout and in the gaps of the previously existing iterations. Folding could be seen here to be powerful in both the creation of actualized and *potential* foldings that the interfacing opened up; a bifurcating of future unfoldings that resonated within the event.

Interfacing here was a performative act by which the machine continued to re-fold its internal systems. It was also a machinic action folding elements outside itself into its workings, and these actions created, as Deleuze says, a 'forced movement' or 'internal resonance' within the system [37]. Thus it was a tactic that re-immersed or re-saturated the event with the virtual as it implicated machinic components in each other's becoming through an ongoing process of variation and re-articulation.

But I want to suggest that the more radical folding occurring in the interruption of *Re:Positioning Fear* through the re-commissioning of the shadow making machine might be seen as a fold of the outside. The 'outside' here is force in non-relation [38] (itself a disruptive gap in the relational field), that 'eats into the interval and forces or dismembers the internal' [39]. This can produce 'trans-formation…to the composing forces, [which] enter in to a relation with the other forces which have come from the outside' [40]. The participants' shadow-body play was an outside of the event (not a potential), which was folded into emergent relation, at the level of force as well as form. By trans-forming forces shaping the event this folding transformed the affects of the event, since affect is what is experienced in the transduction of force [41]. The new affective tonality that was folded into the event coursed through, transducing, infecting all the systems constructing the event.

This outside, seen as the 'incompossible' (that which was excluded or divergent from the event [42]), defined the limit of the event [43]. *Re:Positioning Fear* had limits defining its concrescence both in the types of performances it produced and the potential from which it was drawn (various potential mutations of shadow playing with text, for example). The introduction of a whole new outside tactic of production through connections between participants co-composing relations together via the interfacing of their shadows then delimited the *Re:Positioning Fear* event. The tactic initiated new performances and fields of potential to compose with, even as it continued to drive towards its previously instigated concrescence. In redefining the limits and potential of the event, this folding of the incompossible was a more radically differential act. Such folding was, again, a positive generator of multiplicities of difference [44]. This difference was evident not particularly in a shift in the utility or materiality of the technical objects and other components of the assemblage, but as a force of qualitative change, of affective tonality. Interfacing here might be viewed as a vitality affect on a force, producing a felt moment of creative differing.

3.3 Concretization and the virtual

I want to suggest that it was through these particular interfacings that the machine of *Re:Positioning Fear* underwent a process of concretization. Processes of concretization shift systems from a limited, linear or closed functioning towards self-regulation and sustenance, and, consequently, towards a 'solidarity of openness' (that is, an increase in self-generative capacities) [45]. *Re:Positioning Fear* shifted from a fairly linear production that was to a certain extent its externally instigated functioning, towards the self organization of a new event that was less reliant on the artist's conception of the event or on the original conceived utility of the technical objects. That is, the system moved from a more 'abstract' configuration, to a self-modulating model. The work's differential tension became an intrinsic component in its production and consequently its processes became more circular. That is, the machinic components invented more co-dependant ways of interacting, and a 'recurrent causality' evolved that is characteristic of concretization [46]. This individuation was shared between components, drawing them into concrete machinic process through the evolution of a shared associated milieu.

Interfacing here might be seen to have incited a phase or register-shift through transduction [47], implicating the external. That is, a complexity beyond simple intensive disruption occurred. While the machine's modulations were driven by the compossible actions of the bio-technical interfacing, these radical interfacings acted more significantly on the system. They were capable of rearranging both how the potential combinations actualized *and* of creating completely new milieus. More than modulating transduction, a new machine was produced from the field when the system passed a 'threshold of [qualitative] intensity' [48], forcing new flows, with their attendant individuations, to begin.

With such a shift the machine developed new transductive potentials

between the internal and external (the field), a 'charged grounding' [49] of the two. That is, the connection of internal spacing and external contrast in dynamic virtual relation created a larger machine ecology [50], a 'conversation' between them that gave new dynamism to the event, another scale on which it was self-modulating. Not only the event, but also the *field itself* had changed. *Re:Positioning Fear* had changed its nature, not just by actualizing a previously un-actualized potential, but by rewriting the very field of potential available to it, generating emergent difference.

4. Conclusion

The shifts that occur in *Re:Positioning Fear* as a result of interfacing were both materially (ontologically) slight and processually (ontogenetically) significant. What the participants brought to the event that instigated such a shift was in a sense no more than a new intention, or perhaps even less distinctively, a new tonality that infected the work to produce something new. This is not to suggest necessarily that what it shifted *to* was in itself significant, but that the way that interfacings performed such a shift was of philosophical and artistic interest, in that it provides a potential tactic towards the thinking of more autopoietic, and therefore open-ended systems of interactivity, suggesting a potential machinic, 'minor' art event, concerned less with signification than a collective becoming [51].

This interfacing was performed, not, one can say, ever entirely by either the biological nor the technical systems making up the machine, but by the machinic action producing also the potential ruptures and the uncertainty of an evolving dynamic virtual that was its fertility. Here the further potential of interfacing remained present even as it was enacted. It perhaps remained as a 'lure' towards feeling, as a pull towards the future [52], a pre-relational tendency towards affectual relation.

Interfacing here was propositional of differentiation, attuning the conditions for potential trans-force-form events; luring multiple transductive events into being. The event, one might say, answered Stern's call for interactive art to move away from privileging signs and images at the interface and the demonstration or fetishization of the technology in the work. Instead it engaged, as Stern proposes, 'with the quality and styles of movement' that were performed [53], with the invention of (new) styles, with the implicit, the potential, to construct new ways of relating through interfacing.

References and Notes

1. Michel Serres & Bruno Latour, *Conversations on science, culture and time*. (Ann Abor: University of Michigan Press, 2011) p.70.

2. Brian Massumi, "Interface and active space: human machine design", *6th international symposium on electronic art*, Montreal, 1995 p.7. <http://www.brianmassumi.com/essays>

3. Brian Massumi, Arne De Boever, Alex Murray & Jon Rolfe, "Technical mentality revisited: Brian Massumi", *Parrhesia*, 7 (2009) p.38.

4. Massumi [2] p.1.

5. Massumi [2] p.9.

6. See Thomas LaMarre, in Muriel Combes. *Gilbert Simondon and the Philosophy of the Trans-individual*. Thomas LaMarre Trans. (Cambridge & London: MIT Press, 2013), pp. 79-83, for a succinct discussion of Simondon's critique of cybernetics.

7. Brian Massumi, "The Interface and I", *Artbyte: The Magazine of Digital Arts*, 1, 6 (1999) p. 33.

8. Massumi [2] p. 3.

9. Anna Munster, *Materializing New Media: Embodiment in Information Aesthetics* (Hanover & London: University of New England Press, 2006) pp.122-124.

10. Lozano-Hemmer, Rafael 'Interview by Jos. Luis Barrios', Trans. Rebecca MacSween, 2005 pp. 5-6. <http://www.lozanohemmer.com/publications.php?subtype=Interviews>

11. Katherine Hayle, cited Munster [9] pp. 62-3.

12. Elizabeth Grosz, "A thousand tiny sexes; feminism and rhizomatics", in *Giles Deleuze and the theatre of philosophy*, Eds. Constantin V.Boundas & Dorothea Olkowski, 1994 pp.193-4.

13. Félix Guattari, "On Machines." *Complexity* 6 (1995) p.12.

14. Brian Massumi, *A user's guide to capitalism and schizophrenia: deviations from Deleuze and Guattari* (Cambridge: MIT Press, 1992) p.192.

15. Andrew Murphie, "Computers are not theatre: the machine in the ghost in Gilles Deleuze and Felix Guattari's thought", *Convergence* 2 (1996) p.80 <http://con.sagepub.com/content/2/2/80>

16. Guattari. [13] p.8.

17. Félix Guattari, "Machinic heterogenesis", in Verena Conley, Ed. *Rethinking technologies* (Minneapolis: University of Minnesota Press, 1993) p.35. Such machines are 'about symbolic alliances and fusion…about viral or parasitic interdependence'. Rosi Braidotti, *Metamorphoses: towards a materialist theory of becoming.* (Cornwall: MPG Books, 2002) p.254.

18. Guattari [13] p.8.

19. Munster [9] pp.13-14.

20. Gilbert Simondon, 'The genesis of the individual', in Jonathan Crary & Sanford Kwinter, Eds., *Incorporations* (New York: Zone books, 1992) p.313.

21. Oliver Grau, *Virtual Art: From Illusion to Immersion* (Cambridge and London: MIT Press, 2003) p.198.

22. That is, it has shifted *towards* the pole of concretization (becoming-concrete), rather than seeing the terms as absolute and exclusive.

23. Andrew Murphie. [15] p.104.

24. Munster. [9] p.15.

25. Gilles Deleuze, *Difference and Repetition*. Paul Patton, trans. (New York: Columbia University Press, 1994) p.57.

26. Andreas Brockman, In Rafael Lozano-Hemmer, Ed. *Vectorial elevation: relational architecture no. 4* (Son Torge: Mexico National council for culture and the arts, 2000) p.172.

27. Andreas Brockman, In Lozano-Hemmer [26] p.172.

28. Brian Massumi. In Lozano-Hemmer [26] p.200.

29. Muriel Combes, *Gilbert Simondon and the philosophy of the transindividual*, Trans. Thomas LaMarre, (Cambridge & London: MIT Press), 2013 p.60.

30. Rafael Lozano-Hemmer, 'Interview by Jos. Luis Barrios', trans. Rebecca MacSween, 2005 p.6. <http://www.lozano-hemmer.com/publications.php?subtype=interviews>

31. See <http://www.lozano-hemmer.com/repositioning_fear.php> for short video sequences of various installations of the work.

32. Michel Serres, *The parasite* (Minneapolis: University of Minnesota Press, 2007) p.35.

33. 'Signaletic material', as Deleuze discusses it. Giles Deleuze, *Cinema 2*. Trans. Hugh Tomlinson and Robert Galeta, 3rd ed. (Chippenham, Wiltshire: Continuum, 2005) p.28.

34. Simon O'Sullivan, *Art Encounters with Deleuze and Guattari: Thought Beyond Representation* (Hampshire and New York: Palgrave McMillan, 2006) p.17.

35. Isabelle Stengers, *Thinking with Whitehead: a free and wild creation of concepts* (Cambridge, Massachucetts & London: Harvard University Press, 2011) p.160.

36. Murphie [15] p.89.

37. Deleuze [25] p.118.

38. Gilles Deleuze, *Foucault*, (Minneapolis: University of Minnesota Press, 1988) p.72.

39. Deleuze [38] p.72.

40. Deleuze [38] p.73.

41. Deleuze [38] p.60.

42. Gilles Deleuze, *The Fold: Leibniz and the Baroque*, Trans. by Tom Conley, (Minneapolis: University of Minnesota Press, 1993) p.60.

43. Alfred North Whitehead, *Process and Reality*, (New York: The free press, 1978) p.45.

44. Deleuze [25] p.267.

45. LaMarre, In Combes, [29] pp.92-3.

46. LaMarre, In Combes, [29] p.93.

47. Manning, Erin. *Always More Than One: Individuation's dance*. (Durham and London: Duke University Press, 2013) p.133.

48. Manuel DeLanda, *Intensive science and virtual philosophy*, (New York and London: Continuum, 2005) pp.18-19. This is a point of absolute origin of a new machine from the field producing new modes of transduction

49. LaMarre, In Combes, [29] p.93. As LaMarre says the internal and external grounds communicate 'actively across their asymmetry, and have to stabilize that communication. The result is a self-regulating individual'. P.97.

50. See LaMarre for a discussion of the relation between the internal and external, in Combes [29].

51. Simon O'Sullivan, *Art Encounters with Deleuze and Guattari: Thought Beyond Representation*. (Hampshire and New York: Palgrave McMillan, 2006) pp.69-71.

52. Manning, [47] p.57.

53. Nathaniel Stern, *Interactive Art and Embodiment: The Implicit Body as Performance*, Canterbury: Gylphi limited, 2013) p.10.

MEDIUM-SPECIFICITY AND SOCIALITY IN EXPANDED CINEMA RE-ENACTMENT

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Abstract

In this short paper, I introduce the work of the artist group Teaching and Learning Cinema, which re-enacts Expanded Cinema artworks from the 1960s and 70s. I make a connection between sociality (which binds together artists in collectives and screening "clubs") and the issue of medium-specificity. Re-enacting Expanded Cinema, I suggest, gently probes at the intersection of medium-specificity and sociality. This practice asks questions about the material qualities of film, video and performance, and the particular relations these media carry across time and culture.

Keywords: expanded cinema, re-enactment, medium-specificity, sociality, performance art, experimental cinema, pedagogy

Introduction

This paper uses the re-enactment practice of the artist group Teaching and Learning Cinema (Louise Curham and Lucas Ihlein) to consider some broad issues about medium-specificity. By re-creating performative works from the past, questions of materiality and social context are tangibly activated in situated experience. I begin by giving a brief genealogy of Teaching and Learning Cinema, before touching on some of the problems which emerge through re-enactment.

Historical Background of Teaching and Learning Cinema

Teaching and Learning Cinema (Louise Curham and Lucas Ihlein) evolved from another collective called SMIC – Sydney Moving Image Coalition, formed in 2003. SMIC, for its part, was inspired by MIC – the Moving Image Coalition – based in Melbourne, which had evolved from the Melbourne Super 8 Group.

SMIC was a "film-lovers and film-makers" group, which held convivial sporadic screenings in inner-city warehouses, and encouraged its members to bring along and show things they had made. SMIC had a very DIY ethic, and during the early 2000s many of its activities involved Super 8 film, encouraging members to make and show work using this small-gauge celluloid medium.

SMIC's focus on Super 8 could arguably be seen as a return to territory staked out by the Sydney Super 8 Group in the 1980s – a group which (in 1990) evolved into the less medium-specific Sydney Intermedia Network (SIN) – which itself evolved, in 2000, into dLUX Media Arts (the "d" presumably standing for "digital") [1].

Thus it could be offered somewhat wryly, that SMIC's focus on the pre-digital Super 8 format represented something of a *devolution*. But I don't believe that our interest in "old-media" was in any way anti-progress – nor was it a nostalgic technology-fetishists club.

However, SMIC *was* in practice a sort of social club (defined as an "association of two or more people united by a common interest or goal") - one whose members were, on the whole, quite young. One of the binding tenets of this club was the belief that it was important, in a moment when digital video had just begun to gain ubiquity, to spend some time with a medium which was well and truly on its way to becoming commercially redundant (and possibly extinct). Our screenings were peppered with discussions around notions of medium-specificity: the image grain, colour-cast, and archival issues of Super 8 film stocks – and these material, chemical and physical qualities were compared, not just with video, but also with other celluloid media, especially 16mm film.

Time was also of the essence in these discussions: not just in the obvious sense – that a cartridge of Super 8 afforded only three precious minutes of footage – but also in that it would take at least a month to have it processed. Such a slow turn-around (in a world that in the early 2000s was on the cusp of YouTube!) necessarily expanded our discussions of medium-specificity to encompass how cycles of creation and distribution in moving image making intersect with our social experience of time in everyday life.

SMIC screenings usually incorporated a segment we called "Primary Sources" – in which an Australian film-maker or artist was invited along to show and speak about a work they had made (either recently or in the distant past). These Primary Sources segments were an attempt to turn our self-made cinema into an ad-hoc classroom. Artists we worked with included David Perry, Joan Grounds, Mike Leggett, John Gillies, Manny Gasparinatos, Mike Cooper and Anne Walton [2]. It was the richness of this pedagogical aspect which led Louise Curham and I to shift our focus away from the convening of collective screening events, and towards a slower process of historical practice-based research in moving image performance. This shift also coincided with a change of name, to Teaching and Learning Cinema.

Expanded Cinema Re-enactment

What we have focused on, since mid 2005, is the re-enactment of works of Expanded Cinema from the 1970s (the decade, incidentally, in which Louise and I were both born). Our focus to date has been on works produced by artists associated with the London Film-Makers' Co-op, such as Guy Sherwin, Malcolm Le Grice, William Raban, and Anthony McCall [3]. Our impetus – as it was in the SMIC Primary Sources events – is to learn something by trying to connect with the work of our forebears. In some cases, this has involved us becoming "custodians" of works of experimental film which involve a live or "performed" element – works which might (without our intervention) cease to exist once the originating artist dies. To be precise – the works *would* continue to exist, in the same way that their deceased creators will continue to exist – as memories, stories, and as documentation in archives – but their embodied enactment would no longer be able to be directly experienced by others [4].

Since the readily available, then-current technologies for making moving image art in the 1970s included 16mm and Super 8 film, our re-enactments necessarily have to grapple with the issues of medium-specificity and "authenticity". Does it make sense to use celluloid in 2013 to recreate a work from 1971? The answer is "yes and no". [5]

Our contemporary media context might make the choice of pre-digital technology seem like a deliberate technological "statement" (retro / nostalgic / luddite). One could argue that, in the 1970s, the use of celluloid film by artists may have seemed more transparent – a "neutral" and convenient carrier of audio-visual meaning within then-current moving image discourse. And yet the situation is not quite that simple.

Artists such as Malcolm Le Grice, William Raban and Guy Sherwin (whose works we have re-enacted to varying degrees of depth and completion) are all associated to some extent with the structuralist/materialist tradition in experimental film-making. Working in this tradition meant drawing attention to the specific qualities of the film medium, as well as the discourses that surrounded the proliferation and consumption of moving images in society. In other words, such works were *already* – in the moment of their execution and initial performances – problematising the notions of medium and mediation [6].

Thus – to re-enact 1970s Expanded Cinema is not, we would argue, to produce a "cover version" – a lesser imprint of an "original" which retains its authenticity even in the face of its corporeal degradation – but rather it is to engage in an ongoing chain of remediation initiated (and indeed called into being!) by the work itself.

Our research process brings us into direct contact with artists 30 or 40 years older than us. This intergenerational exchange involves learning – not only about how media artworks were made before digital technology – but about what kinds of "social clubs" were invented to serve the purposes of production, screening, and discussion [7]. Thus re-enactment creates new layers of mediation – not only technological, but also, crucially, *social* - or perhaps it reminds us of the difficulty in regarding these two things as separate domains.

References and Notes

1. This organisational evolution is briefly summed up at the SCANLINES website, <http://scanlines.net/group/sydney-intermedia-network-sin>, accessed June 25, 2013.

2. Some archived media releases from these events by Sydney Moving Image Coalition are here: <http://www.teachingandlearningcinema.org/2013/01/15/smic-primary-sources-poster-for-3-feb-2004-screening-lanfranchis/>, accessed October 8, 2013.

3. Our focus on British artists does not represent a turning away from an Australian historical context. Our ethos, while embedded in our local context, is resolutely internationalist. In fact, as we discovered recently during a performance and discussion in London (convened by Sally Golding of Unconscious Archives) it is precisely our geographical distance from the so-called "centres" of cultural production which has made our re-enactments necessary, and allowed them to evolve beyond the boundaries of the original works.

4. A similar focus on the corporeal articulation of archival documentation is described by Jonathan Walley in relation to his own experiment with re-creating Takehisa Kosugi's *Film & Film #4* (1965). Walley considers the connection between his approach and that of Teaching and Learning Cinema. Jonathan Walley, "Recreating Expanded Cinema", *Incite Journal of Experimental Media*, Issue No. 4, Fall 2013, <http://www.incite-online.net/issuefour.html>, accessed October 25, 2013.

5. The practical and philosophical issues around the choice of medium for Expanded Cinema re-enactments are discussed in more detail in an earlier paper: Lucas Ihlein, "Re-enacting Expanded Cinema: Three Case Studies", presented at *Re-Live Conference*, Melbourne 2009, <http://www.teachingandlearningcinema.org/wp-content/uploads/2012/03/TLC-Reenacting-expanded-cinema-three-case-studies.pdf> accessed October 25, 2013.

6. Some of the complex debates around medium-specificity in film and new media are discussed by Steven Maras and David Sutton in their essay "Medium Specificity Re-visited". Maras and Sutton (following the work of Jay David Bolter and Richard Grusin) put forward the notion of *remediation* as a useful way of picking a path through the thorny territory of medium-specificity. This notion makes space for the complex and multiple ways in which works (of art, film, etc) travel through time and across cultures and material manifestations. Steven Maras and David Sutton, "Medium Specificity Re-visited*", Convergence: The International Journal of Research into New Media Technologies*, Vol 6. No.2, 2000.

7. See for example "1966, 13TH OCTOBER, LONDON FILMMAKERS' CO-OPERATIVE IS FORMED", *Lux Online Website*, <http://www.luxonline.org.uk/history/1960-1969/london_film-makers_co-op.html>, accessed June 25, 2013, and Bob Percival in discussion with Kate Richards and Mark Titmarsh, "d/Lux & the super history of super 8 in Sydney", <http://www.realtimearts.net/article/77/8361>, accessed June 25, 2013.

DATA ECOLOGIES: *LAIKA'S DÉRIVE* AND DATAWORK

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Abstract

Today the affordances of contemporary data representations and presentations allow for the reading of complex relational works, which I am classifying as data ecologies. Data ecologies can be performed with and across spatio-temporal networks of relations, and can be understood as assemblages of the agentic quality of flow. Data ecologies connect with the rise of statistical thinking throughout the nineteenth century, and developments in technology into the twentieth and twenty-first centuries. In this paper data mapping and data mining strategies are explored to develop a concept of data ecologies in interactive, reactive and generative creative works.

Keywords: data, data visualisation, data visualization, data mapping, data mining, interspecies communication, psychogeography, Laika.

Data ecologies are the process of creating a relational flow, assemblages of data, and can be used to describe the role of data in new media works. Although data ecologies may include procedures and processes from data mining and mapping approaches, within them data may be conceived of in ecosophical terms. Processes become relational within the strategy of representation. The work of data ecologies is to address and re-present relationships as an ecology, including the data "collection" methods as an intrinsic component of the work. This paper takes a recent project, *Laika's Dérive* as a starting point for thinking through a concept of data ecologies [1].

In an era of post-media aesthetics, there is a need for further examination of the strategies by which "a cultural object organizes data and structures the user's experience of this data" [2]. Wright has also correctly pointed out that "Visualisation is usually separated out as a tool for knowledge formation rather than a visual form of knowledge itself" [3]. The affordance/s of contemporary data presentation allows for the reading of complex relational works, which can be classified as data ecologies. These are located in current debates and discourse about mapping, data mapping and representation (from both the Visualisation field and Software Studies) and intersect with concepts about the representation of space/place in new media contexts. From this perspective it can be seen as an art of networks, and of territories that can be rendered as a mapping of temporal flows and relationships that remain fluid and dynamic within a system. Rossiter outlines these issues succinctly in his outline for a "processual media theory" which posits the need for a politics of time within processual systems [4]. We could extend this further into a politics of process within processual systems.

Laika's Dérive, a locative data mapping and capture work about interspecies communication, collaboration and knowledge, is one example of data ecology. The project has had two iterations thus far, at Performance Space, Carriageworks, Sydney, Australia (2011) and most recently at Furtherfield Gallery, London, UK (December 2012).

On November 3 1957, the Soviets launched Sputnik 2 into space. On board was a dog, Laika, in a cramped cabin with space for standing or sitting only. She was in a harness, with electrodes attached to measure her vital signs; heart rate, breathing, water and food intake. The data was transmitted back to earth via early telemetry. The mission provided scientists with the first data on the behaviour of a living organism in the space environment. Unfortunately Laika survived for only a few hours instead of the planned ten days due to heat and stress. There was never any plan to bring her back to earth.

Laika embodied multiple meanings, as a symbolic action, on both sides of the Iron Curtain. In simple terms, "For the Kremlin, her mission commemorated the fortieth anniversary of the 'great October Socialist revolution' and she emerged as a canine hero of the Soviet Union. Gazing up at the night sky, many Americans saw the small dog as a terrifying declaration of Communist technological supremacy and American vulnerability"[5].

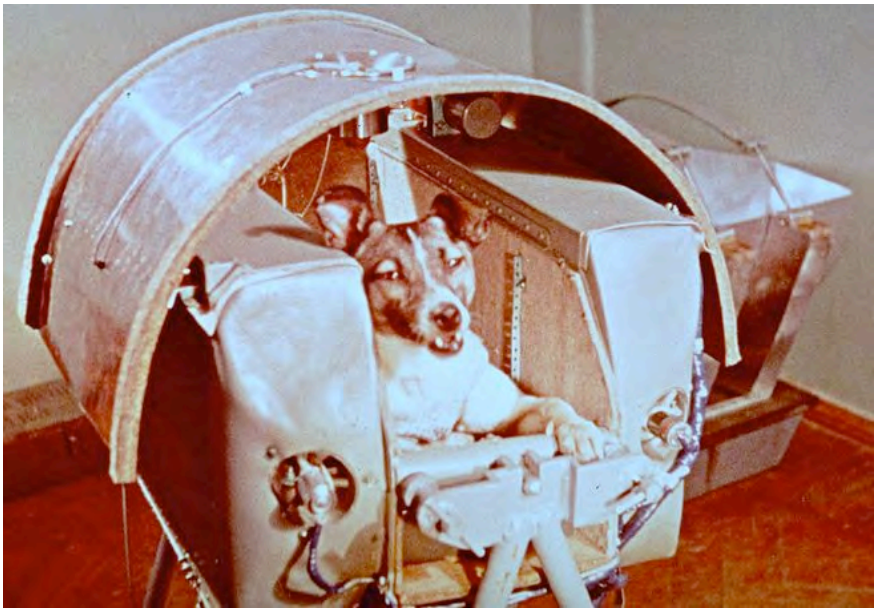
In looking at the data captured from Laika on Sputnik 2, we can know that she had an accelerated heart rate and that she ingested food. If we map cabin temperature and humidity readings using standard data mapping techniques, we can extrapolate that she was stressed by heat.

What we can't know from this is the depth of her experience. The data can tell us however, that the intention of the Soviet experiment was to support physical life in space. The collection of the data can also tell us about a species in what Donna Haraway calls an "obligatory, constitutive, historical, protean relationship with human beings" [6]. The intention and greater ecology of the data methods of the Laika mission tells us more than the data itself.

In my recent (ongoing) project, *Laika's Dérive*, community participants and their dogs use an electronic mapping system to collect data, including sniff location, pathway, head position and photographs, to explore a psychogeography of place, and to provide an alternative mapping of place [7]. Unlike the original Laika, this project was designed as a collaboration between species, and a gentle nudge towards recognizing the primacy of human senses and sensing in environments.

The project involves developing data mapping technology to map the dog interests and journeys. Simply, the system is designed to facilitate inter-species

Fig. 1. Laika in Sputnik 2. (Public Domain, NASA)



communication through translating canine smell senses to human visual ones. The system design for this project uses the dog's olfactory capabilities to select photographs from the dérive and to present these back to the human participants as a record of a shared journey. To do this the accelerometer and time data identifies areas of most interest, mapping those peaks to the geo–tagged photographs. Those photographs are then displayed online as a photographic record of the journey. The data is also used for a sonification and visualisation of the smell activity, a map of dog sensed place, and a Google map presentation of the data.

While walking with dogs, the psychogeography of place is changed and amplified, you are more aware of boundaries, dangers and the simplicity of enjoying both the moment, and the everyday. By collaborating with dogs and their differing perceptions and sensual capabilities, we are expanded from the everyday, and from the limits of our everyday human perception.

While the data collected from *Laika's Dérive*, and the visualisations developed from that data may tell us something about the most enjoyable spots for dogs in an environment, the data collection method, and walk, provided a subtler form of knowledge development. This is not necessarily captured in the data visualisation, or in the database of over 30,000 photographs taken by dogs, and the many gigabytes of location and accelerometer data that informs those photographs.

Participating in the project enabled users space for reflection. The project is very much about data process, not representation.

When Species Meet [8] is an extension of Haraway' s *The Companion Species Manifesto* and continues to develop her previous work on technology, nature, and culture. It is particularly relevant to a discussion about interspecies communication, and data gathered from such provocations.

Her exploration of our co-species existence is guided by two main questions that she outlines in her introduction, "(1) Whom and what do I touch when I touch my dog? And (2) How is 'becoming with' a practice of becoming worldly?" [9]. Haraway argues for an epistemological and ontological shift to recognize non-human animals as agents that can also shape human lives and proposes that this co-constitution requires an ethical call for respect and responding "to and for those other primate beings" [10].

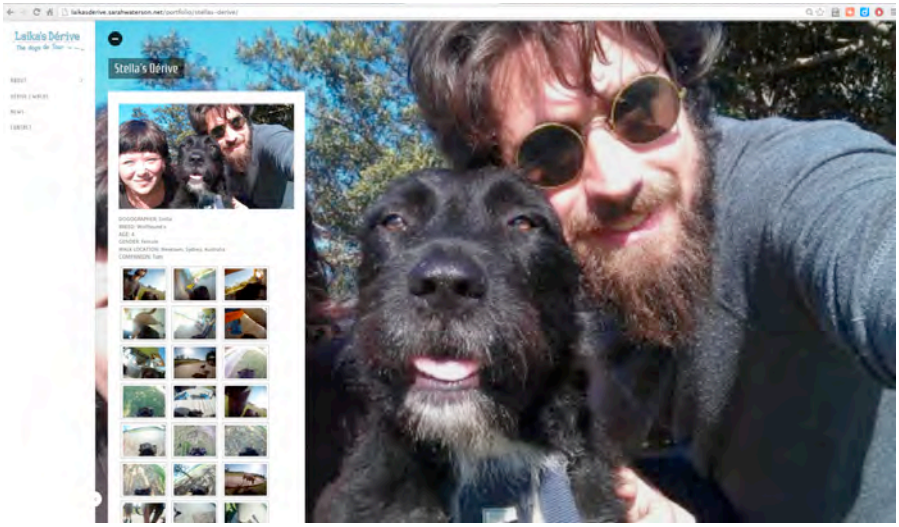
Ultimately, Haraway finds that respect, curiosity, and knowledge spring from animal-human associations and work powerfully against ideas about human exceptionalism. *Laika's Dérive* was developed as a result of this thinking, and is meant as a collaborative communication tool across species for data mapping place for humans; a data ecology that explores place, sensing, embodiment and representation.

To contextualise this, the following will summarise how we might think of data and where we might place "data ecologies" in all this.

Data

It is useful to understand that data are values, and embody values. Data often refer to measurements, observations, images and other raw materials. Data however is more than an "objective" measurement, more than raw material.

Fig. 2. Laika's Dérive participant page. (© Sarah Waterson)



Data itself has a qualitative component. Data, like knowledge, is "situated, partial, and constitutive" [11]. The measurement itself carries its own meaning, particularly as a stand in for the thing, and the instance in time, that it is measuring. An example of this might be the geo-location of a timed event, such as the recording of a dog sniff. What we see as a plotted moment on a graph is not an objective datum, but a qualitative data of that dog's embodiment in time, the recording methods, techniques and intentions of that moment and the interpretation of the viewer.

Despite this, within the field of data visualisation, data itself traditionally has no meaning. For data to become information, it must be interpreted and take on a meaning. It needs to be presented, be it a spreadsheet, table, pie graph, or raw values scribbled on a napkin. For example, the sniff location of a dog could generally be considered as "data", a visualisation of that sniff on a map may be considered as "information", and a report containing practical information on the best way to find that sniff spot may be considered as "knowledge".

To build on this approach further, and giving consideration to data as a qualitative component, strategies to present that "data" should attend to that qualitative component, and recognise its provenance. Given this, data then can be thought of as being entirely about relations, and not about information *per se.* In considering a concept of data ecologies, we would then also include the processes and methods of the data production, and reception as part of the data presentation.

Alessandro Ludovico and Paolo Cirio's online and installation project *Face to Facebook* is also an excellent example of a work that exposes the provenance and data ecology, by representing the data in an alternative form and system [12]. *Face to Facebook* involved appropriating 1 million Facebook profiles, filtering them with face-recognition software, and then posting them on a custom-made dating website. This repositioning of the market value of the data into a new system of relations draws attention to the broader ecology of the data. This work can be seen to be a data ecology in that the data re-presented is entirely about relations, not information. Within the exhibition component of the work, a system diagram displays the data pathways and treatment. This again emphasises process over product. That the dating site works

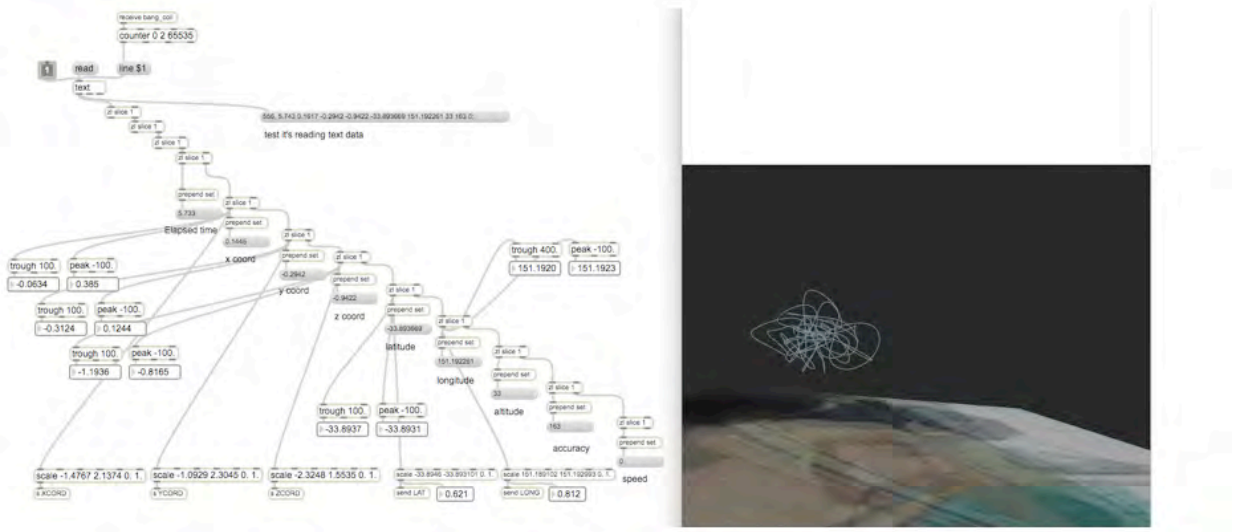


Fig. 3. Laika's Dérive sniff visualisation screengrab. (© Sarah Waterson)

with the data from Facebook, exposes an assumption that the Facebook profile photo data is there for dating or attractiveness.

The bias in the choice of the image for representation is a key component of the data ecology. It provides a commentary on Facebook profile data by representing an assumed desire of users to be attractive to others.

Information visualisation, Data visualisation and Data Ecologies

The strategies and techniques used for creating artworks from data provide one way to investigate the cultural materiality of that data, and to give aesthetic form to *human* experience within a world of information.

A Manovich model would say that the data visualisation is about finding all of the datasets, scraping them to reveal information, and then bringing everything from metadata through to image rich media into another context in order to be able to make sense of the data in question. This needs to be critiqued to include the broader ecology of the data, and to recognise it as an ecology, not a material to be strip-mined for usefulness (pattern and so forth). If we are to consider the ecology in its broadest sense, the shared record of the data, and the assemblage of all experience of the collection and re-presentation, i.e. both the provenance and the future of the data ecology, then feedback loops, complexity and chaos theory, dissipative structures and autopoietic, or self-organising, systems need to be included as practice starting points, other than pattern recognition and counting. *Face to Facebook* in re-presenting existing data in an explicit context provides an opportunity to reflect more fully on the data in question, and its broader ecology [13].

Thrift's non- representational theory challenged geographical research to go beyond representation, basically a call for looking at practices, rather than focussing on what is produced [14]. That is, a theory of movement that is useful to the representational strategy applied to data. The stress here is on performative and embodied knowledges, processual rather than representation and interpretation. Lorimer suggested the term 'more-than-representational' to replace "non-representational" to better describe the concept [15]. The practice of data in *Laika's Dérive* responds to this, focusing on the collaborative dérive (process), rather than the data produced and collected. Both the representation/s produced for the project, the online photographic journeys and the Google map presentations are in some ways incidental to the project itself, which was designed as a reflective process.

So to contribute usefully to information visualisation practices in new media works, we need to enter into a relational understanding of data, and extend beyond data as a thing, to data presentation as a processual practice.

Data mining and data mapping are about processes and techniques of working with data that drive certain visualisation outcomes, but neither is particularly good at capturing a flow of data, or temporal shifts. De Landa's writing on the assemblage – including the material role, expressive role, territorialisation and deterritorialisation (consistent with Deleuze and Guattari) aids as a starting point for locating the conceptual practice of using data streams as an ecology for generating emergent behaviours, patterns and affect [16]. Data ecologies can be performed with and across spatio-temporal networks of relations, and can be understood as assemblages of agency. The previous example, *Face to Facebook*, can be seen as a successful strategy in generating a new assemblage that plays on the greater ecology of the data, including its collection techniques and presentation strategies.

Whatmore's 'hybrid geographies' also speaks about the complexities of formations, and is useful in conceiving of the non-human [17]. Further to Thrift and Whatmore, Actor Network Theory (ANT) is also being used as a way of exploring the relational ties within the artwork, and as a way of looking at the practice as process and processual thinking, rather than the materiality of what is produced. This ties in directly with the idea of data ecologies. As Latour notes,

"explanation does not follow from description; it is description taken that much further." It is not, in other words, a theory *of* anything, but rather a method, or a *how-to* as he puts it [18].

Bennett also takes up ANT with a call to action, where she says: "we need not only invent or reinvoke concepts like conatus, actant, assemblage, small agency, operator, disruption, and the like but also to devise new procedures, technologies, and regimes of perception that enable us to consult nonhumans more closely, or to listen and respond more carefully to their outbreaks, objections, testimonies and propositions. For these offerings are profoundly important to the health of the political ecologies to which *we* belong" [19].

The data capture mechanisms within *Laika's Dérive*, the dérive itself and the behaviours surrounding the data presentations also perform as assemblages of agency within this model. Power relations inherent in the data sources are explored, to develop an assemblage of actants where power and agency is not equal- but carefully "designed" to represent Bennett's "politics" of things where she emphasises the "active powers issuing from non-subjects" [20]. Data ecologies can include systems that evolve over time, environmental factors, and interactions.

This paper is a starting point for looking at data ecologies, and thinking about how they might perform in new media works. We are enmeshed in data ecologies that are more complex and generative than we are able to perceive or present. Despite this, strategies to present "data" should attend to the qualitative component of data, and recognise the provenance of the data and the collection methods. We can see that data can be thought of as being entirely about relations, and not about information per se. Those relations, in the example of *Laika's Dérive*, can include the non-human and the processes employed within the work. They provide a representational strategy for communicating complexity and developing poetic systems of knowledge made relevant to a data saturated world.

References and Notes

1. S. Waterson, *Laika's Dérive*, exh. cat. (Sydney, Australia.: Performance Space, 2011)

2. Lev Manovich (2008) Post-media Aesthetics. <http://manovich.net/articles/>, accessed 29 August 2008.

3. Richard Wright, "Data Visualization", in Mathew Fuller, ed., *Software Studies* (Cambridge, MA: MIT Press, 2007).

4. Ned Rossiter, "Processual Media Theory," Digital Art and Culture, (2003) < http://hypertext.rmit.edu.au/dac/papers/Rossiter.pdf >.

5. U.S. National Library of Medicine (n.d.), < http://www.nlm.nih.gov/exhibition/animals/laika.html >, accessed 1 November 2012.

6. Donna Haraway, *The Companion Species Manifesto: Dogs, People, and Significant Otherness* (Chicago, Illinois: Prickly Paradigm Press, 2003).

7. Sarah Waterson (2013), < http://laikasderive.sarahwaterson.net/projects/>, accessed 9 May 2013.

8. Donna Haraway, *When Species Meet* (Minneapolis: University of Minnesota Press, 2008).

9. Haraway [8] p3.

10. Haraway [8] p6.

11. Johanna Drucker, "Data as Capta," *Digital Humanities Quarterly* **5**, No. 1 (March, 2011) p.4.

12. Alessandro Ludovico and Paolo Cirio, *Face to Facebook* (2011), artwork.

13. Alessandro Ludovico and Paolo Cirio, [12]

14. Nigel Thrift, *Spatial Formations* (London, U.K.: Sage, 1996).

15. H. Lorimer, "Cultural geography: the busyness of being 'more-than-representational,'" *Progress in Human Geography* **29**, No.1 (2005) pp. 83–94.

16. Manuel De Landa, *A new philosophy of society : assemblage theory and social complexity* (London: Continuum, 2006).

17. Sarah Whatmore, *Hybrid Geographies* (London, U.K.: Sage, 2002).

18. Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford, U.K.: Oxford University Press, 2005).

19. Jane Bennett, *Vibrant Matter: A Political Ecology of Things*, (Durham: Duke University Press Books, 2010)

20. Bennett [19].

GAME ENGINES AS PREHENSION OF INCOMPUTABLE DATA: THE PROCESSUAL EFFECTIVITIES OF GAME ENGINES

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Abstract

Our research addresses the impact of technological mediations on the contemporary creative practices of production in interactive games and new media arts. More specifically, our research focuses on game engines. Caught between different actors, cultures, organizations and functions, video game engines are cultural and socio-technical objects whose complex nature mirrors the multiple and competing definitions of video games and has similarly broad ranging cultural, social and economic impacts. The paper highlights the necessity to go beyond the current research on game engines, and outlines a new way to conceptualize them through a discussion of the studies of Ian Bogost and Luciana Parisi.

Keywords: video game engines, circulation, creative practices, video game industries, new media art

What are the specificity/effectivities of interactive games as a medium? This question has been addressed by numerous researchers in the field of game/new media studies who emphasize the procedurality of video games [1] and/or their algorithmic nature [2]. Beyond Game Studies, answering this question pertaining to the practices of video game production and the specificity of technological tools used has larger cultural, social and economic implications [3]. Video game production through specific technological tools is a contested space in which many institutional and non-institutional actors play underappreciated roles [4]. Aware of the latest developments, the originality of our approach, anchored in a material analysis of new technologies [5]–[10], is to address this question through the study of game engines, rather than through the study of the specific form of interactive narratives found in video games [11], or through the ludic qualities of video games [12]. We contend that the effectivities of video games are not solely determined by video game publisher companies, nor by a specific professional culture of video game designers, but also and fundamentally by the specificities of some of the technologies used to produce video game technologies; we focus here on the video game engines.

A game engine is a software framework facilitating the creation of video games through a set of functionalities that enable to automatize some programming tasks involved to handle graphics, sound and artificial intelligence processes during the production of video games. Current research on video game engines consists on the one hand of case studies of game engines used by non-market game developers to modify the mechanics of existing video games [13]. On the other hand, some researchers are studying the internal design of game engines as a software [14]. However, to date there is no study of game engines that links their technological features and their specific mode of being to the ways those game engines circulate and have different ranges of effectivities.

Effectivities of video game engines

In the early days of video games, project teams produced video games directly in machine coding; later a number of middleware tools were created to support the process of production of video games. These technological tools were aimed at reducing the huge number of programming routines required by video games given their computational nature, and to enable a quick prototyping of the game; Aric Wilmunder, one of the coders of the game engine SCUMM, explains in an interview: “One of the great benefits of SCUMM was how quickly a game could be prototyped. The designer would have ideas for rooms and locations and the lead background artist could start doing sketches. When enough of the sketches were done, they would get scanned in and you could very quickly add and connect them up using SCUMM” [15].

Video game engines are complex objects, used inside the video game industries as well as outside of them. Some of them are produced by specialized (middleware) companies [16] which subsequently license their engine to other companies, such as CryEngine, produced by the company Crytek to conceive the game Crysis 2. Some other game engines are freeware - Source, Unity [17] - and can be used by people outside the video game industries, and therefore are at the same time professional tools developed along a business-to-business logic, and end user products taken up by consumers or players to create their own games. Assessing their effectivities is not an easy task, Despite the utopian discourses surrounding their production, they cannot be considered as technologies where engineers enclose scripts of usage to be taken up by users [18], [19]. Nor can it be contended, despite the many tutorials, manuals and formations on game engines (Unity is a case in point), that they are mere tools in the hands of game designers, lending themselves to the transparent actualization of the game designers’ (creative) intentions. Whatever the complexities of projections or mutually rationalized anticipations that can be imposed on video game engines (in part due to their strategic position in the financial economy of video game production), their effectivities must be considered beyond the limitative relationship between video game engines as tools and human intentionality.

Mackenzie’s definition of software can aid understanding of the complex nature of the video game engine as a techno-cultural object:
“At stake here is an account of software as a highly involuted, historically media-specific distribution of agency. This account diverges from a general sociology of technology in highlighting the historical, material specificity of code as a labile, shifting nexus of relations, forms and practices. It regards software formally as a set of permutable distributions of agency between people, machines and contemporary symbolic environments carried as code. Code itself is structured as a distribution of agency” [20].
What is the media-specific distribution of agency enabled by video game engines? To answer this question we must pay special attention to the algorithmic nature of video game engines themselves, leading us to consider game engines as “mechanisms for the processing and calculation of quantities of data, rather than instruments for the production of qualities/effects.” [21], rather than only as tools that mimic the existing worlds through the use of 3D graphics. We contend here that the effectivities of video game engines are related to their specific modes of being (algorithmic objects) that enable what Luciana Parisi and Portanova call an “aesthetic of soft thought”. We sketch a new way to conceptualize game engines through a discussion of the research of Ian Bogost on video games, and of Luciana Parisi on contemporary architecture and new media art.

Video game engines and unit operation and the expressive power of video games

For Bogost, procedurality enables video games to be expressive through rules,

interactions between the player and the video game, and processes. Video games differ from other forms of creation in that in the video game "arguments are made not through the construction of words or images, but through the authorship of rules of behavior, the construction of dynamic models" [22]. Hence procedurality is not limited to functional task according to Bogost, and certain procedures related to game playing can convey an expressive power; we use computational power not only to produce better pictures in Photoshop or to write texts in Word, but also to have an aesthetic emotion linked to the expressive power of the procedures we undertake as a player. In other words, "videogames are computational artifacts that have cultural meaning as computational artifacts" [23].

Bogost makes clear that gameplay, hence procedural rhetoric, is linked to the video game engines used to produce games: "The notion of a common substructure for similar games grew into modern game engines, component-based software systems useful not only for rendering background effects like physics, but also for orchestrating the crucial functions of the game- play itself" [24]. To Bogost, video game engines are not just neutral technological tools that will passively house creative expressions of game designers; on the contrary, they play an important role in defining what video game are. "… game engines regulate individual videogames' artistic, cultural, and narrative expression" [25]. The role of game engines in video game production is important for Bogost's development of his theory of unit operations, at the crossing of literary criticism and new media studies. Bogost describes how the poems of Baudelaire were symptomatic of a turn toward "more and more compact modes of representation" in which there occurs a decoupling of human experience and creative work from their continuity in rituals and social abundance [26]:

"My contention is that as this very modern experience moves from an experience of crisis in the mid-nineteenth century to an experience of banality in the twenty-first century, it becomes compressed into more and more compact modes of representation. Baudelaire does not merely author a poem; he also creates a unit of cultural memory, a tool that others can make fungible as a performance of the modern life … . Together, Baudelaire's lyric encapsulates these figures and tropes into a framework, or rule set, for living the modern life. Benjamin calls these rules motifs. I would call them unit operations" [27].

Rather than authoring a poem, Baudelaire is crafting a unit of cultural memory that others can integrate into the performance of modern life [28]; these units of cultural memory are what Bogost calls unit operations. He views the video game engine technologies as central in the contemporary relevance of the concept of unit operation, saying that "the game engine dramatically increases the scope of unit-based abstraction compared to other forms of cultural production" [29]. For him, ultimately, in studying mechanics of video games such as GTA and focusing our attention on unit operations that are the main modes of representation in video games [30], we should strive to "understand and refine each unit operation of our possible actions so we can interrogate and improve the system of human experience." [31]. Bogost invites us to study software itself through a close study of "[p]ublicly documented hardware and software specifications, software development kits, and decompiled videogame ROMs …" [32].

The concepts of procedural rhetoric and unit operation do a wonderful job in accounting for the way in which the player is drawn into an aesthetic experience in a video game, beyond the literary mode of engagement, and the ways in which players can experience emergence through the open ended world of GTA [33]. The concept of unit operation aids understanding of the expressive power of the video game (especially through game engines), where the aesthetic experiences of the players interact with the intentions of the video game designers. Nevertheless, if our main interest lies in the study of the technocultural processes pertaining to video game engines, and how effectivities arise from the interaction of technologies and human practices, we must shift our emphasis from the phenomenology of the players and the game designers that underscore the study of Bogost in *Unit Operation*. The effectivities of game engines must be envisioned beyond their uses as tools by game designers and companies, and beyond their expressive power toward players - beyond modes of representation and human experience; we must examine the unintended consequences of their complex internal dynamism, uncoupled from human agency, unaccountable through phenomenology, and grapple with the complexities of their algorithmic nature - their *soft thought.*

Video game engines as prehension of incomputable data

In Unit Operation, Bogost emphasized the intentionalities of video game designers and the aesthetic experience of the players vis-à-vis unit operations. If we were to use the same theoretical frameworks to study the effectivities of video game engines, we would rely "on the interaction of/with biophysical data in order to explain change." [34] Such a view restricts the range of effectivities displayed by video game engines. The way in which Bogost frames the concept of unit operation doesn't allow us to take into account the internal dynamics of video game engines, the ways in which algorithms become actual entities through the prehension of incomputable data – a process which occurs in a specific spatiotemporal structure that is not the "present state of the world" (duration) in which bodies and matter interact in a linear and efficient causality [35]. Parisi contrasts those conceptions of interaction with the recent development in nanoarchitecture (and especially Anders Christiansen's nanoarchitecture design of *Homeostatic Membrane*):

"As opposed to interactive architecture, according to which spatiotemporal experience is defined by a change in the system induced by biophysical data, nanoarchitectures are spatiotemporal structures of anticipation characterized by incomputable data, corresponding neither to mathematical nor to physical inputs. From ubiquitous computing to the nanofabrication of walls, smart objects, and clothes that sense and anticipate (or productively prerespond to) changes in atmospheric pressures, moods, sounds, images, colors, and movements, incomputable data have infected the general ecology of media systems" [36].

In Parisi's view algorithms aren't just a mode of computation of "real" data overlaying the reality, but constitute building blocks of reality through diverse process of prehension of (incomputable) data. The algorithm isn't just a specific mediation rerouting the existing reality; rather, it generates in and of itself new forms of spatiotemporal realities.

Thus, video game engines shouldn't be considered as a set of predefined possibilities that are materialized through situated practices in a given context; the relationship between them and the con-

texts in which they are produced and used is non-trivial. The internal dynamism of game engines as algorithmic and unstable objects has to be accounted for if we want to understand the whole range of their effectivities; the "soft thought" inherent to them has to be accounted for if we want to understand the ways in which they transduce their diverse contexts of production and circulation.

The effectivities of video game engines as a set of algorithms should not be limited to the intentionalities that the producers of video game engines put into it, or to the state of technology, or to the will of the video game designer using it as a tool. Following Parisi, we have to acknowledge the internal dynamics of video game engines; they have dynamism of their own which escapes their context of use and production, and human perception most of the time - which is why Parisi claims to do a non-phenomenological study of algorithms [37]. They have emergent properties, the singularity of which is linked to the algorithmic nature of video game engines: "I will propose that algorithmic architecture needs to be explained through another kind of aesthetics, relying neither on the beauty of simpler axioms nor on the continual variation of biophysical interactions. On the contrary, algorithmic architecture is important because it offers us an opportunity to discuss another species of actualities: algorithmic objects, the data structures of which now constitute the immanent data of experiences that do not stem from the directly lived" [38].

Parisi and Portanova emphasize the autonomy of code and the specificity of its aesthetics, where aesthetics refers to a mode of "soft thought" inherent to algorithmic objects and data structures, not to the ways in which code is phenomenologically perceived by humans. Game engines are such algorithmic objects and lend themselves to this "soft thought."

What are the effectivities of the production/circulation of game engines inside a complex media ecology that includes companies specializing in their production, game publishers, independent game developers, modders who modify video game content, and digital artist communities using video game engines to produce works of art? [39] This circulation, linked to the internal dynamism of video game engines (the specificities of the aesthetics of their code), continuously redefines the game engine at a technological level (the set of functions they can perform as a software technology) and at a cultural level (the creative practices with which such engines are enmeshed). Video game engines, given their algorithmic nature, shouldn't be considered mere simulations of physical data, but actual entities, becoming actual through prehension of incomputable data [40]. This leads us to focus on the processes that constitute continuously the game engines, their *endurance* [41], as well as on the effectivities of game engines on the media ecology pertaining to its scattering/distribution. A better description of the circulation and effectivities of game engines between internal/external heterogeneous entities is crucial to understand the multiple ways in which interactive games inform, in singular ways, the contemporary forms of cultural production.

References and Notes

1. I. Bogost, *Persuasive games: videogames andprocedural rhetoric*. Cambridge, Mass.; London: MIT Press, 2007.

2. A. R. Galloway, *Gaming: Essays On Algorithmic Culture*, 1st ed. University of Minnesota Press, 2006.

3. E. Castronova, *Synthetic worlds: the business and culture of online games*. Chicago: University of Chicago Press, 2005.

4. C. Poremba, "Discourse Engines for Art Mods," *Eludamos J. Comput. Game Cult.*, vol. 4, no. 1, 2010, pp. 41–56.

5. T. S. Barker, *Time and the Digital: Connecting Technology, Aesthetics, and a Process Philosophy of Time*. Dartmouth, 2012.

6. S. Cubitt, *Digital Aesthetics*, 1st ed. Sage Publications Ltd, 1998.

7. M. Fuller, *Media Ecologies: Materialist Energies in Art and Technoculture*, Illustrated edition. MIT Press, 2005.

8. A. MacKenzie, *Transductions: Bodies and Machines at Speed*, New edition. Continuum, 2006.

9. A. Munster, *Materializing New Media: Embodiment in Information Aesthetics*, Annotated edition. Dartmouth, 2006.

10. L. Parisi, *Contagious Architecture: Computation, Aesthetics, and Space*. MIT Press, 2013, p. 25.

11. M.-L. Ryan, *Avatars Of Story*, 1st ed. University of Minnesota Press, 2006.

12. E. Aarseth, "Computer Game Studies, Year One," *Game Stud. Int. J. Comput. Game Res.*, vol. 1, no. 1, 2001.

13. D. B. Nieborg and S. van der Graaf, "The mod industries? The industrial logic of non-market game production," *Eur. J. Cult. Stud.*, vol. 11, 2008, pp. 177–195.

14. D. S. Evans, A. Hagiu, and R. Schmalensee, *Invisible Engines: How Software Platforms Drive Innovation and Transform Industries*. MIT Press, 2008.

15. M. Bevan, "The SCUMM Diary: Stories behind one of the greatest game engines ever made," *Gamasutra*, 12-Jul-2013. [Online]. Available: http://www.gamasutra.com/view/feature/196009/the_scumm_diary_stories_behind_.php?page=3. [Accessed: 16-Jul-2013].

16. D. Charrieras, "Les médiations sociales, culturelles et technologiques dans la production et l'appropriation des intergiciels de l'industrie du jeu vidéo au Canada," *Commun. Inf. Médias Théories Prat.*, no. Vol. 29/1, Oct. 2011.

17. "List of game engines," *Wikipedia, the free encyclopedia*. 10-Jul-2013.

18. M. Akrich, "The De-Scription of Technical Objects," in *Shaping Technology, Building Society: Studies in Sociotechnical Change*, Wiebe Bijker and John Law. Cambridge, Mass.: MIT Press, 1992, pp. 205–224.

19. L. Suchman, *Human-Machine Reconfigurations: Plans and Situated Actions*. Cambridge University Press, 2007. pp. 191–192.

20. A. Mackenzie, *Cutting code: software and sociality*. New York: Peter Lang, 2006, p. 19.

21. L. Parisi and S. Portanova, "Life and mind: From autopoiesis to neurophenomenology. A tribute to Francisco Varela," *Phenomenol. Cogn. Sci.*, vol. 3, no. 4, 2011, pp. 381–398.

22. I. Bogost, *Persuasive games: the expressive power of videogames*. Cambridge, MA: MIT Press, 2007. p. 29. Cf. also p. 11, p. xiii.

23. Bogost [22] p.ix.

24. I. Bogost, *Unit Operations: An Approach to Videogame Criticism*. MIT Press, 2006, p. 55

25. Bogost [24] p.56.

26. Bogost [24] p.74.

27. Bogost [24] p.73-74.

28. Bogost [24] p.73-74.

29. Bogost [24] p.55.

30. Bogost [24] p.64

31. Bogost [24] p.169

32. Bogost [22] p.63

33. Bogost [24] p.166.

34. Parisi [10] p.25.

35. A. N. Whitehead, *Process and Reality*, 2nd Revised edition. Free Press, 1979, p. 487.

36. Parisi [10] p.26.

37. Parisi [10] pp.69-70.

38. Parisi [10] pp.21-22.

39. P. Krapp, *Noise Channels: Glitch and Error in Digital Culture*. University Of Minnesota Press, 2011.

40. Parisi [10] pp.25.

41. Barker [5]

REDUCTION AND THE TACHISTOSCOPIC FLASH – A MARGINALISED TECHNOLOGY

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Abstract

The subliminal flash has had a long and colourful history in perceptual psychology, from its origins in WWII military and law enforcement training, through use as a tool for market research and by structuralist filmmakers of the 1960s, to more dubious associations with mind control. In more recent times the subliminal flash has been used in television advertising as a gimmick rather than a surreptitious form of brainwashing - though the practice is still officially banned in Australia. This paper explores the history of the tachistocopic flash as a methodology both cultural and technological, and more recently as an outlawed practice in commercial screen culture.

Keywords: tachistoscope, flash frame, subliminal, perceptual psychology, digital Easter egg, mind control

At the first ISEA I ever attended, back in 1995, I presented an artwork on an Amiga 3000 computer. This was primarily because Apple Macintoshes were too expensive, the graphics were still black and white, and the CPU could barely muster a stack of images into a meagre animation. Despite the excitement and enthusiasm regarding the possibilities of new media, computer graphics were about limitation and restrictions: the number of colours used, the size of the image (remember the tiny postage stamp sized QuickTimes) and the frame rate. Reduction was ever present for the 'New Media' artist amidst an ongoing crusade for image fidelity; yet here we are in 2013 with comparatively no restrictions on the use of two-dimensional graphics regarding colour, speed, frame-rate, quality and bandwidth - though for some reason I still find myself seduced by technological minimalism, a self-imposed reduction. I revelled in the challenge of working in only eight colours, and of being able to fit my entire animation on a single sided floppy disk; it is partly for this reason that I have become interested in the tachistoscope as a pre-computer screen apparatus, and the subliminal flash as a comparatively marginalised moving image process. To work with the flash frame is to work with a tiny fragment, a millisecond in duration – the antithesis of the hours and hours of real-time video documentation we can now wade through on YouTube. While this may seem a glib justification or convenient excuse for laziness, I also see the 'tachistoscopic flash' as relevant to the contemporary exploration of moving image language.

The tachistocope began as a research tool and is more or less a slide projector, but one that has been modified to reveal the images in controlled temporal fragments, usually milliseconds. There is really no one definitive tachistoscope; many versions have been adapted or developed from scratch according to the needs of the researcher. The first one was developed as early as 1859, and the Bubley TS1 Projector Tachistoscope is still sold online today [1]. The tachistoscopic flash frame has its origins in a mixture of historical sources ranging from vision training and testing, B-grade cinema novelty, curative therapy, marketing, market research, conspiratorial hoaxes, anti-narrative materialist cinema, advertising gimmicks and cheap animated special effects. As an artist/practitioner and teacher, my interest lies with not only the history and novelty of the flash frame, but also the simplicity of it. I am compelled by the tiny amount of time and space the single flash frame may occupy compared to the conventional moving image; the flash frame seems to me to be an energy efficient compact moving image solution to excessive temporal visual consumption.

Testing and Training – the early years

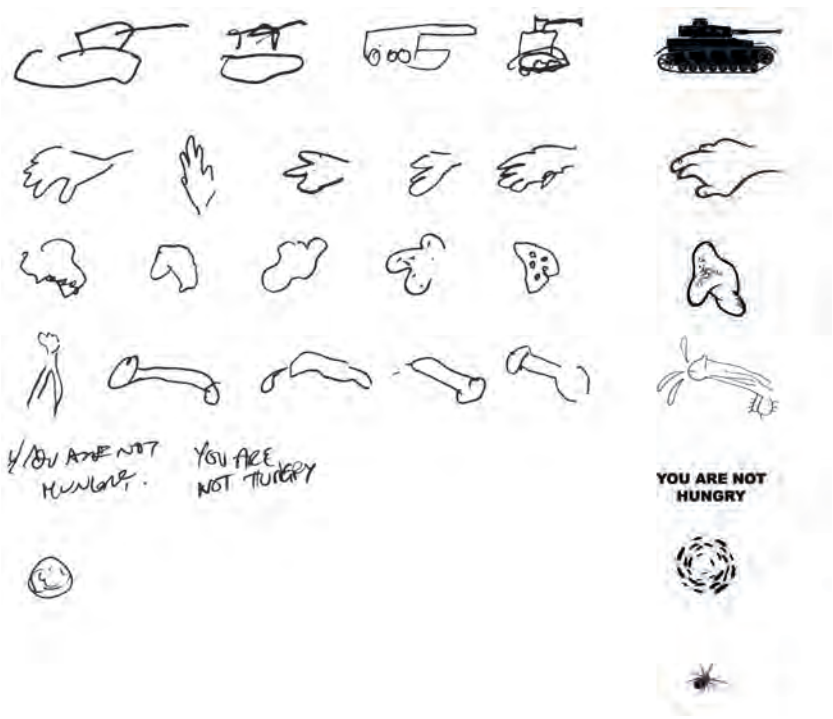
One of the most interesting examples of the tachistoscopic flash that I have come upon was an experiment regarding the use of caricature in 1956 by Ryan and Schwartz called 'Speed of perception as a function of mode of representation' [2]. By and large this study was typical of many such studies conducted throughout the 1940s and 50s that used the tachistocope for vision training or vision testing for the purposes of visual proficiency. This experiment set out to test and measure which type of pictorial representation could be perceived in the shortest amount of time, to improve efficiency of wartime and industrial training manuals. Air Force pre-flight training schools had already been using tachistocopic flash training since 1942 under the instruction of Samuel Renshaw; Renshaw's training techniques enabled pilots in WWII to accurately and quickly distinguish between enemy and allied aircraft within milliseconds. Flash recognition training (FRT) was believed to be effective as it prevented the viewer from saccadic sampling of an image; in other words, there was no time to glance at sections of the image, but instead the image must be perceived as a total form – a gestalt. Remarkably, shorter amounts of time were found to be more effective than longer ones.

In the 1956 experiment the flash frame was used not to train vision, but instead to test it in relation to the efficiency of the image. If an image were to be quickly perceived as a whole, what type of representation would be most effective, mimetic or caricature? The conclusions indicated that it was actually the cartoon representations that were perceived in the shortest amount of time, and line drawings needed the longest amount of time to be perceived accurately.

If we consider the outcomes of these two experiments, what does this tell us about how cartoon animation (which is made up of separate stylised drawings) was perceived at that time? If, like the fighter pilots, we can perceive the whole more accurately in a fraction of a second rather than a long duration, and, as in the second experiment, we also perceive more accurately if the form is cartoony rather than photographic, does that mean that cartoon animation was the most efficient pictorial moving image system of the time? So much so that it could have even been reduced to a series of discreet flash frames instead of continuous movement, saving the animators and studios considerable time and money? This kind of moving image system could perhaps have been seen to bypass the illusion of continuous movement in favour of concentrated modernist efficiency. It was not until the 1960s that this idea was actually tested as a form of creative expression by experimental filmmakers such as Robert Breer, Paul Sharits and Tony Conrad.

Another example of the use of tachistoscopic training, from the late 1940s, occurred in the area of perception and drawing, in Hoyt Sherman's Flashlab at Ohio State University. Sherman was a professor in the department of Fine Art, and like Renshaw had been involved in the training of Naval and fighter pilots in WWII. The Flashlab was a course designed to teach students to draw more efficiently (faster and more accurately). Sherman also shared Renshaw's view about 'perceiving the whole,' further describing how the lack of dimensional depth in flash frame perception enables the silhouette or outline of the shape to become more apparent, assisting in the translation of three-dimensional form into two. Using this technique the students are actually drawing from the afterimage rather than from any direct pictorial reference. Interestingly, Sherman is best known

Fig. 1. Results of audience participation experiment in which Sherman's Flashlab techniques were tested on a panel audience at 100th of a second. *ISEA2013* (© artist)



for his contribution to modern art rather than his wartime contribution, as Roy Lichtenstein was his most famous student. Regarding the benefits of the flash frame as a learning tool, David Deitcher, in his chapter 'Unsentimental Education,' draws a connection between Lichtenstein's art school education in the Flashlab and his later comic book style paintings as the 'mastery of form and contradiction' [3]. Sherman's Flashlab is an early example of the transition in education from the page to the screen, and the use of technology in the classroom as an expression of the romantic conviction of the benefits of scientific methodologies.

Subliminal images and mind control

It would not be possible to follow the historical trajectory of the flash frame without mentioning James Vicary and the subliminal message. Vicary's infamous stunt/prank staged in 1957 in Fort Lee, New Jersey in which he claimed to have exposed an unwitting movie theatre audience to subliminal flash frames to increase sales of popcorn, has been well documented. Charles Acland, in his book *Swift Viewing* [4], chronicles the rise of the subliminal image and the hysteria associated with it as a development from the post war use of the tachistoscope, and extensively covers historical examples in popular culture. Vicary's rise to fame eclipsed any rational analysis of whether the technique actually worked, and despite Vicary's numerous refusals to recreate the experiment, as well as a later confession that the results had been fabricated, the idea of subliminal persuasion was well and truly cemented in the popular and academic imagination. Within the sphere of academic psychology experiments of flash frame testing continue to this day, although focus has shifted from subliminal mind control to implicit perception - that is, perception beyond our awareness; recent research findings in social psychology suggest that individuals can, in fact, process information of which they are apparently not consciously aware [5].

Interestingly, in Australia we still have laws in place to prevent the use of subliminal images described in the Commercial Television Industry Code of Practice July 2004 [6]. As stated in the code:

1.8 A licensee may not broadcast a program, program promotion, station identification or community service announcement which is likely, in all the circumstances, to:

1.8.2 depict the actual process of putting a subject into a hypnotic state;

1.8.3 be designed to induce a hypnotic state in viewers;

1.8.4 use or involve any technique which attempts to convey information to the viewer by transmitting messages below or near the threshold of normal awareness;

While the idea of the subliminal message as an effective means of persuasion had begun to lose credibility around the late 1950s, and instead became the subject of many spoofs and jokes, the idea of the flash frame as a method of intrusion or surprise used within the moving image had much more traction. Throughout the 1950s and 60s there were many examples of the subliminal frame used within television or cinema for its novelty, humour and spoof value; again, these have been described by Acland [4]. Many examples played on the theme of mind control, continuing the popular mythology of the surprise flash frame suggesting the presence of an external authority, a 'big brother' seeking to infiltrate the audience even while at leisure. In this way the flash frame became parasitic, feeding off the host narrative and infiltrating its micro-narrative. Other examples played on the association of mind control and sex, sneaking in suggestive or sometimes explicit images as a way of seducing our minds into submission, and perhaps even leaving us wondering whether we had just imagined it.

Flashing

In this way the flash frame may also be considered as a form of 'flashing' - flashing the forbidden, such as the single frame of the penis in the opening sequence of Bergman's *Persona*, the end section in *Fight Club*, and even the saucy single frame of Jessica Rabbit's uncovered crotch in *Who Framed Roger Rabbit?* – where, like the trench-coated flasher in the park, a single frame appears out of nowhere, and we are left stupefied and incredulous as to what we just saw.

Flashing the un-seeable may also be viewed within the familiar horror trope of the lightning flash revealing the monster's transformation, the killer in the window, or the dead body in the dirt. This type of flash frame is more suggestive of the phantasmagorical rather than the forbidden. Lightning could be considered the original progenitor of the tachistoscopic flash frame, the electrical life-giving spark of the cinematic apparatus. Here all the qualities of the flash frame come together: the surprise, the extreme contrast in light and dark, and the afterimage which both psychologically and physiologically leaves its silhouetted remains on the retina.

The flash as a source of power is a familiar trope within super-hero animation, and there is no better example of the powers of the flash

frame than in 1997 the episode of Pokémon, Denno Senshi Porygon (or 'Computer Soldier Porygon'). The superhero power flash is the offspring of the phantasmagorical lightning flash combined with the electronically saturated RGB colour cycling of 8-bit computer games. For those who are old enough to remember, this episode contained a particular combination of frenetic flashing coloured frames which sent hundreds of children across Japan into spontaneous seizure [7]. This event, while inadvertent, was probably the closest any moving image sequence has come to what might be considered mind control.

In many senses one of the functions of the flash frame within the moving image is to disrupt illusionary space (where the flash frame contains a different representational space to the host sequence). A consequence of this disruption of illusionary space is also a disruption of what Laura Mulvey refers to as voyeuristic separation [8], the disembodiment of the spectator gazing into the hermetic illusionary world of the cinema. When voyeuristic separation is disrupted by a flash frame, we are no longer merely a spectator, we are now being looked back at and addressed directly. The historical use of the tachistoscope as an art school vision training tool, as well as a psychological tool, coalesced nicely with the development of structuralist cinema, where, as mentioned earlier, illusionistic space was no longer a motivating force. Acland identifies a pertinent point of difference, regarding the tachistocope and the cinema as being similar but also the inverse of each other: 'In its pre-digital form, film is an arranged series of still images that move at a constant rate, separated by imperceptible black fields. The tachistoscope is an arrangement of a still black field interrupted by nearly imperceptible images exposed at a variable rate' [9]. From the late 1950s the moving image in the hands of experimental filmmakers rejected many aspects of cinematic illusion, such as the lack of continuous movement, pictorial space and narrative, in favour of the emphasis of intervals, of the negative black space normally imperceptible. Even the presence of the projector/apparatus in the same space as the audience, while an obvious necessity for laboratory and training purposes, was a critical shift and point of difference in cinema, creating a self-awareness and physicality that is now a familiar structure within contemporary installation. Works such as *Fist Fight* by Robert Breer (1964), *N.O.T.H.I.N.G.* by Paul Sharits (1968) and *Flicker* by Tony Conrad (1965) are key examples of this alternative style of filmmaking, and led to the more general aesthetic of the barrage shock edit montage that we still see today.

Digital Treasure Hunts

In an era when successful advertising can be distributed socially as well as through conventional broadcast channels, the flash frame may be embedded for the purposes of a digital treasure hunt, rather than subconscious brainwashing. The treasure hunt or 'digital Easter egg' is only successful through the use of personalised media such as YouTube, Apple TV, as the user must hunt through the sequence and be able to locate the frame to collect the 'treasure'. Two well documented Australian examples are the 2007 ARIA awards [10], and the iiNET advertisement in 2010; in the former, brand logos were flashed on the screen for one frame at a time, embedded within fast paced motion graphic montages, while the latter made use of a two frame hidden message linking to a URL and free gift. There was also the single frame McDonalds logo that appeared in 2007 during Iron Chef America, which was later explained as an inadvertent editing glitch. These incidents, which were deemed in breach of the Australian media's code of practice, naturally caused a stir for the broadcasters and a lot of welcome attention for the sponsors, as despite their withdrawal from broadcast TV, all the sequences were then disseminated on YouTube. While the popular mythology, as well as the Australian industry code of practice, suggest that this type of advertising is a form of hypnotism, the more plausible explanation of the success of the process is actually the appeal of detection, whether it be in real-time from the live broadcast or later played back from a download. Either way, the marketing succeeds.

It is now possible to have a maximal electronic media presence with the minimum amount of effort, as smartphones allow the seamless production and display of digital video without the 'techy' nuisance of capturing, editing and exporting. The digital revolution is a revolution of infinite real-time video and the lazy producer, with no aspect of our lives left undocumented. In comparison, the flash frame is, for me, therapeutic – the intervals of space and the rarity of the fleeting image are comparatively secretive. The tachistoscopic flash frame is a technology marginalised not necessarily by its own technological obsolescence, but by its prohibition as a potential tool for infiltration. From the mechanical spark, through the electronic flash to the digital glitch, the flash frame makes manifest the apparatus, disrupting the comforting trance of moving image narrative and momentarily breaking the spell. Where the original impetus for the tachistoscopic flash frame was the modernist drive for speed and efficiency (in perception, learning, or influencing the mind), the contemporary notion of efficiency has now become one of reduction, of cutting back on time, space and money. For me this standpoint is by no means one of ethics. I am not necessarily interested in the morals of media consumption, but merely regard the tachistoscopic flash frame as an opportunity to take pleasure in a possible alternative and cut back on moving image pollution!

References and Notes

1. http://www.bubley.com/t-scopes/research.html

2. T. A. Schwartz, and C. B Ryan, 'Speed of Perception as a Function of Mode and Representation,' in *American Journal of Psychology* 69 (1): 10. 1956.

3. David Deitcher, 'Unsentimental Education,' in Roy Lichtenstein and Graham Bader (eds.), *Roy Lichtenstein (October Files 7)*. Cambridge: MIT Press, 2009, p. 98.

4. Charles R Acland, *Swift Viewing: the Popular Life of Subliminal Influence*. Durham: Duke University Press, 2012.

5. Paula M, Niedenthal, 'Implicit perception of affective information,' in *Journal of Experimental Social Psychology* 26, 1990 (6), pp. 505-527.

6. For a full description of the Australian industry codes see: http://www.acma.gov.au/webwr/aba/contentreg/codes/television/documents/commercial_tv_industry_code_of_practice_2004.pdf

7. *Cartoon-based illness mystifies Japan*, CNN Interactive, December 17, 1997 http://edition.cnn.com/WORLD/9712/17/japan.cartoon

8. Laura Mulvey, 'Visual Pleasure and Narrative Cinema,' *Screen 16.3*, Autumn 1975, pp. 6-18.

9. Acland, [4], p. 74.

10. Nathan Bazley, *Subliminal Ads*, ABC Behind The News, Oct 21 2008. http://www.abc.net.au/btn/story/s2395742.htm

WHAT IS TRANSMEDIA? PROJECTS AND THOUGHTS BEYOND THE BUZZWORD

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Abstract

Transmedia is a cultural paradigm that allows audiences to participate in the meaning-making process of narrative worlds. However, what does 'transmedia' really mean? There are so many voices and definitions, but the question remains: is transmedia a real practice able to foster multiple perspectives, allowing the development of widespread creativity and enhancing the role of the crowd? The aim of this paper is to expose the debate around the term and identify its key features in order to develop a design tool.

Keywords: transmedia, storytelling, audience engagement, framework, communication design

"Who killed Laura Palmer?" … "Why so serious?" … "Should Barbie take Ken back?" We are surrounded by such frequently communicated artefacts, or 'calls to action', in jargon. It is this sort of 'we want you' that drives people to interact with the surrounding stories; but what are the consequences?

The most important consequence is the breakage of the 'fourth wall', a metaphorical barrier between the public and the action that unfolds on stage, keeping reality separate from the fictional world. This dramatic convention is accepted by viewers, allowing them to enjoy those narrative universes that do not correspond to reality's logic — allowing for the *suspension of disbelief*. A disruption of the fourth wall, used to surprise the audience and develop *metafiction* reflections, has become one of the key features of the transmedia phenomenon, which allows people to enter story worlds through the dissemination in different media of 'points-of-entry' (access points to the story), and 'rabbit-holes' (primary access points to the fictional world) [1].

We have therefore been witnessing the emergence of phenomena in which channels and languages that have broken their historical isolation allow a more dynamic use of stories: narrative environments that are capable of shaping society and influencing media habits.

Here we are, like Alice; when "the Rabbit actually [TAKES] A WATCH OUT OF ITS WAISTCOAT-POCKET, and [looks] at it, and then [hurries] on", we jump to our feet and run "across the field after it, and fortunately [are] just in time to see it pop down a large rabbit-hole under the hedge" [2]. We fall down, then, through a transmediated world which surrounds and welcomes us with open arms.

However, what does transmedia really mean? Is it only an adjective that we can use with other words, or is it something more?

Following thoughts [3] and projects developed over the years, the aim of this work is to identify the transmedia phenomenon as a possible approach to merging different languages, media and technologies, and to rethinking participatory processes. First, the paper will explore the various definitions of the word. Then it will briefly discuss the initial findings of my PhD research, which introduces a 'transmedia design framework' — a useful tool for those who wish to develop engaging environments and understand how aesthetic and economic issues work together in contemporary 'design ecology'.

Tracking Transmedia

There are many, often contradictory, definitions of 'transmedia'; thus we need to go 'through the looking glass' [4] in order to explore definitions developed by leading players in the ongoing debate.

The power of story | We heard the word 'transmedia' for the first time in 1991, thanks to Marsha Kinder, who coined the term in reference to the franchise entertainment super-systems that work "to position consumers as powerful players while disavowing commercial manipulation" [5]. The work of Professor Henry Jenkins was a theoretical improvement that defined transmedia storytelling as "Stories that unfold across multiple media platforms, with each medium making distinctive contributions to our understanding of the world, a more integrated approach to franchise development than models based on urtexts and ancillary products" [6].

Transmedia is a real-world-building process, of which one of the best-known examples, also used by Jenkins, is *The Matrix* [7], an American science-fiction film written and directed by Andy and Larry Wachowski, and disseminated through different media that are self-contained, yet also work together to create a universe suitable for the era of collective intelligence [8]. There is a textual activator [9] for fans, who started to create their own videos by making short films dedicated to *The Matrix*'s universe. A recent example is *Kaydara* [10], a 55-minute movie made by Raphael Hernandez and Savitri Joly-Gonfard, whose story takes place in that story world.

Jenkins further states that "the current configuration of the entertainment industry makes transmedia expansion an economic imperative, yet the most gifted transmedia artists also surf these marketplace pressures to create a more expansive and immersive story than would have been possible otherwise" [11]. However, this expansion must be coordinated, as described by Jeff Gomez, the CEO of Starlight Runner Entertainment, who uses the music metaphor to describe each storytelling medium as a musical instrument: "Different media should be considered as music instruments: put together, they form a symphony" [12]. He continues, "you don't need a science fiction or fantasy story to spark up a transmedia narrative". The "main criteria … is that the story, brand or message lends itself to a rich world, real or imagined. This world needs to have a past and future, it must be populated with engaging characters, and there has to be something about it that makes us want to be a part of it" [13].

An example of this is *The Beast*, an alternative reality game built and executed to promote *A.I.: Artificial Intelligence* (Steven Spielberg, 2001), to anticipate the key elements of the film and to allow people to become active participants in the narrative universe. The game was characterised by the overlap of game space and real world, and is a clear example of what could be defined as *experiential space*: an environment in which people can interact, creating collaborative networks able to experience narratives spread out by non-linear communication systems through collective consumption. Cloudmakers.org, a *Yahoo!* discussion group founded on 11 April 2001, completed the game on 24 July in the same year [14].

The power of structure | The first key feature of the transmedia phenomenon is a storyline that is not reduced to a single story arc, but has grown to become a complete universe in which, using Christy Dena's words, "each of these compositions are self-contained, but also have a continuing narrative that run through all of them" [15].

Geoffrey Long, who highlighted a difference between adaptation and transmediation by saying that "Retelling a

story in a different media type is adaptation, while using multiple media types to craft a single story is transmediation" [16], reinforced this thought in 2007. He recognised three types of transmedia storytelling: "ones that are designed from the beginning to be transmedia (hard), ones that are then developed as transmedia projects after the success of mono-medium project (soft)" [17] and "those with a mix of both (chewy)" [18]. Long further highlighted a better distinction between "*a priori* (before the experience) and *a posteriori* (after the experience) transmedia forms" [19], referring to a classification related to the experience.

Examples of a priori transmedia projects are *Pandemic 1.0* [20], *Iron Sky* [21] and *The Cosmonaut* [22]. *Pandemic 1.0* is a transmedia storytelling experience developed by Lance Weiler for Sundance Film Festival (2011) attendees and a global online audience, with a core short that tells the story of a pandemic disease. This is a common topic in linear narrative films, and in this case spreads through different media in order to test new business models and study the spreading phenomenon in social environments (in collaboration with Medic Mobile and FreedomLab). The peculiarity of these projects is that "In transmedia practice there is no single medium, no one single way of expressing or experiencing the world. There are many media that have their own production and experiential media cultures; and they can actually work together despite their differences" [23].

Iron Sky is a 2012 Finnish-German-Australian comic/science-fiction film directed by Timo Vuorensola, which tells the story of Nazi Germans taking refuge on the moon in 1945, following the Second World War, and later returning to conquer the planet Earth. Its main characteristic is the use of an alternative production workflow that fosters audience engagement through crowd-funding and crowd-sourcing processes, which are now being used to raise money for the sequel, *Iron Sky—the Coming Race*. The producers need their fans because "with Iron Sky 2, we want to go darker, we want to go crazier, we want to be more experimental" [24], so as not to compromise the integrity of the story to fit the financiers' needs.

The Cosmonaut, a Spanish science-fiction movie produced by the Riot Cinema Collective, tells the story of Stas and Andrei's arrival at Star City in 1967, where the Soviet Union was training the first cosmonaut. The spectator follows the failures, successes and love struggle of the two characters and their friend/lover Yulia, a telecommunications engineer who they meet in Star City. Related to the new wave of 'participatory' cinema and rethinking of the industrial mindset, the main features are the application of a new model of production and distribution that involves crowd-funding processes, and the release of the film under Creative Commons licences, using social communication tools to enhance the role of the crowd.

The power of engagement | The core of transmedia projects, identified by Marsha Kinder in 1991, is the audience engagement, which allows people to be embraced by the narrative world and involved in its building. In his book *Getting Started in Transmedia Storytelling*, Robert Pratten (CEO of Transmedia Storyteller) explains how "'Transmedia storytelling' is telling a story across multiple media and preferably, although it doesn't always happen, with a degree of audience participation, interaction or collaboration". He continues that "In transmedia storytelling, engagement with each successive media heightens the audience' understanding, enjoyment and affection for the story. To do this successfully, the embodiment of the story in each media needs to be satisfying in its own right while enjoyment from all the media should be greater than the sum of the parts" [25]. This does not mean we must seek the highest possible degree of engagement, but that it is necessary to develop environments in which people can decide and shape their own engagement path in order to enjoy the content in a personal way.

An example of this approach is *The Spiral* [26], a pan-European transmedia project co-produced by seven broadcasters and spread through a television series, a LARP (live action role-playing game), an online scavenger hunt and the online construction of *The Warehouse* art community. The project left the contributors free to choose their own participation path, creating an environment "where everyone can participate the way they like and the way they feel" [27] — through involvement in the online artistic community and the LARP, or as intermittent contributors in the online game. A large audience chose to simply follow the television series.

Transmedia: What it is and what it could become

All these examples are grounded in their audiences' participation in the meaning-making process of the story worlds, allowing the development of widespread creativity thanks to the success of the phenomenon, based on storytelling, collaboration and engagement.

In this way, alternative production pipelines that go beyond the 'mainstream' circuit sprout up and can be applied to several fields, from branding to social activism, from entertainment to the artistic world. The first question — what is transmedia? — can be answered by identifying three key features common to all the case studies.

The first is the building of a story world towards the construction of a complex 'mythology' [28] that covers every aspect of the story and the characters, from the relationships between the characters to the rules of interaction between audiences and the story universe. The story architect has to think about the narrative arc, the world setting and environment, the characters (their habits, motivations, feelings, back-stories and relationships), and the rules that allow people to engage with it, not forgetting free space for audience expression and further developments.

The second is the distribution of content: fragments, elements and characters referring to the same narrative universe are spread through different media, creating a choral expression. In this way, people can enhance their participation, choosing their path and engagement level through different channels.

The final feature is audience engagement, for which the main consequence is a mutation in the relationship between the mainstream media ('top-down') and participatory culture ('bottom-up' or 'grassroots'), because the transmedia phenomenon allows audiences not only to access content in a different way, but also to participate in the meaning-making process. For this reason, during our design practice we need to be aware of contemporary media habits, in order to "start a dialog with" the "audience in such a way as to activate them, validate their participation and get them to advocate on behalf of the story" [29].

From a design/artistic perspective, the second question appears more interesting: what could transmedia become?

In reality, what may seem a technicality has become a real design practice, and one which is not restricted to big Holly-

wood projects, as demonstrated by the independent productions that have incorporated it. In fact, transmedia has proved to be an approach potentially able to support the construction of a 'human landscape', relying on storytelling ability to foster multiple perspectives, and allowing people to become aware of their leading role in the contemporary 'mediascape'. Hence, it is important to identify guidelines that will allow us to apply this practice to other areas. To this end, the aim of my PhD research is the construction of what I call a Transmedia Design Framework, to help understand how aesthetic and economic issues work together in the 'design ecology'.

In the informatics field, a framework is a reusable platform that allows programmers to develop solutions, focusing on specific software requirements; it can be considered a 'boundary object', as it can maintain its structure, yet is, at the same time, adaptable and open. This concept was developed in the field of sociology by Susan Star and James Griesemer to describe "objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" [30]. They further applied this analytical framework to their case study and identified four types of boundary objects: repositories, ideal type, coincident boundaries and standardised forms. Standardised forms aim to share methods and guidelines for collaboration among diverse work groups, a description consistent with the aim of the Transmedia Design Framework, which is intended to become a useful tool for teams wanting to develop engaging environments.

Conclusions and Future Actions

The first result of my research was the identification of transmedia practice as an approach that might overcome contemporary complexity through storytelling, collaboration and audience engagement. The aim of this work is to highlight the key features that are inferred from definitions and projects discussed above. What emerged is that transmedia practice is concerned with the building of a story universe through different channels, in order to enhance the role of the audience. It is a socially understandable paradigm, the growth of which requires specific skills and teamwork.

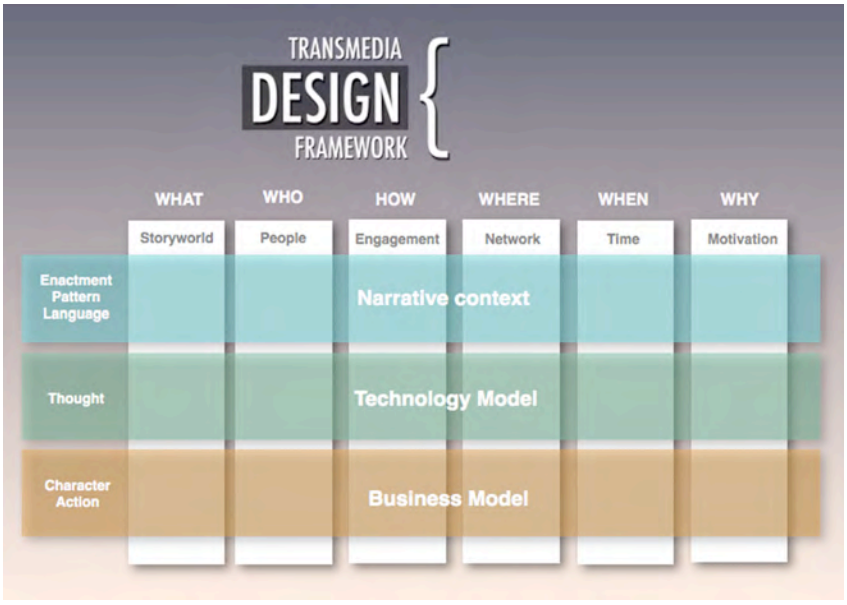
Therefore, the next step of my research (not the topic of this paper) will be the construction of a Transmedia Design Framework. Until now, I have defined different classes related to transmedia features that also answer the questions all designers need to consider in order to develop efficient, satisfactory, effective and enjoyable communication contexts: what, who, how, where, when and why? I wove these classes together with the six elements of Aristotle's poetics, qualitative elements which structure a drama like an 'organic whole', translated for the human-computer activity by Brenda Laurel in *Computers as Theatre* [31]: action, character, thought, language, melody (pattern) and spectacle (enactment). This allowed me to identify three sub-classes, within which I am working to define the sets of procedures and tools that will complete the framework, and that reflect the main features highlighted in this work:

Narrative context | According to the idea that we live in a script's society [32], it is possible to recognise the rising importance of the storytelling practice, and the consequent development of narrative environments founded on a complex mythology. Therefore, it becomes necessary to identify the possible story structures (e.g., linear, parallel and cyclic), and potential paths that allow people to consume and engage with the content.

Technology model | The emergence of crossmedia and transmedia structures has completely changed the role of the audience, showing that to overcome contemporary complexity it is necessary to find new ways for collaborative creation and the collective consumption of narrative worlds. Further, we have been witnessing a shift in the traditional relationship between the mass media (top-down) and participatory culture (bottom-up / grassroots). The main consequence is the need to identify the channels available to access the narrative universes, highlighting their key features.

Business model | In the contemporary communication scenario, the traditional production flows face a change in the distribution of financial resources, with the consequence that designers must deal with new approaches related to production and audience engagement. Therefore, it becomes necessary to highlight possible business models that projects can adopt, including the new processes which enhance the role of the crowd, and that constitute an alternative to the traditional production workflow.

Transmedia Design Framework – Classes and Sub-classes © Mariana Ciancia



References and Notes

1. Max Giovagnoli, *Transmedia: Storytelling e comunicazione* (Milan, Italy: Apogeo Next, 2013).

2. David Widger, *Project Gutenberg's Alice's Adventures in Wonderland, by Lewis Carroll* (2012), <http://www.gutenberg.org/files/11/11-h/11-h.htm#link2HCH0001>, accessed 12 June 2013.

3. See, for example, Nuno Bernardo, *The Producer's Guide to Transmedia: How to Develop, Fund, Produce and Distribute Compelling Stories Across Multiple Platforms* (Lisbon-London-Dublin-Sao Paulo: BeActive Books, 2011); Christy Dena, *Transmedia Practice: Theorizing the Practice of Expressing a Fictional World Across Distinct Media and Environments*, PhD thesis, University of Sydney, 2009; Geoffrey Long, *Transmedia Storytelling: Business, Aesthetics and Production at the Jim Henson Company*, Master of Science Degree thesis, Massachusetts Institute of Technology, 2007; Indrek Ibrus and Carlos Alberto Scolari, *Crossmedia Innovations: Texts, Markets, Institutions* (Frankfurt am

Main-Berlin-Bern-Bruxelles-New York-Oxford-Wien: Peter Lang, 2012); Henry Jenkins, *Convergence Culture: Where Old and New Media Collide* (New York: New York University Press, 2006); Andrea Phillips, *A Creator's Guide to Transmedia Storytelling: How to Captivate and Engage Audiences Across Multiple Platforms* (New York: McGraw-Hill, 2012); Robert Pratten, *Getting Started in Transmedia Storytelling: A Practical Guide for Beginners* (CreateSpace, 2011).

4. David Widger, *Project Gutenberg's Through the Looking-Glass, by Lewis Carroll* (2013), <http://www.gutenberg.org/files/12/12-h/12-h.htm>, accessed 30 June 2013.

5. Marsha Kinder, *Playing with Power in Movies, Television, and Video Games: From Muppet Babies to Teenage Mutant Ninja Turtles* (Berkeley and Los Angeles, California: University of California Press, 1991), pp. 119–120.

6. Jenkins [3] p. 293.

7. Andy Wachowski and Lana Wachowski, *The Matrix* (1999), film.

8. Pierre Lévy, *L'intelligenza collettiva: Per un'antropologia del cyberspazio* (Milan, Italy: Feltrinelli, 1996).

9. Henry Jenkins (2007), <http://henryjenkins.org/2007/03/transmedia_storytelling_101.html >, accessed 13 June 2013.

10. Raphaël Hernandez and Savitri Joly-Gonfard, *Kaydara* (2011), film.

11. Jenkins [9].

12. Catalina Briceno (2011), <http://www.cmf-fmc.ca/about-cmf/industry-research/trendscape-blog/2012-trends-transmedia-rising-a-new-language-to-tell-stories/28/?setLocale=1>, accessed 24 June 2013.

13. Stephen E. Dinehart (2009), <http://narrativedesign.org/2009/09/creators-of-transmedia-stories-3-jeff-gomez/>, accessed 21 October 2013.

14. Cloudmakers (2001), <http://www.cloudmakers.org/>, accessed 24 June 2013.

15. Dena [3] p. 100.

16. Long [3] p. 22.

17. Dena [3] p. 202.

18. Dena [3] p. 202.

19. Long [3] p. 20.

20. Lance Weiler (2011), <http://www.lanceweiler.com/2011/01/pandemic-1-0/>, accessed 24 June 2013.

21. Timo Vuorensola, *Iron Sky* (2012), film.

22. Nicolás Alcalá, *The Cosmonaut* (2013), film.

23. Dena [3] p. 331.

24. IndieGoGo (2013), <http://www.indiegogo.com/projects/iron-sky-the-coming-race>, accessed 24 June 2013.

25. Pratten [3] pp. 1–2.

26. Hans Herbots, *The Spiral* (2012), television series.

27. Interview with Peter De Maegd for *Interactive TV Today*, by B. S. Hurst (2012), <http://vimeo.com/48494252>, accessed 24 June 2013.

28. Henry Jenkins (2009), <http://henryjenkins.org/2009/09/the_aesthetics_of_transmedia_i.html>, accessed 24 June 2013.

29. Diego Perrone, 'What Jeff has not said', *Subvertising. La sovversione della pubblicità* **50** (2012) p. 11, <http://subvertising.it/>.

30. Susan Star and James Griesemer, 'Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39', *Social Studies of Science* **19**, No. 3 (August 1989) pp. 387–420.

31. Brenda Laurel, *Computers as Theatre* (Boston, MA: Addison-Wesley, 1991).

32. Luca Toschi, *La comunicazione generativa* (Milano, Italy: Apogeo, 2011).

DIY DNA VISUALIZATION: A PRELIMINARY METHOD

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Abstract

The findings presented in this paper are the result of research from the work "ONE: a durational performance by Rebecca Cunningham and all of you" wherein the artist creates a bio-portrait and symphony from the DNA of one million strangers. A preliminary DIY method undertaken by the author will be followed by a discussion of the particular practical, technical and legal implications for the large scale collecting and imaging of human DNA. The paper concludes with areas of future research and further questions.
www.oneperformance.wordpress.com

Keywords: performance art, DNA, DIYbio, visualization, large data, portraiture

Introduction

"ONE: a durational performance by Rebecca Cunningham and all of you" is a performance that may take ONE lifetime. ONE person, sitting opposite ONE person. There is ONE exchange. ONE sample of DNA is collected. If desired ONE sample of DNA is exchanged. This will happen ONE million times until ONE million samples have been collected. Once ONE million samples from ONE million people have been collected, each DNA sample will be imaged. From ONE million DNA images ONE will be made, a composite of all becoming ONE [1]. This paper outlines the research from the work "ONE". A preliminary DIY method undertaken by the artist-author will be followed by a discussion of the particular practical, technical and legal implications for the large scale collecting and imaging of human DNA. The paper concludes with a discussion of areas of future research and further questions.

Fig. 1. Rebecca Cunningham - ONE premiere Brisbane Festival Under the Radar 2011. (© Rebecca Cunningham. Image Gerwyn Davis)

Bio Art is a burgeoning field with artists such as Stelarc [2], Andre Brodyk [3], Svenja Kratz [4] and Terumi Narushima [5] pioneering the field. Further, bio focused institutions and organisations such as La Paillasse [6], and DIY BIO [7] are emerging worldwide.

ONE began in 2010 as an idea. I will now continue this work for the rest of my life. I was thinking about trust, and community. I was wondering what it would look like if we could get the smallest parts of ourselves and put them as close together as possible. What would this mean? What would this look like? Would it be interesting?

ONE consists of three components 1) DNA Collection 2) DNA Visualisation and 3) Translation of Visualisation into sound. Each step will be further elaborated in turn.

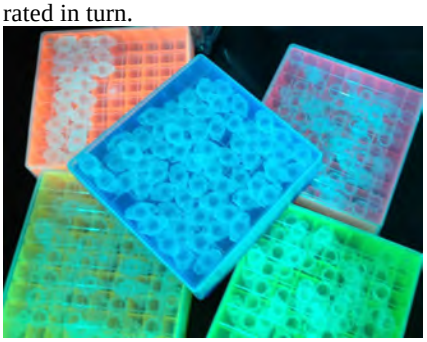

Fig. 2. Eppendorf tubes (© Rebecca Cunningham.)

1) DNA Collection

This component consists of a performative act between myself and one million individuals. This process as performance was premiered at the Brisbane festival in 2011 and has since been performed in New York, Paris and multiple sites in the United Kingdom and Australia.

2) DIY DNA Visualization

Three steps have been identified for the DIY DNA visualization of a human hair sample: a) extraction, b) amplification c) visualization. The following is a preliminary protocol.

Step a – DNA Extraction

Fortunately there are existing protocols for the extraction of DNA from human hair [8]. Put simply, 10-15 roots are cut approx 0.5cm long and put into a 1.5ml eppendorf tube. 50ul of 200mM NaOH solution is added. The tube is put into a water bath of 94 degrees Celsius for 10 minutes. The sample is cooled at room temperature to which is added 50uk of a solution containing 200mM HCL and

Fig. 3. Building OpenPCR (©Rebecca Cunningham.)

100mM Tris-HCL having pH 8.5
After this is completed, the sample is ready for amplification.

Step b – DNA Amplification

Traditionally PCR – Polymerase Chain Reaction has been used to multiply a sequence of DNA many millions of times; making visualization possible.

The initial issue with this method was that PCR machines – thermal cyclers – have been very expensive and accessible only through professional laboratories. In the twenty-first century and with the advent of BIO hacking and open source, the DIY bio community have created open source PCR. There are two companies which offer PCR kits, Lava Amp [9] and Open PCR [10].

Fig. 4. Running Open PCR (©Rebecca Cunningham.)

The Open PCR kit comes with software that connects simply to your laptop. The extracted sample is then taken and a primer added. The primer specifies which part of the DNA strand the PCR is to amplify [11]. As this process is designed to create images of the DNA rather than to genotype or sequence the DNA, this lo-fi method is currently suitable. The type of primer used will also have an impact on the process run on the PCR. Once the primer has been added to the extracted sample it is placed into the PCR. Within the PCR process the samples are heated and cooled at specific times and temperatures. After approximately three hours the samples have run through this process and are ready for visualization.

Step c – DNA Visualization Gel Electrophoresis.
There are a range of possibilities for DNA visualization such as Scanning Electron Microscopy, Transmission Electron Microscopy and gel electrophoresis. The method of visualisation is selected based on what type of analysis is required [12, 13]. As this project is not analyzing, sequencing or genotyping the DNA sample, yet simply imaging for the sake of a "do-it-yourself" or DIY setting, gel electrophoresis has been selected [14]. To undertake gel electrophoresis, one requires a gel electrophoresis chamber and low voltage power supply, in addition to other ingredients such as buffer, chemical grade agarose, and dyes [15]. The first step is to create the gel, which is made with chemical grade agarose and dye. The dye is required so that the DNA will be visible. The common dye used is ethidium bromide (EtBr), however, this dye is a known mutagen and is not safe to use in a DIY setting. SYBR Safe is another option, however as yet I have been unable to source this chemical in Australia. SYBR Green is a commonly used dye in gel electrophoresis and it does bond to the DNA particulates. However as SYBR Green is a known carcinogen, it is prohibitive in some DIY scenarios [16].

Once the gel is made with the dye, it is set with a comb. Once the gel is set, the comb is removed, allowing divots to be revealed in the gel. This is then placed into the gel electrophoresis chamber. The chamber is filled with buffer with a ph8.4 – akin to seawater. The samples from the PCR are loaded into the gel via a pipette. Low and varied levels of voltage is applied to the chamber. This pushes the DNA through the gel as small pieces of DNA move faster than large pieces of DNA. This process may take between eight and twelve hours. Once the gel has completed its run, it is removed from the chamber and placed on a dark reader [17]. This device pushes blue Ultra Violet light through the gel, illuminating each sample, making the DNA "pop" wherever it has stopped in the gel. A dark room and safety glasses must be used for this process.

Fig. 6. Dark Reader (©Rebecca Cunningham)

3) Translation of Visualisation into sound.
A future component of this work involves translating the image of an individuals' DNA in sound. During the residency at The Edge, and further, while touring ONE in Europe last year, I began searching for established procedures for this translation [consisting of translating the colour spectrum to the sound spectrum and bringing the pitches into the human audible realm]. There are some open source ware that allows for this to happen in a routine and mechanical way. Working alongside a programmer would allow for this component to be developed, and ultimately a piece of freeware that elegantly reads images will be developed and released.

Participant experience and feedback
Relating this process back to the work ONE, the participant's first experience of the work takes place during the performative collection process. To date, there have been over 150 participants. In the majority of cases, the performative setting is public such as in a museum, a mall, or a foyer. I sit in a lab coat at a table with one chair empty. I have a secure box, a series of analogue rubber stamps and a carbon paper book set out on the paper. On the chair there are instructions "If this chair is free, feel free to sit with me." I do not ask people to join me outside of this textual invitation. Once a participant sits with me, I invite them to read some text about the work [the same as that outlined in the introduction to this paper]. I ask if they have any questions. At this point, the conversation turns any number of ways. Frequent questions include, what are you going to do with my DNA; what type of DNA are you collecting; are you a scientist; and what do you think this will look like. Often the conversation turns to policy, current genomic trends and ethics.

Once I feel that the conversation has come to a natural pause, I ask if the participant if at this time they would like to participate in this artwork. If a participant indicates they would not like to participate, they are thanked for their time, and given the link to the website for the project should they reconsider. Participants who choose to participate are then asked to read the template participant authorization statement. We then complete the statement together, and exchange a hair sample, carefully putting ten strands of hair into a zip-locked bag with the participant's number. At this point the performance element ends and the participant leaves the performance space.

Participants may at any stage contact me with questions or queries related to their participation. After the initial interactions and exchange, I do not contact participants until their DNA has been visualized. Once this has occurred, each participant receives a copy of their DNA via email. Once the image of their DNA has been converted into sound, participants then receive a sound track of the image of their DNA. The individual images are then compressed and compiled until there are one million people's DNA visualized as a single image and sounds compiled into a symphony.

Technical and Legal implications
Space: Although the process is planned to be DIY, due to the chemicals used there is a technical requirement to have a clean bench lab space. I am working to make a clean bench so that I may run samples at my leisure. Prior to this I plan to use a lab to practice and refine my skills on a pilot batch of samples prior to

commencing imaging on ONE samples proper.

Cost: The cost of imaging each sample is approximately $50AUD per person with the outlined method. The initial outlay for the PCR machine, gel electrophoresis chamber, low voltage supply and dark reader were under $5,000 AUD, however the ongoing cost of consumable chemicals and primers are significant. For DIY DNA visualization to become feasible in any large quantity, inexpensive alternatives will need to be developed.

DNA regions and Ethics: We know that human DNA is mostly the same and we have many aspects in common with other species. As the outlined method looks at a particular sequence rather than the whole DNA strand, the outcome of the image is likely to be rather pedestrian and uniform. A more interesting approach might involve imaging non-coded/regulatory/junk DNA that has variation in length. Coded DNA is represented by approximately 5% of our sequence with non-coded/regulatory or junk DNA comprising the remaining 95%.

There are two obstacles to pursuing this option of exploring non-coded DNA regions. First, a primer will need to be designed and created to amplify this non-coded DNA sequence. The project ENCODE will be an important resource in the initial stages of design. I am not a scientist nor geneticists, so much more research and collaboration will be required to pursue this primer design and implementation [18].

Second, there are considerable ethical and legal implications when looking at non-coded DNA regions. In 1989, the Australian company Genetic Technologies was formed, and soon after it was successful in its application to patent all non-coded DNA in humans and animals [19]. Any person or researcher wanting to investigate non-coded DNA must now request a license from Genetic Technologies Ltd [20, 21].

I have been asked why I wish to undertake this laborious lab work when there are outsourcing potentials with companies such as 23andme [22]. It is true that there are better, more efficient ways to do this. However, I consider this work conceptually as an experiment in trust - strangers trust me with their DNA and I trust them with mine. At the point of exchange, I say that only I access the sample. If that changes I promise to contact them and request their permission. As this is part of their body I want them to have control over these types of decisions. I appreciate how laborious this makes the work, but I think it is worth it. I want to be intimate in this way, working with the DNA of 1 million people over the course of my life. As such, I don't want to outsource the labour as I feel this undermines that foundation of trust that I aim to build within the exchange. Although this work has an end result, the image and symphony, this work will continually evolve as I progress through my life. In time, technology will change, thus these processes will change and in turn, the work will continue to develop over time.

I am interested in the notion and practice of the organization DIY bio [23], as the scientific lab no longer belongs solely to those with specific training, but is available also to interested and vested parties within the general public. To quote from the organization's website "DIYbio.org was founded in 2008 with the mission of establishing a vibrant, productive and safe community of DIY biologists. Central to our mission is the belief that biotechnology and greater public understanding about it has the potential to benefit everyone" [24].

This ethos of knowledge belonging to everyone is by no means new, however when it comes to DNA and ownership as per the example above (Genetics Technologies), there are many ethical grey areas in this burgeoning field of bioscience and specifically genetics. There are growing banks of DNA samples, such as 23andme, The National Human Genome Research Institute [25] and deCODE (including the famous Icelandic sample) [26]. In Australia there is a swathe of regulatory bodies who legislate around new technologies and advancements [27]. In my experience, DIY bio works within a grey area. As an artist working in this space I feel it is imperative to maintain transparency of practice, just as it is important to maintain the privacy and anonymity of participants.

Conclusions and Future Research

In conclusion, as a lifelong durational work, this artwork ONE will always be changing. There is a need for further research and publications of various elements of DIY bio strategies and procedures both artists and the general public are undertaking in their studios and in their homes. As new technologies become more freely available to the general public, the work will progress at a more rapid rate. I urge researchers to engage further in this field, and I look forward to learning and sharing this process not only with participants, but those interested in DIY bio in general.
For more information, papers, and updates, follow the project at www.oneperformance.wordpress.com

References and Notes

1. www.oneperformance.wordpress.com ONE brief history: 1) DNA collection. This work premiered at the Brisbane festival in 2011. Technical set up requires one table, and two chairs. The artist sits and talks with participants one on one. After discussing the project, the artist and participant exchange DNA. Currently the DNA is a hair sample. An analogue document of agreement is then created by the two parties so that the DNA may be held and imaged by the artist. 2) DNA Visualisation: In April – June 2012, I undertook a residency at the Queensland State Library | The Edge, and here compiled a preliminary method for DIY DNA Visualisation. This method was presented at the CSIRO SPECTRA conference in Canberra [Oct 2010] and at TEDX in Nottingham UK [Nov 2012]. I have been working on the DIY DNA Visualization method, to date, however outside a lecture on DIY DNA Visualizations; - no images have been created nor displayed. I plan to work with a genomic consultant to realize this element. 3) Translation of DNA into sound. All elements are in the process of being realized and presented.

2. Zurbrugg, N "Virilio, Sterlac and 'Terminal technoculture" Theory Culture & Society **16** (1999 p177-199)

3. http://intraactionart.com/andre-brodyk

4. http://svenjakratz.com

5. Fargher, C. Anne . & Narushima, T. "Knit two together: Art/Science collaborations in BioHome: the Chromosome Knitting Project." The Scientific Imaginary in Visual Culture. Ed.A. M. Smelik. Goettingen: V & R Unipress, 2010, 181-194.

6. http://www.lapaillasse.org/

7. www.diybio.org

8. http://www.protocol-online.org/biology-forums/posts/760.html

9. http://lava-amp.com

10. http://openpcr.org

11. http://ghr.nlm.nih.gov/glossary=primer

12. Müller-Reichert, T. Gross, H "Microscopic analysis of DNA and DNA-protein assembly by transmission electron microscopy, scanning tunneling miscroscopy and scanning force microscopy" *Scanning Microscoy* **10**(1996 pp 11-20)

13. Bell, D.C., W.K Thomas, K.M. Murtagh, C.A. Dionne, A.C, Graham, J.E. Anderson, and W.R Glover, "DNA base identification by electron microscopy." *Microscopy and Microanalysis* **18(05)** (2012 pp 1049 – 1053)

14. http://www.dnalc.org/resources/animations/gelelectrophoresis.html

15. I managed to find both of these items on eBay for less than $200.

16. This dye requires a minimum of a clean bench or level 1 lab safety space. SYBR Green must be stored in a refrigerated environment and to remove SYBR Green it must be subjected to activated charcoal and disposed of as solid chemical waste. This dye is also quite expensive for DIY purposes, costing approx $600 AUD for 5 mls.

17. *www.biosci.com.au/* The pictured mini Dark Reader was purchased from Bio Scientific for $700 AUD.

18. In 2007, after the Human Genome was sequenced the Encyclopedia of DNA Elements or the ENCODE project commenced.
http://genome.ucsc.edu/ENCODE/

19. United States Patent number 5,612,179 ('179)

20.http://wwwgtglabs.com.au/announcements/genetic-technologies-us-patent-update

21.
http:/www.patentlens.net/daisy/junkDNA/681.html

22. www.23andme.com

23. http://DIYbio.org

24. http://DIYbio.org

25. National Human Genome Research Institute
http://www.genome.gov

26. www.decode.com

27. Gene Technology Regulations
http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/legislation-2
There are techniques that are not considered to be gene technology and as such I have not sought permission for my artwork
http://www.comlaw.gov.au/Details/F2011C00732/Html/Text#_Toc302474507
The following extracts from the legislation are those found pertinent to ONE "Part 2: Interpretation and general operation
4 Techniques not constituting gene technology
For paragraph (c) of the definition of ***gene technology*** in section 10 of the Act, gene technology does not include a technique mentioned in Schedule 1A.
"
Further looking to section 10 of the Gene Technology Act and Schedule 1A [looking at the current act for Queensland as of July 2013, it refers to itself as Schedule 3
http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/G/GeneTechA01.pdf
the definition of gene technology as per pg 132
" gene technology means any technique for modifying genes or other genetic material, but does not include the following -
(a) sexual reproduction;
(b) homologous recombination;
(c) any other technique prescribed under a regulation for this paragraph
"
In ONE I do not modifying genes, I am imaging them and as such I have not undertaken licensing. However I have discussed this work at length with both Arts Law and the Law Society of QLD and although thinking the project was weird, considering the nature and the content of the work at this stage, licensing was not considered a legal issue.

EVALUATION IN PUBLIC ART: THE LIGHT LOGIC EXHIBITION

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Abstract

This paper discusses evaluation in the context of public art and specifically of interactive digital art. The study reported is of 'Light Logic', an exhibition of retrospective and current drawings, paintings and interactive digital works by the second author. The study was conducted by Site Gallery Sheffield in association with UK and Australian researchers. A survey of evaluation practice amongst artists and groups working in digital art is described briefly.

Keywords: Digital Art; Interactive Art: Participation; Evaluation

There are many dimensions to the question of what is evaluation in the context of public art, a term that we use to apply to art that can be freely viewed by the public. We are at an interesting point in the development of new forms of interactive art that has been accelerated by advances in computing technology. These new forms are having an impact on how we approach the difficult business of evaluating quality. For artists making interactive works, it is important to understand the kinds of audience or viewer experience that arise from the interaction with the work: "as behaviour is central to its very existence, the artist can hardly ignore audience engagement within the making process. Evaluation, in some sense, of an interactive system in action is the only way to understand its full dimensions." [1].

Background to Evaluation in Public Art and Interactive art

There is an increasing drive towards finding more systematic ways of embedding evaluation into institutional art programs and funded projects. Traditionally, evaluation has been associated with measuring impact often through simple quantitative measures such as footfall and visitor satisfaction indexes. Public policy and institutional approaches to evaluation have predominated and, until recently, there has been less attention to the role evaluation can play in the creative process of the artists themselves. The public art think tank, IXIA, funded by the Arts Council of England [2], was set up to promote and influence the development of art policies and strategies. In 2004, it commissioned OPENspace to carry out research into ways of evaluating public art [3] and produced a guide to evaluation that is useful for scoping the main issues that organizations and individuals need to take on board when contemplating evaluation. Nevertheless, there is a considerable gap between advice and actual practice: practice requires methods and methods need to be learnt and tested. Whilst the IXIA initiative is important and welcome, it nevertheless forms only one aspect of the evaluation requirements for public art. An important dimension of evaluation is the need for advice and methods that address the specific needs of creative practitioners undertaking novel and often high-risk types of art projects. This is especially so in the digital interactive art field where practitioners are often working in collaboration with academic researchers whose frame of reference for evaluation may arise from different value sets and concerns. The work may also involve risks that lead to dead ends, or outright failure to achieve the initial aims, and it is only through adopting an evaluation strategy that these kinds of experiences can be turned into positive learning. As the Wellcome Trust's advice to grant applicants indicates, it is important to anticipate the possibility of failure when striving for innovation and thereby to learn from it.

Digital Art Evaluation Survey

Evaluation involves mixed methods and many layers of richness and complexity in aims, motivations and scope. In order to establish a better understanding of the current situation with regard to the role of evaluation in public art, we have carried out a preliminary study of existing practices and the methods and documentation available to practitioners and institutions. We identified a range of methods used for gathering information of which the questionnaire survey format is the most common. Evaluation is done mainly through general questionnaires which helps to provide feedback for the curator and the artist to measure success in terms of audience attendance and general attitudes: for example the company, Thresholdstudios uses questionnaires, social media and reviews such as the ones made by students in the blog of their Frequency Festival [5]. The feedback from this information was used to evaluate audience responses to the work and to share some of this with the artists informally [6].

It is important to distinguish between evaluation that functions mainly for institutional and policy purposes and that which functions for individual artists and groups. We noted a difference between what institutions require from evaluation and what artists do; for the latter, the emphasis is on collecting data about specific aspects of the work in order to inform practice. This varies according to the complexity and goals of the artwork, the exhibition, and the role of the audience. Some works use immediate feedback from the audience informing their work directly, such as the work *Audience*, created by rAndom International and Chris O'Shea, exhibited in the Victoria and Albert Museum's 'Decode' exhibition in 2009 [7]. Other works involve the audiences as participants in research processes, where they become co-creators of interactive artwork. In *Day of the Figurines* (Blast Theory), audiences are involved as performers of an experimental work crossing boundaries between the physical space of the gallery, the public street space, and the virtual space. The Blast Theory collective, whose works are hybrid forms of participatory interactive digital art, have used complex ways to evaluate the experience: for instance, to evaluate *Day of the Figurines* they carried out a public test over 24 days, the duration of the artwork. This involved testing interfaces, running trials of varied types of content, exploring narrative, critiquing the semiotics within the work and tracking the routes through the work in chronological order. Ethnographers from the Mixed Reality Lab, University of Nottingham, worked on the evaluation of this process which informed the project's development [8]. The artists claimed that this artwork shed light on several contemporary issues of HCI, as their goal was to understand how players interweave the experience of playing the game with patterns of their daily lives. Feedback, mixed with an analysis of log files of messages sent to and from the game, indicated to them: 'that the majority of players exhibit an episodic style of play, sometimes playing intensively and sometimes not playing at all for several days before returning again' [9].

Mixed methods for evaluation were needed to explore 'when and where people prefer to engage with a mobile experience'…to explore how people experience and engage in a narrative that is delivered and constructed through text messaging'; there were also technological issues such as the exploration of

‘new techniques for making maximum use of the limited bandwidth of each text message by aggregating information about several events into a single SMS message’ [9].

Other evaluation methods were used to support interactive artworks in what can be understood as participatory work. This form of evaluation fits into the category known as ‘formative’, where the aim is to explore, generate on the fly understandings and develop the works as a result of that process. Theatre Sandbox, a national scheme for theatre makers to research and develop experimental pieces of performance that use pervasive media technologies, devised and delivered by iShed in Bristol, adopts a formative approach to evaluation by seeking to understand the value of this project as a developmental process. The evaluation explored ‘the impact of the scheme on innovation in artistic practice, interdisciplinary collaborative working and the integration of digital technology and live theatre’. It focused on the process (rather than on individual performances) and used a mixture of qualitative and quantitative methods. Qualitative methods included semi-structured interviews with Theatre Sandbox participants such as ‘artists, host venues, iShed and advisory group members’; ‘documentary analysis of Theatre Sandbox Grants for the Arts proposal, applications to the scheme, selection interview notes, websites, blogs, Twitter feeds, videos and online workspaces’; ‘observation of three salon workshops’; ‘test performances, and Theatre Sandbox showcase’. Quantitative methods included: analysis of iShed’s evaluation and monitoring forms, completed by participants in the five introductory workshops; ‘follow up online survey of workshop participants six months later’. [10]

The IQ (Intelligent Questionnaire) system, originally developed to interact with job seekers, was designed to respond intelligently to answers given by respondents rather than just presenting a list of pre-existing, pre-ordered questions, in order to get a deeper level of feedback. Sophy Smith and Mario Gongora recognised its potential as an evaluative tool for arts organisations and in summer 2012 the IQ system was trialed at Phoenix digital media centre, Leicester, as a tool for obtaining a deeper-level of audience feedback about specific exhibitions. This system was also used by Ximena Alarcón to measure visitors’ engagement when listening to her sound exhibition ‘Migratory Dreams’; here experimental evaluation was used to understand the experience of listeners who shared the experience of migration, focusing on evaluating connectivity rather than interactivity. For the artist, using this questionnaire helped her to imagine how, in the future, this evaluation could become the catalyst of audience’s narratives, helping the user to reflect on the experience creatively, poetically and collectively. It also helped the artist find collective narratives that bring traces of the connections established in the virtual network of dreams.

A number of conclusions from these experiences have been identified. For institutions, evaluation focuses on general feedback from the audience measuring success of the exhibition. For artists, evaluation supports different aspects of their creation and research and is interdisciplinary and experimental. An interesting finding is the emphasis on mobile phones, as a technology that expands the museum experience, involves audiences as co-creators of content (Theatre Sandbox), and acts as performers in hybrid artworks (Day of Figurines). Also, sociological issues regarding the use of mobile phones are being evaluated through artworks, making it an interesting case of evaluation influencing artwork. On the other hand, evaluation tools that have been designed for other purposes, when used by an artist, acquire different connotations, and stimulate reflection about the purpose of evaluation and the creative use of collected data. Using social media has been shown to stimulate the exploration of technological aspects of the art practice. The evaluation experiences that have been identified have involved audiences in different roles (e.g. participants/co-creators/performers), expanded the reach of the museum/gallery space, and with it, explored the innovative uses of technologies.

The survey of evaluation experience discussed here contributes to establishing an evaluation framework that involves institutional concerns, such as engaging audiences in artworks, and artists’ intentions for the interactive artworks, understood as ‘art systems’, and the extensions that new communication technologies offer, either as part of the artwork or as supporting devices for evaluation.

The Light Logic Exhibition

We now move to an example of evaluation that focused upon the exhibition ‘Light Logic’ at Site Gallery Sheffield [11], which examined the nature of audience experience in a way that provides insights into the deeper levels of art experience. The main aim of the study of 'Light Logic' was to gather information about audience response to the artworks and installations exhibited in the Site Gallery, Sheffield during January 2013. The objectives were to:

•To evaluate the curatorial design of the Light Logic exhibition

•To evaluate the audience experience of the artworks and installations

•To develop a framework for gallery and museum staff to facilitate the embedding of evaluation into curatorial practice.

Gathering and Analysing Audience Information

'Light Logic' included paintings, drawings, time based work and interactive art. There were four main areas of focus that were represented in different areas of the gallery space as follows:

•Documentation: the artist's development through time

•The Art: the relationship between digital works, prints and paintings

•Interactive Installation: the Shaping Space light sculpture

•Interactive Artwork: ColourNet for influencing a Shaping Form artwork

The study included a range of aspects of the art and its exhibition including the audience experience of the work and being involved in research. It included the curatorial and artist perspective in the kinds of issues being explored. It used observation by video and person in combination with interviews for close attention to individual responses. The information gathered also included documented reflections by the gallery researchers that focused upon the experiences of learning new processes and acquiring new skills in evaluation methods. All members of the evaluation team were prepared for the study through trial runs of the procedures and methods. This involved conducting trial exercises during which each researcher played the participant visitor and observer at different times and the outcomes were then evaluated and the process refined.

25 participants were recruited by gallery notices and from regular visitors on the basis of age range and gender, in order to have as diverse a range of participants that could, in a certain sense, be typical of a gallery visiting public. Inevitably, there were more people involved in creative works of some kind than, for example, office or service workers, so they cannot be considered to be fully representative of the public at large. All

participants were asked to give written consent to the gathering of data about their activities in the study environment including specific agreement to being video recorded. A statement regarding the anonymity of the data collected was also provided.

Information was collected by video recording whilst people freely explored the exhibition. This was followed by a semi-structured interview based on a set of pre-determined questions. Video cued recall was also used to remind the subjects of what they had just seen and done. In addition to the audience, other perspectives were included in the outcomes of the research, principally, the intentions of the creative curator and the voice of the artist. These voices in particular guided the questions that were asked in interview. The data consisted of interview transcripts and video data which was analyzed using keyword allocation and collation by two researchers acting separately. The audio and video data has provided a rich source of information about the responses and experiences of the participants.

The data analysis is ongoing and at this point the findings should be regarded as preliminary. Outcomes may be grouped as follows:

Curatorial Design

Most participants mentioned the following:

•the importance of an open airy and naturally lit space for appreciating the work
•the value of digital and painted forms juxtaposed in a historically accurate way
•the archival documentation for what it revealed about the artist's way of working.

The documentation archive consisted of the artist's working documents arranged by the curator to reveal a certain narrative. There was a timeline on a wall at the entrance to the exhibition that placed the work in relation to other developments from the 1960s onwards, which many participants commented on as being very helpful. One or two people wanted more 'explanation' but for this kind of work it was a surprisingly small number. The general attitude seemed to be – 'I want to look and judge for myself first'.

There was an order implicit in the design of the spaces: main art room followed by documentation room and then hidden behind a curtain the dark interactive space. One person only opted to turn right into the documentation room before going into main open art space.

Audience Response

There was a distinction between audience response to the interactivity elements and experience of the whole exhibition itself. In a certain sense, the comments about interactivity arose from an attempt to analyze it. There is a clear contrast between the 'analytic' comments that denote thinking about the interactivity itself rather than being immersed in it, and the 'affective' descriptors denoting emotional and sensory responses. For example, here is a selection of the participants' descriptors:

Analytic:

"Not obvious it was interactive"
"Went behind the projector"
"Did not realise it was interactive"
"How did the interaction work?"
"Had a sense of being in control"

Affective:

"Calming effect"
"Mesmerised"
"Scary"
"Soaked it up-dangerous"
"a womb space"

This suggests that a focus on the quality of interactivity by itself can be misleading especially where the audience is puzzled having had no prior experience of it. On the other hand, from the artists' perspective this puzzlement may be a very positive element that can be exploited in some way. By contrast the felt experience of an interactive artwork or installation can work in different dimensions as the widely contrasting responses to the work indicated.

Therefore, if we only try to understand interactivity in terms of observations of what people do (their actions, movements, outward behavior) this is only a partial view of the way that interactive art engages audiences. Going further into the deeper aspects of audience response –and evaluation of interactive art in general, requires enquiry methods that are directly informed by audience experience. It means that what they experience can be elicited by observation complemented by conversations. This has implications for the way we conduct evaluation in museums and galleries and research studios.

Embedding of evaluation into practice

As can be seen from the survey, the embedding of evaluation, in some form, into curatorial and artistic practice is a growing trend. The 'Light Logic exhibition' case study points to the development of a framework that can be used to implement public art evaluation: in this case, the development of a guide to evaluation is being carried out by the curatorial team in collaboration with the researchers. Whilst public funding bodies need to learn about matters that influence policy, it is also necessary for both curators and artists to learn about aspects of their practice that can inform their future work and also public policy. As with some of the examples from the survey, the Light Logic evaluation is leading to reflections that will have an impact on future practice.

Conclusions

The type of evaluation study described here is one in which evidence about the curatorial, artistic and audience dimensions of a public art exhibition is acquired and then used to establish the value of a particular artefact or experience. This kind of approach to evaluation lends itself to the creation of shared values based on agreed evidence because it involves an exploration of situational knowledge. The gathering of information about what takes place, how audiences respond to the art exhibition and what curators and artists learn from the designing, making and reflecting process contributes to an understanding of what makes a successful or otherwise exhibition of art in the public arena. From the analysis so far, the findings promise to contribute to establishing a framework that can be applied more widely in public art evaluation.

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References and Notes

1. Edmonds E. (2011). Interactive Art. In Interacting. Art, Research and the Creative Practitioner, Candy and Edmonds) Oxfordshire: Libri Publishing, pp 18-32.

2. Arts Council of England (2013). http://www.artscouncil.org.uk/selfevaluation/ accessed June 9th 2013

3. IXIA (2013). Public Art: a Guide to Evaluation, ixia PA limited: http://ixia-info.com/research/evaluation/

4. Wellcome Trust (2007). Public Engagement Evaluation Guidelines for Applicants 2007. p 1.

5. Frequency Lincoln Digital Culture Festival (2011): http://www.frequency.org.uk

6. Diaz, K (2013). Email communication from Diaz, Online Strategy and Marketing, Thresholdstudios.

7. Decode: Digital Design Sensations (2009): http://www.vam.ac.uk/microsites/decode/

8. Blast Theory: blasttheory.co.uk/bt/work_day_of_figurines.html

9. Adams, Benford and Giannachi (2008): 'Pervasive Presence: Blast Theory's Day of the Figurines', in Documents, Contemporary Theatre Review, 18:2, 219-257.

10. Warburton, A. (2010) Some kind of Magic. An evaluation of Theatre Sandbox 2010. iShed, Watershed. p 16.

11.Site Gallery Sheffield (2012): http://www.sitegallery.org/archives/5345

Fig. 1. Installation shots of Light Logic Exhibition © Ernest Edmonds

LARGE SCREENS AND THE TRANSNATIONAL PUBLIC SPHERE

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Abstract

This paper is based on an ARC Linkage grant on the use of large screens as communication platform for an experimental transnational public sphere. The project involves linking large screens in Melbourne and Seoul for three 'urban media events'- 'SMS_Origin' and '<Value>'; 'Hello' and 'Dance Battle'. We argue through these experiments that large screens situated in public space in metropolitan centres offer strategic leverage for understanding the potential for networked media to form public sphere.

Keywords: large screens, transnational communication, cultural public sphere, media space, public space, Federation Square.

This paper is based on an ARC Linkage grant that explores the use of large screens as a communication platform for an experimental transnational public sphere. The project involves linking large screens in Melbourne and Seoul for three 'urban media events'- '*SMS_Origin*' and '*<Value>*', '*Hello*' and '*Dance Battle*'.

In this paper, we explore how the commissioning of artists to make artwork that appears on these screens worked. The key to our exploration was the idea that art and the technologies of representation are in fact instrumental in creating public spheres, public engagements and public communication. And this research is based on an understanding of the impact that large screens have, not only with regards to civic participation and the public dissemination of information, but also in relation to the opportunity for them to be used as platforms for cultural, artistic and aesthetic practices, and the fact that they provide not only a new kind of screen, but also a new mode of interaction and engagement in public life. Methodologically, the project is about facilitating the creation of an activity and a process, rather than just simply investigating its effects after it had been initiated.

Background

Large screens are not traditionally seen as a promising space for rich forms of public interaction. They are often associated with highly over-determined excessive spaces such as the Times Square in Manhattan or Hachikō Crossing in Shinjiku where the screens are high up and dominated by advertising.

The project grew out of existing research looking at a number of large screens, particularly Federation Square in Melbourne, the *Public Space Broadcasting Project* which is run by the UK in partnership with the BBC, and a screen in Amsterdam, the contemporary art screen CASZuidas. In these projects, we identified 'a second generation' of urban screens that share a number of characteristics. One was their location: they were not in high traffic locations; they were in more traditional public spaces, such as public squares. Second, they tended to be positioned differently: they were not up high, which is characteristic in many Asian cities, but were much lower to the ground and tended to be more integrated with the architecture. Third, in terms of content, they had a more civic rather than a commercial orientation, so they were not primarily showing advertising; thus they were open to other forms of content [1]. The key question that arose from the existing research on large screens was: what kind of new partnerships are able to support content in this domain? Because large screens are a very particular type of platform, there is very little content that is produced specifically for them. The common practice has been to take content produced for cinema or for video and to transfer it onto large screens. Thinking about original content for large screens was tricky, partly because people who operate them have limited background in or budget for producing content [2]. In this project, we linked Federation Square in Melbourne to media facilities in Seoul, to test the technical, cultural, social and managerial challenges the programmers of any large screen might have to face in order to succeed in generating a new form of public sphere [3].

Federation Square is a good example of a screen integrated with the surrounding architecture. It faces back onto a gently rising plaza like a classic amphitheatre with a range of formal and informal seating, and a reasonable crowd can gather around it. The presumption is that as soon as there is capacity for people to stop, there can be different kinds of content. One of the key events for such thinking was the national apology to the Stolen Generations that took place in February 2008 [4]. Although people could watch at home very easily, many people wanted to watch it in public. It was a very significant day and demonstrated how staging an event in a public space not only gives it a symbolic priority but also allows it to intervene in the news cycle. It allows the public to become actors by providing them with a form of agency in ways that didn't exist before. When Brendan Nelson, who was then Leader of the Opposition, made his response to Kevin Rudd's apology, a significant number of the crowd turned their backs at the screen. This very dramatic demonstration of people's disapproval of his response was taken up into the news cycle.

Spectatorship is not only about looking at the screen, it is also about the embodied experiences. In this instance, the bodily gesture not only mimics the act of defiance against Brendan Nelson but also demonstrates cultural solidarity and social connection with the Aboriginal community. It showed us a way these screens could actually enable publics to become active in different ways.

A couple of other factors drove the thinking of the possibility for large screens to be a new form of public sphere. One was the widespread availability of mobile devices – an easy mechanism for people to be able to interact with a screen. The possibility is real for large screens to become something other than a read-only device, something that could enable public communication. A further factor was the growth of broadband capacity in Australia. Because most large screens are built as stand-alone installations and they have their own dimensions and operating systems, it is difficult to link screens in different locations. But with improved Internet connectivity, we were no longer constrained by the need to purchase a satellite link in order to do a live event. We could actually link up screens in different cities and potentially in different countries. And it is certainly more affordable to run these kinds of events across the net instead of using satellite. The final frame for the project was the question of how we relate to other people in public in the context of more mediated environments in urban space.

Studies have documented the problem of modern living characterised by new forms of mobility, and global digital networks that have become such a strong part of our everyday experience. However, little attention has been paid to large screens. The fact that large screens are treated as billboards in all Australian planning jurisdictions demonstrates the status of large screens as an emergent form of media communication platform. This presumes that they are for static, one-way content and advertising, with no consideration of the other possibilities. We argue that large screens have a huge potential to become local nodes in these global digital networks, whilst facilitating the formation of a new form of public sphere.

In order to do so, our research project positions the large screen at the junction of two conceptions of the public sphere. One is the traditional conception of people meeting face to face in a public space. The other is the idea of a mediated public sphere that increasingly took over the kind of political and social roles that someone like Habermas associates with the public sphere [5]. However this project is really interested in a 'third' space, that is, it is interested in the way in which this form of face-to-face interaction and mediated interaction might come together. The research is also interested in affectivity and the way in which people could express themselves in more embodied ways. A key aim of the project in this regard was to think about how we understand urban public space in a context in which it is local and global, physical and immaterial, through its being connected in real time to other spaces. However, our project tries to move beyond this idea of media space or cyberspace as an abstract, global space [6] and think about how it might work if it is actually instantiated as a connection between particular groups of people in particular spaces.

SMS_Origins and <*Value*>

The first experiment of the project was translated into two urban events that happened simultaneously in Melbourne and Seoul. *SMS_Origins* and <*Value*> (August 7, 2009) could be described as accidental interactivities where audiences have a random encounter with the making of art through large screens. They both relied on audience familiarity with the mobile phone to encourage their participation in their telematic transfer of data. Hence the intention of both projects was very democratic in the sense that they wanted to develop user-friendly interfaces through which anyone could easily participate in constructing the resulting artwork. These are works that expand from the individual out, gathering that information and presenting it in a new form of art every time someone makes a change to the content.

Figure 1. SMS_Origins, Leon Cmielewski, Josephine Starrs and Adam Hinshaw, 2009. (© the artists, Image courtesy the artists).

SMS_Origins is an adaptation of a segment of a larger gallery installation; it evolved from an earlier project called *Seeker* (2006). Conceptualized and designed by artists Leon Cmielewski and Josephine Starrs and programmed by Adam Hinshaw, *Seeker* asked people to map their family migration history by dragging nodes around on a touchscreen. The potential for this to work outside a gallery, using phone-based public interaction, presented an ideal opportunity to test the role large screens can play in facilitating such interaction. The work itself has a very simple premise. Visitors are invited to text the birthplace of their parents and their own birthplace to a large screen, which would then map those generational vectors with either Melbourne or Incheon being mapped as the origin point.

Running this in Incheon as well as in Melbourne allowed audiences to see the generational migration make-up of the two audiences connected by the screens. It was decided that the easiest way to make this happen was through SMS. The map on the screen grows as it accumulates all the migration vectors of people that have been participating, to become a collective map of the different crowds' family origins. This idea had previously been tested as an ambient art making exercise (within small spaces) but not applied to a large screen context. The potential for the interface to be used as some kind of interactive filler for those really large events, for example, the Eurovision Song Contest and the AFL – those kind of tribal events where people are, in a way, barracking for their nation –was really attractive both to Federation Square and to Incheon.

There were a few technical issues because of the interface that the team was using. For example, it was very difficult to 'guess' what words people were going to text to the screen, so the team had to compile a massive dictionary of allowable words, and in this case, it was decided to select place names. This meant there a significant amount of work in terms of compiling lots and lots of place names and mapping them onto the map.

These two SMS-based interactive projects were launched in a very public and high profile event in Korea: the launch of 'Tomorrow City', a major new centre in Incheon, outside Seoul. The development of a large screen seems natural for Incheon whose ambition is to become Korea's future city – a 'smart city' based on sustainable energy and mobile technologies [7]. As a result the project received high-production values quite quickly. The project team was involved in high-level political protocols between the two spaces followed by high-level technical discussions between Melbourne and Incheon. It was a global event whose success relied on maintaining a constant level of scrutiny – checking out protocols and very specific details that in a way would be not what the team would have anticipated initially.

<*Value*>, which was designed by artist Seung Joon Choi, looked at the complexity within networks by using mobile technology to attain a public sense of values at any given time. This was another SMS-based interactive screen work that focussed on capturing people's values around urban space, social systems, technology and art. It

linked Federation Square in Melbourne with a large screen in Incheon. A word sent via SMS responding to the question "what is valuable to you?" generates a text and data flow. The word cloud expands depending on how much people value each word. The words may be 'love'/'networking'/ 'home'/ 'joy'. <*Value*> expresses what any particular group, in that time and across space, wishes to emphasize. When people both in Seoul and in Melbourne SMSed their particular term to the screens, what they simultaneously saw on the screen was a slight tectonic ripple as the data expanded according to the importance of that value. The process generates a piece of art that is very much about social and political engagement by particular groups of people.

The underlying importance of <*Value*> is that it is really asking people to stop and consider what they do value at any given time. As we are bombarded with information we often find that decision-making power is taken away from us, and thus it is crucial to stop and consider what is important, and to see how one's sense of what is important is reflected in a relationship to groups of people around us. This then becomes a fairly potent public space engagement that results in very rich social and demographic content.

What is also observed in this event is the relationship between the new media architecture and the traditional urban space. The ambition of any city to become a 'future' city is demonstrated well in the development of large screens in new urban squares (as in the case of Incheon), but as our project discovered, such underlying 'politics' of large screen might not necessarily be supported or compatible with either the architecture, the technology or the community that it was meant to serve [8].

Hello

The second event the research team facilitated was *Hello*, an interactive screen-based dance work conceived by Australian artist Rebecca Hilton in collaboration with Korean choreographer Soonho Park. The idea was to test a more embodied form of interactivity, a person to person exchange instead of a text-based or phone-based interaction. The aim was not to mobilise a mass group of people but to create real transnational connections between individuals on a meaningful level. By mobilising dance as performative element within the large screen context, we wanted to make the technology fade into the background, allowing the screen to become a conduit for physical exchanges. The result resembled a dance-based version of exquisite corpse - the surrealist game where people collaboratively construct a text or image. In the *Hello* Project, this collaborative exchange was gestural. One participant would throw out a gesture, another participant on the other side of the world would have to learn it, and then throw it back to the next person. The dance sequence itself was choreographed by Hilton and Park from movements that were donated to the project from community groups in Melbourne and in Seoul. Those short, 30-second choreographed sequences were then passed onto audiences in the two cities.

There are many technical challenges involved in realising a project like this. The first was finding a suitable screen in Seoul. Although there are thousands of large screens in Seoul, they are not exactly right for encouraging person-to-person interactivity over distant locations. This is mainly because they're just too far from the ground, on top of tall skyscrapers. As a result, the team had to build a screen in Seoul for *Hello*. It was also difficult to find an environment that had the same kind of ambient traffic in Seoul as in Melbourne where Federation Square is. *Hello* is designed for an ambient level of people-screen interaction where audiences were not 'captured' but 'allured' to the aesthetic and social interaction projected by the screen. The district we chose in Seoul is a university district; it has a lot of theatres, and attracts a lot of people going to cultural events.

There are new challenges presented by this event because of its embodied approach to mediated communication. *Hello* was made with two choreographers, between two cities, with two tech teams (one that spoke English and one that spoke Korean), using one screen that was built specifically for this event and one existing screen with its own infrastructure with two very different groups of audiences. The entire project was like a massive exercise in 'translation'. Although there were new challenges presented because of these technological elements and because of the event's embodied approach to mediated communication, one of the successful things about using dance was that it enabled us to sidestep the linguistic barriers that we had previously experienced in linking audiences in Korea and in Melbourne. This also facilitated the formation of that 'third space' [9], through both a direct face-to-face communication and an indirect communication based on cultural identity, self-affirmation and customs, as the following audience research exemplifies.

Dance Battle

Dance Battle is a transnational live dance event that was staged simultaneously in Melbourne, Perth and Seoul. The dance event used the standard hip-hop format of 'the battle' to display and examine the affordances of large screens as communicative and aesthetic devices.

Applying knowledge learnt from the previous two large screen experiments, this event expanded the project's focus on the communicative systems and modes of management associated with improvised, real-time use of large public screens for the purposes of vernacular,

Fig. 2. Hello, Melbourne (Photograph © Scott Mcquire).

minimally governed interaction amongst people of different geographical, linguistic and cultural placements.

The project had moved from the personal sharing of private information via mobile devices (as shown in *SMS_Origins* and *<Value>*) to a very public participatory experience. The *Dance Battle* event drew performers from the hip-hop communities in all three cities and engaged a participant audience of several hundred over a three-hour period in each of its three networked locations.

This event was designed to be a 'quasi' competition, one that emerged in part from an understanding of how 'competitive' elements work in engaging transnational audience. People came at a certain time and danced with each other freestyle in the public space – a bit like a hip- hop street battle. Participants would be able to see themselves on the big screens, and their partners in the other city. Invitations were extended to a mix of people who know how to dance and people who would like to join in. Aside from hip-hop battles, the live link-up included special performances and free public hip-hop workshops. Each screen in the three cities had a warm up period of one-hour public hip-hop workshops. Some routines were taught to the general public during this time. Then the 12 sets of 2-minute dance 'set' battles began: first Seoul vs Melbourne; then Melbourne vs Perth; and last Perth vs Seoul. There was a break of 15 minutes for free style dance to give time for the special performances by dancers in the three cities. The dancers performed for 10 minutes each and the event finished with public dancing followed by a finale of everyone on stage and screens. Participants danced either alone or in groups. Melbourne, Perth and Seoul dancers took turns presenting short dances and each had a turn at the 'dance-off' between the cities.

The event relied on broadband network to connect screens in each location. This made the image quality better, thus encouraged better personal identification and connectivity. Through its selection of popular cultural expressions, *Dance Battle* was a successful example of working with the general public via large screens. The vast majority of audiences comprehend the difference between their experience with *Dance Battle* and that of general broadcast. The performers were really keen to show what they could do to audiences in other locations. Many said that this event made them feel personally connected to the people in the other cities.

The performances have been treated as generators and communicators of insight and enhanced, embodied understanding about the personal, communal and social uses of large public screens. In addition to engaging its participant audiences in three cities at the time of its enactment, the dance project also generated audio-visual data and ethnographic evidences for future analysis and knowledge transfer.

Audience research

We conducted audience surveys and participation observation at each event and collected a total of about 330 surveys across the three big artworks, *SMS_origins* and *<Value>* (2009), *Hello* (2011) and *Dance Battle* (2012). The survey questions revolved around a series of themes, including questions about the participant's relationship to the artwork, the degree and quality of interactivity with the artwork, and the different experiences of this particular kind of artwork to other kinds of digital media experiences. We also asked a series of questions around participants' connection to place and people in order for us to think about transnational connections and identity: the experiences of their relationship to other people in the square, in the same space. What the audiences saw differently on the screen in Korea than those in Australia point to broader, transnational, cross-cultural issues. For the *Hello* dance project additional questions were asked about their experiences of learning or teaching the dance, and with *Dance Battle*, questions comparing the kind of competitive nature of the hip hop dance battle to previous kind of experiences of online gaming, for example. In this way, each event tried to test the conceptual frameworks of the project, but demonstrated at the level of audience participation, the quality of cultural participation and cross-cultural engagement [10].

The whole project in terms of audience participation can be summarized in terms of two trajectories. The first reflects new kinds of embodied experiences or 'cultural semantics', which take into account cultural specificity and context in relation to corporeal reality – the changes in semantics in relation to technologies in use. In short one can think of this as a hybrid framework that tries to combine technology, body, community and place – the body experience of cultural participation. The other level of audience engagement and cultural participation we tried to test and demonstrate is cross-cultural audience engagement. The screen is viewed as the contact zone – a space where two cultures come together – a space of hybridity and a space of translation.

The first event *SMS_origins* and *<Value>* used the mechanism of texting. Texting is where you see cultural semantics at work – how working with mobile technologies has the capacity to transform the place and community. Quotes from interviews during the event demonstrated how the artwork has transformed audience experience from that of a personal to a public experience, and indicate that a transformation of place has also occured.

The second event, the *Hello* event, took place in Federation Square and in Seoul. There were many different environmental factors between the two cities and the two events. The key difference was that two audiences perceive distance and proximity very differently. The Australian respondents perceive the event as evidence of the physical distance that separates the two countries - the ideas of globalisation and transnationalism were motifs of space and time distanciation. In contrast, the Korean respondents said, "It was really amazing, we felt so close, like we were really physically together." Here their understanding of globalisation and transnationality is really about time and space compression, coming together in one world. Their practices of connectivity are differently perceived as well. The Australian respondents talked about the dance in the following terms: "Before we dance, we talk, but after we were dancing, you know, I felt that there was no more connection." The Korean respondents on the other hand said, "Wow, it was through dancing that we built this connection." To the Australian audiences, dance appears to be public but anonymous - there's a sense of alienation and depersonalisation in the dancing, whereas the Korean response tells us that dance is a form of shared consciousness that will help to build connection. The event also had a very different transformative impact on the two audiences. In Australia it was more about cultural differences: "It's useful, finding out about culture coming together as one." It is really about, "I want to find out about the other culture

and learn about the cultural differences". In Korea there was no desire for the search of cultural differences at all, it was instead about personal similarity: "I felt like we became good friends, I wanted to be friends with them more."

The last event – the *Dance Battle* in Melbourne, Perth and Seoul, brought new revelations about the use of large screens in public space. Overall, respondents found the event very different to other kinds of dance battles, especially given that the mediation of technology complicated the relationship between the self and others. As one opponent noted, there was no eye contact with the other person, and thus "It was very hard, you know, I couldn't even visualise them, I didn't know who my opponent was, I couldn't do the moves, I couldn't visualise my movement at all." Participants also said that there was a lack of local space because of the lack of corporeal co-presence. This seems to suggest that engagement was very much at the level of spectatorship, rather than communication. People had to look at the screen to see what the opponent was doing in order to top the move. Experience of connectivity was characterised very much in terms of reciprocal interaction, 'you have a move and I will try to top your move and back and forth'. It's very much like co-creation or telling of stories, 'you tell one part, I add on'. In the experience of sociality, participants felt that there was a sense of community based on the sharing of geographical space. The following quote from the Perth event shows the sense of sociality and geography of place is very much intra-local rather than transnational: "It was a good opportunity for me to interact with other Perth people," and "this was really good because it was an opportunity for us to take over the Northbridge area". On the contrary, the Korean quotes highlighted the transnational experience of the event, but their affirmation of the transnationality was very much couched in terms of national identity: "It was very lively, but you know, I cheered a lot for our Korean dancers." One can start to see this kind of transnational sharing of a common culture coming together as a result of sociality and co-creation.

Conclusion

How to make sense of the cognitive scramble this project has generated? It is interesting to look back at the list of all of the moments where protocol is required, such as where some alienated device needs to signal to another alienated device and say, "Are you here? Are you hearing me? What do you need and what can I give you?" "Now are you hearing me? What did you just give me?" These are all moments of negotiation, which you would imagine the technicians would have worked out by now, but of course when two national cultures and two different subsets of venture capitalism and entrepreneurial technology-driven profit enterprise are brought together there are thousands of different protocols possible. This project started from that taken-for-granted attitude towards the use of large screen, in particular the thought that it will be so simple to just get people to communicate (talking, or not even that, gesturing) to each other by linking them together on large screens. It's so simple!

The project has created a multitude of scenarios and geo-political contexts in order to test the above presumption. These iterative dynamics happen often simultaneously in the course of the project – from very personal responses to the screen to a kind of protected environment where people can perform in the open. There has been a learning process throughout and the feedback from the first project, the *SMS_Origins* and *<Value>*, fed into the idea of thinking outside the linguistic paradigm in the *Hello* and *Dance Battle* projects.

What we've learnt from all of these events is that what may be referred to as a set of second-generation screen practices involve not only technical protocols but also political, cultural and social ones. The challenges and protocols we've described above are just a fraction of what we had to negotiate. For example, in the *Hello* project, it turns out that in Korea, "People won't dance out in open space," whereas semi-inebriated Melbourne people - try and stop them. So how do you negotiate that kind of psychologically set of precepts that everyone has? And then of course there are large legal and public infrastructural protocols as well.

There is no simple answer to each question when we try to get the technological, psychological, sociological, legal, national, cultural protocols aligned, except this idea that we all exist inside ideological state apparatuses that structure us. Our journey started from this taken-for-granted notion that an apparatus is a kind of configuration of a tool that allows us to work with the rest of the world and each other, but of course the tools shape us as well. Some of the great apparatus theories were applied to cinema, especially studio-based cinema, such as Tino Balio's studies of American film studio systems [11] and Jay Leyda's studies of Soviet cinema in the 1930s [12]. That kind of apparatus theory is very relevant to the intensely complicated, quick-feedback systems that digital and interactive network configurations produce. There is no simple way to come out of applying that kind of apparatus thinking, but we have attempted to go beyond these ideas based on what we learned from these projects and we know now that it is possible to work with alternatives.

This project is structured around the concept of community involvement, but it demonstrates that there is no easy or natural way for large urban screens to be used by the public. In fact, according to Federation Square, this curated content for community engagement accounts for only five to ten per cent of the lived time in the square. How to fill the cracks, the gaps, the lived moments of day and night in the public precinct, is an opportunity but also a daunting task for programmers of large screens. The reason this project has been of particular significance may be because the unexpected outcome of public interactivity due to Federation Square's commitment to curating original aesthetic content. It is a grand experiment, at least for Melbourne, as a large screen in a very significant public place privileged by its geography. To have such a toy, to have such an asset with such potency, with such power, is an irresistible opportunity.

But what can happen to screens in less privileged locations? What do these sorts of projects do to provoke person to person connection in public spaces in different ways? Our project has provided us with an opportunity to test such inter-screen connections underlying the above questions. We discovered among many other things that it is not just about programming, the anticipated and the expected contents. We discovered that experimentation is at the heart of public engagement. Such an organic process demands operators of urban screens to try to capture a little bit of inspiration, or highjack a little bit of attention in unexpected ways. Being able to do interesting, different, engaging and interactive things on a big old screen is certainly fuel for that agenda.

References and Notes:

1. S. McQuire, M. Martin and S. Neiderer (ed.), *The Urban Screens Reader* (Amsterdam, Netherlands: Institute of Network Cultures, 2009). See also S. McQuire, N. Papastergiadis and S. Cubitt, "Public Screens and the Transformation of Public Space", *Refactory: A Journal of Entertainment Media* 12 (2008).

2. Mike Gibbons, *Interview with Mike Gibbons* (Head of Live Sites and UK Coordination for LOCOG, and previously Project Director, BBC Live Events) by Scott McQuire, Melbourne, October 4th, 2008.

3. N. Papastergiadis, "Large Screens and the Making of Civic Spaces: An Interview with Soh Yeong Roh", *Urban Screens Reader* (Amsterdam: Institute of Network Cultures: 157-62, 2009). See also S. McQuire and M. Martin, "Sustaining Public Space: An Interview with Kate Brennan", *Urban Screens Reader* (Amsterdam: Institute of Network Cultures: 121-34, 2009). S. McQuire, "Media Technologies, Mobility and the Nation State", in Hall, J. R., Grindstaff, L. & Lo, M-C. ed., *Handbook of Cultural Sociology* (London and New York: Routledge, 2010).

4. On 13 February 2008, the then Prime Minister Kevin Rudd presented an apology to Indigenous Australians on the Stolen Generations (also known as Stolen children) in Parliament House. The Stolen Generations were children of Australian Aboriginal and Torres Strait Islander descent who were taken away from their families by the Australian Federal and State government agencies and church missions mostly during 1909 and 1969.

5. Jurgen Habermas, *The Structural Transformation of the Public Sphere – an Inquiry into a Category of Bourgeois Society*, T. Burger and F. Lawrence trans. (Cambridge: Polity Press, 1989[1962])

6. S. Sassen, "Reading the City in a Global Digital Age," in McQuire, S., Martin, M. and Niederer, S. (ed.) *Urban Screens Reader* (Amsterdam: Institute of Network Cultures, 2009). Also S. Sassen (2011) "Talking back to your intelligent city", <http://whatmatters.mckinseydigital.com/cities/talking-back-to-your-intelligent-city>
See also S. McQuire, S. *The Media City. Media architecture and urban space* (London:Sage, 2008)

7. S. S. Ko, "Meeting the Future City in Songdo," Naeil Shinmoon. Released on 10 August 2009. Available at <http://www.naeil.com/News/economy/ViewNews.asp?nnum=489235&sid=E&tid=5>. Also K. H. Jeong, "Cisco Investing 2billion to "Songdo Smart City"," JoongAng Ilbo. Release on 25 Oct 2010. Available at <http://article.joinsmsn.com/news/article/article.asp?total_id=4565100&cloc=olink|article|default>.

8. Tim Cresswell, "Towards a Politics of Mobility," *Environment and Planning D: Society and Space* (2010), 28(1): 17-31. See also P. Mörtenböck and H. Mooshammer (ed.) *Networked cultures parallel architectures and the politics of space* (Rotterdam: NAI Publishers, 2008)

9. Oldenburg (1999)'s book - the 'great good place' coined the term 'third place' suggesting that unlike the first place (home) and second place (work place), the third place is where community life is played out. Such view has limitation in understanding virtual communal spaces that are not bounded by physical locations. Third space is therefore a term to allow reflections on the possibilities of constructing public sphere in the virtual world. Scott Wright's paper 'from third place to third space: everyday political talk in non-political online spaces' provides a good analytical background to the two terms.

10. See A. Yue, "Urban Screens and Spatial Regeneration: Evaluation Strategies for Cultural Participation", in McQuire, S., Martin, M., and Neiderer, S., (ed.) *The Urban Screens Reader* (Amsterdam, Netherlands: Institute of Network Cultures: 261-278, 2009). See also A. Yue and S. Jung, "Urban Screens and Transcultural Consumption between South Korea and Australia" in Jin, D.Y., (ed.) *Global Media Convergence and Cultural Transformation: Emerging Social Patterns and Characteristics* (IGI Global: Philadelphia: 15-36, 2011)

11.Tino Balio, *The American Film Industry* (University of Wisconsin Press, 1985).

12. J. Leyda, *Kino: a history of the Russian and Soviet Film* (Princeton University Press, 1983).

LARGE SCREENS AND THE TRANSNATIONAL PUBLIC SPHERE: Q&A SESSION

Nikos Papastergiadis (University of Melbourne), Cecelia Cmielewski (University of Western Australia), Ross Gibson (University of Sydney), Scott McQuire (University of Melbourne), Audrey Yue (University of Melbourne), Leon Cmielewski (University of Western Sydney), Amelia Barikin (University of Queensland), Matt Jones (Federation Square), Xin Gu (University of Melbourne)

This is a transcript of the audience Q & A session that took place during "Large Screens and the Transnational Public Sphere" panel discussion at ISEA2013.

QUESTION: What makes a public space amenable to urban screens? I think in Federation Square it works really well, but it's a difficult paradigm to apply to any space, and I think that's a really critical question. The other perhaps more important question is, what does moving from rational discourse to the experiential mean in relation to public sphere theory? I was at a conference with a bunch of engineers last week in California, they wouldn't have bought [your qualitative research findings] because you're dealing with embodied interaction, with concepts that are so abstract applied to it that it's difficult to measure, it sounds more like rhetoric. I'm interested in it, but I find it difficult to grasp. So I'm really interested in this difference between what you're calling the linguistic and the gestural.

ROSS: Nikos, maybe I can just respond to the initial question, about how do you make a public screen work. I think that's a really critical issue, and I don't think there's actually many examples of urban screens that are very well-designed in the public space. They're not well-positioned, they're often far too high, they're remote from the audience, so that really limits what kind of interaction you might have. They're often used as display spaces, they're about branding a building or they're about a spectacle in the sense, which a lot of things in the city do, that they make you feel small while they feel big. So I don't think there's many examples where they are done well.

I think one of the things that probably we've learned is that using such a large-scale screen has benefits, because it's about collective reception and that's been an important part of our project. But we've also found it hard to do events as subtle and supple as we probably would've liked, because there's quite a lot of infrastructure involved, and there's quite a lot of cost involved. And so I think that's one of the limitations of screens. In terms of your other question about the framework for understanding the audience experience and interaction, I think there's different ways of understanding this.

One of the things that I've noticed in the audience responses to the surveys – which are from very different groups and it's very hard to make generalisation, because the samples we've got are just far too small to do anything like that – is that people are reaching to describe forms of co-presence, to describe that experience. We've often asked people questions like, "Did you feel closer?" And "closer" is a very ambiguous term, but it's really about people describing some kind of experience which is to do with being in one particular place and being aware of your own embodiment, your own situation, but feeling closeness to someone in another place.

And people have used lots of different languages, sometimes paradoxes, to describe that experience. It is, I think, a very common experience, not just in these events but how we live in this world; we inhabit particular situations, we have networks that extend our communications capabilities with people in all kinds of ways. So that even when we're in this space, if you've got your computer on I don't know whether you're looking at your email or talking to someone – you know, there's that kind of disjunction of spatial and temporal frames that we're familiar with. This was a very public platform for working out some of those kinds of experiences and for thinking about how the screen might work as a platform for public communication and what that might mean. And I think you're right, we probably wouldn't convince many engineers, in terms of our framework, but that hasn't been what we've been really working with.

SCOTT: And what's being communicated, it's not necessarily semantic. We find that again and again, both in the questions we're asking and then in the responses that were coming back. You know, there's semantic communication and there's phatic communication. There's a situation where the transaction between people constructs a feeling, and that construction of a feeling is one of the things that's turning up again and again in the experience. We end up talking about the experience rather than the message or what was conveyed.

ROSS: My reference to Habermas wasn't really so much about that's how we were thinking, but just that that's such a dominant way of thinking about the public sphere, and we were saying, actually, this isn't a deliberative notion at all. It isn't about people giving their opinion about whether migration in Australia is good or not, although you can read some of the sort of responses in that way if you want to, but it is really about how people might communicate with each other using a public platform if you give them opportunities, whether it's by revealing certain kinds of personal data, like where they were born and where their parents were born, or by learning a dance from a stranger in Korea and then teaching it to another stranger in Korea, and what that kind of exchange might involve.

CECELIA: I think the other thing to bear in mind is governance. I think for me, seeing the Perth experience really brought that into sharp relief, because in Perth there's two large screens, one in a public centre of the city and another one literally, five blocks away; one that has a very restrictive governing set-up, it's very high and it's programmed as a TV screen; and the other one, in Northbridge, where it is possible to interact. So I think that role that the civic leaders play is very important, and in a way part of this project was to try and influence that thinking.

AMELIA: It would be great to be able to have multiple screens in multiple cities accessible, cheaply, for people to make use of. And we are so far from that. Well, that's basically what we found. It seems really very straightforward, but it's not.

NIKOS: We thought that would be something that would happen in the life of the project. It might not even happen in our lifetime. But adding on to your point about the shift from the normative to the aesthetic, for us one of the fascinating dimensions that's come in that shift, has been the idea of

recognition. And the idea of recognition here is presupposing so many of the conditions of the communication that both Ross and Scott and everyone else have already referred to. But what we found through the feedback was fascinating, because there's a strong desire for recognition, but what kinds of recognition? Two kinds. One is simple, you know, I want to feel close, I want to see their face – facial recognition, and all that signified in terms of proximity and familiarity and friendship, right? Another kind of recognition we've also identified is the idea of face creation. Many of the participants in *SMS_Origins* talked about the pride and presence-ing that they felt, the civic engagement and civic recognition that they get when their own biographical details appeared on this civic platform, the screen. So that was a sense that they often communicate, is, "I feel like I exist, I belong, even though I'm a student here," or a tourist, or a visitor, or even a resident. They would often sense that, "This gives me a sense of being and belonging in this place." So that was a kind of face creation exercise, which is fascinating.

QUESTION: I have a question. Scott, you started talking about – or the whole panel started talking in many ways about – this identification of 'the third space', this coexistence, this shared space. And then there was a comment about Kit Galloway and Sherrie Rabinowitz and *Hole in Space*. And I think the third space is this shared, this coexisted space, and how we identify with this new space is so important. But I think also from Kit and Sherrie's work it's so important we look back to 1980 – I mean, this is almost Stone Age in terms of media – and we think about what looked so simple, to connect a video conference in two shop windows. But what was so simple and what was so complex as well, and so sophisticated, was the way that – where those locations were, the choice of the locations, and the unannounced activity. No one knew what was going on, and it opened up this opportunity to do whatever you want. So the sort of "giving it up", saying, "I don't want to have any control over this. I don't want to put signs up, I don't want to tell people what to do," was so important in making that whole piece work.

SCOTT: Discover what's possible.

QUESTION: Yeah, and that was almost identifying this third space. Because the more you let go, the more you give up, the more you go towards that third space. You won't make it by announcing what it's going to be to the public. You have to let people find it themselves and that's so important.

ROSS: And that's been a great difficulty for the project, because of the nature of the spaces in which we're working, there's legal constraints on how much you can do that. But for something like *SMS_origins*, when it was run multiple times, it wasn't advertised, so it was a more ambient mode, and that's certainly something we really wanted to explore. *Hello* was advertised minimally, so it was more about getting people who are moving through the square to come along and to engage in that, looking for passer-by traffic, so people come without preconception. The *Dance Battle* was a totally different kettle of fish, because it got a lot of media publicity. But what was interesting was not just the cultural diversity, because you'd expect that in Melbourne in particular – but the diversity of ages, and a lot of people who'd never had contact with that culture. And I mean, one of the things about it was to try and get young people to be able to be central stage in a central-city public space, because youth culture is often really excluded and marginalised within those spaces, so that had that interesting aim, but we totally agree with you, and I think that's something we've learnt, that it's actually very hard to do that kind of spontaneous project in that kind of site.

QUESTION: Well, audience differentiation is a big issue here.

QUESTION: You chose to work with possibly one of the most multicultural countries in the world and coupling it with one of the most mono-cultural countries in the world; it's a kind of an apples and oranges kind of situation. So from the perspective of qualitative research I'm just sort of wondering how you juggle that. And a little wider to that, I think the thing that I found that countered that was in that the hip hop stuff is such a kind of globalised, kind of floating culture, that both of those cultures could engage really easily on equal terms. You could have done the same also with jazz, for example, very popular in Korea, very popular here. So I just wonder if I could get some comments on that kind of compare and contrast kind of situation you've put yourself in.

AUDREY: There were a lot of quotes from the respondents saying, you know, music doesn't really require any kind of translation, dance as well, so it was experienced as a kind of universal platform in that context. But as I tried to show, Korea's kind of 'globality', if you like, is very much marked by its outwardness: the fact that is mono-cultural means that it's looking out, and you saw that in the responses. Australia's multicultural context is very much marked to a certain extent by difference – some of the responses suggested, "If we want to know you from the outside it was about knowing cultural differences." So that's perhaps simplifying it, but one direct response to your query. From the production side I'm sure there's a lot of rationale there too.

SCOTT: But your question about, you know, the dream of social science, where's the control and then where are the variations against the control. We've had to decide pretty early, there's no control! Or the control is the dream of direct communication of semantics and phatics. You know, let's use that as the thing we're chasing across these different venues and different cultures, and then let's observe the wild variation around which that control – that dreamed control – actually gets enacted, and then let's not worry about the data that's coming in all directions and the variations in it. That's what's interesting, especially in this interplay between national integrity – take some of the connotations away from that – but integrated, singular idea of national culture and transnationalism, all of these wild variations of interpretable action and information coming through, that's what the project has turned out to be about.

AMELIA: Which is why we chose the curatorial approach that we did, so that we could test those kinds of different parameters in very different situations, in 'apples and oranges' contexts. Sure, if you had more time, you could get bigger samples and you could do more questions and you could collect more data and you could repeat the same experiment in different countries, but really we were more interested in trying to picture the variables. We've got a very good sense of those now!

CECELIA: And in a way curate, produce, design the art projects that would create benefit – that would be able to actually generate the most useful responses.

QUESTION: Firstly, I just thought that was wonderfully rich and very complex and also very risky, and I think it's not such a surprise that the engineering community would find it problematic, because it's much more nuanced and it has a very complex cultural dimension. But my question now is about legacy and sustainability. I know these are big projects and money lasts for a particular length of time, but I think that point you were making, Nikos, about face creation, and this idea of a sense of citizenship must have a political impact. And also I wondered about the kind of cultural policies within the particular environment in which it was situated, particularly Melbourne … I'd be very interested to know how you would bring that discourse [on citizenship and public policy] forward into what is being such a narrowed down discourse, as what constitutes the public, the social.

NIKOS: What I might try and do now, given that we've only got 15 minutes left, is take a suite of questions together.

QUESTION: I originally thought my question was a bit more for Matt, but having listened to Tim talk maybe it sort of has broader options. It is about this kind of temporality that you talked about, about the kind of programming and usage of space. Because we think about public often in terms of public infrastructure which has some sense of permanence, and I think that's what Tim's talking about with his project which is kind of excellent, but then, Matt, you talked about how there's a five to ten per cent kind of temporal programming in the space of Fed Square which goes on. I was just wondering if you could talk a bit more about the kind of spill over of that event time into the non-event time and how that perhaps constitutes a public space or public spaces that sit around those events when they're not actually on, and also whether there's been, over the ten years any kind of differences in the sort of rhythm and pacing of events, and what you've kind of learnt about that in programming things at Fed Square.

QUESTION: Very similarly, Audrey, do you have any sense of how important it is to your audiences that this form of cultural participation is free? And then, Matt, and anyone else on the panel, how do you view this research, and how does it relate to other research that's being undertaken, for example, by the dance festival in Korea or ongoing research by other tenants at Federation Square? And then as someone who's a curator involved in contemporary art spaces, I'm very interested in how the methodologies that you're developing about cultural participation and the qualities that you are associating as indicators of cultural participation might be applied to other ways and spaces and situations like contemporary art spaces where people are engaging with artists and art.

NIKOS: That's a lot to deal with already, but I might actually ask Matt to start, and Audrey, and then maybe other members of the panel can chip in. But let's start with this first question about sustainability/programming and curatorial application. In other words, how does – what ongoing significance can we attribute?

MATT: I think that all those questions are part of the same continuum really, at least from our venue-based perspective. On the legacy and sustainability, at a real simple level, some of the models of those projects, especially the hip hop dance battles – and we've done a couple of them now, only one of them that's involved Korea, but we've done a couple of them – the learning for us is that stuff like that works and people like to come to the square to participate in it. Many of my colleagues here have already made the point in different ways that there really isn't any role model, there really is no exemplar for this sort of stuff. Somewhat through accident, somewhat through intent we are the pioneers of this, and so, you know, there are limits on what you can plan in terms of that. But we learned that people like to come into the square to relate and they like to come into the square also to relate to people in other contexts and spaces.
I find it interesting to note that Northbridge Plaza, the Perth screen partner – although that screen is controlled by council and that comes with its own particular limitations – but the guy [Damien Blyth] that actually drives that forward, for what it's worth, is an ex-Fed Square staffer. So he was involved probably at Fed Square from year four, through to about year seven or year eight, and he was very close to that journey as well. And he, within his particular context, has tried to replicate some of the models, which is what has enabled, frankly, us to have a much more direct and harmonious relationship with Perth. So in terms of sustainability and legacy, we learned some models for projects that we would like to program and we would like to emulate.

In relation to your question about the temporality of that programming, there's sort of a sliding scale that we have to use in the allocation of our resources and the allocation of our staff and programming priorities. At one end is passive content, it's doing the best we can with the relatively small resources we've got to make the screen content interesting, relevant, dynamic, worthwhile and non-commercial. I really try to resist what we were doing even a couple of years ago, which was just to turn on Foxtel and play a wildlife documentary or whatever, even if sometimes that results in pretty inexplicable fringe art content that will irritate some people, it's better. It's better to try to aim for that and occasionally fail than it is just to treat it like a big telly, which is probably what we were doing a few years ago, and the legacy of that is that we still use language in our marketing collateral such as "Fed TV". There are new models that we're trying to learn and we're trying to articulate big screen access, and that isn't just about replicating a big TV.

At the other end of the spectrum are projects like this one, which are high resource, high input, and low output in terms of screen-time, as I said, but that are really cutting edge. And yes, it would be great if us and many other screens around the country and around the world had the ability to have portals and if we could up the percentage of time that we could devote to those sort of projects that would be ideal, but that is a lifetime thing, that is a generational thing. Really interestingly, one of the easiest payoffs we can have is, even if it's just a step, you know, more primitive than the hole in space, is to use the screen as a mirror. We have something called *Fed Cam*: a webcam which is embedded in the wall, we turn that on, turn the screen into a giant mirror and we'll leave that on for an afternoon, and it just – it delights people and it's so simple and it doesn't cost us anything.

Really, really briefly on how this relates to other research: from our perspective we obviously do a lot of surveying of site visitation anyway, but probably our two core drivers are visitor satisfaction and visitor yield: the conversion of visitation to spend. And it's worth noting that one of the areas that we have to grow more as a venue is this kind of dichotomy we've got going between events – and I include our screen program with that – and Fed Square's tenants. Put simply, does

bringing people to the square convert into business for our tenants? Or do the events themselves, including this sort of stuff, actually detract and prohibit visitation to those tenants? There is an unavoidable tension at the heart of that. Are we getting in the way of a more effective retail precinct, or are we enhancing that? And different tenants will have very strong views on that, as we do, but that is the kind of a tension at the heart of the programming philosophy of the space as well. When is too much too much?

SCOTT: I just wanted to say something about just the first question, which was to do with the legacy of this, particularly in terms of cultural policy, because I think there are really fundamental issues here. One is at a planning level. If you look at the way large screens are treated in all Australian planning jurisdictions, they're billboards. So that presumes they're for static, one-way content and for advertising, and there's really no consideration of the other possibilities. And I mean, one thing that was really odd about something like the *Dance Battle*, but really nice, was we had no sponsorship announcements. We were actually doing something that was about putting value back into a civic space, or this idea of the public space, so I think that's a very contested and uncertain idea right now. And we didn't have to acknowledge commercial partners in that, and that was really interesting, to actually have a three-hour event in the middle of Fed Square where there was no announcements and saying, "Thanks, it's brought to you by this."

AUDREY: And a lot of audiences mentioned that too. You know, "It was great, we want to participate because non-commercial event," and a lot of quotes around that. Whereas the *SMS_origins*, right, we had a few people pulled out because they asked, "How much does it cost?" I'd say, "The cost of an SMS," and they say, "Oh no, I'm not going to participate." Right, so you know, that's that. But as to the broader question around impact and cultural citizenship and cultural policy, there's been a discussion paper on multicultural policy, but flagging only two kinds of citizenship: economic citizenship and social citizenship. So cultural citizenship, in the way that we've tried to materialize and engage it, introduces a third dimension into this debate. The fundamental unit of cultural citizenship, having access to culture, is about participation. You'd probably be familiar with all the theoretical work on cultural citizenship, but this project to a certain extent tries to operationalize it, by looking at the qualities of cultural participation and creating situations for participation to occur.

QUESTION: I've got a couple of questions and I haven't condensed them all, but as a former programmer of screens I came here curious about the kinds of ways in which large urban screens might serve art and other cultural phenomena, so I was interested in feedback on successful events of other kinds than this particular interactive one that we've talked so much about… I just wondered what other kinds of events could be described as interactive and what kind of ventures into art, or narrative, or other forms of culture that have been particularly successful could be deemed to be interactive and globalised as well. I also just want to throw in that I was involved with a little project that did a very similar thing as you dance project between Yokohama and Sydney in The Rocks, in January, and we did it with webcams and choreographers, and programmers, a very simple system, really … and it actually had a very, very similar response but on a smaller scale. So I'm curious as to why you needed a larger urban screen to do that, or whether the events actually needed a public precinct. That throws to the governance issue about public space, too.

QUESTION: My question is about methodology. How did you make all your questions for the survey, and how actually – apart from the SMS – how was the survey conducted?

QUESTION: We've done quite a number of projects for the BBC big screens, initially *Picnic on the Screen*, which was for Glastonbury, but we've also done linked with China and Manchester and Liverpool. I'm also doing a PhD on urban screens and looking at open systems of interaction and how as media artists we can design artworks that engage with a broad audience giving them agency, offering them agency. But my question really is around the curation of the projects – do you think perhaps they could be exclusive? You know, do the dance projects exclude certain age groups, for example? Or do they kind of tap in, maybe, to the celebrity culture?
ROSS: Picking up on that questioner talking about the Yokohama/Rocks project, one of the buzzwords we haven't thrown in yet, and I'll throw in, is "intimacy". One of the things we were trying for – but I now realise that we were working more and more and more towards – was how, with these huge public facilities, do you develop intimacy as a sort of shared experience, and to what extent then has the public sphere as an idea always been about this tension between exposure and intimacy, or distance and intimacy? So for me in some respects, yes, exactly right, throw up a little screen quickly in a space, do a dance battle, get out again, that is in a way a perfect model. But what we were testing was the affordances and limits and potentials of this big, big installed facility. Can you throw in that particular battle scenario and develop intimacy? Do you develop something else?

QUESTION: Or can you have longevity, can it be over a longer time, so that people know where to go to seek that experience.

ROSS: And just very quickly, and then I'll turn off my microphone for the duration, I reckon the Fed Square charter, as a constantly reiterated, redrafted legal document, is one of the classic administrative documents of the last ten, fifteen years or so. I actually saw it from its first scrappy draft through to about 2003. We might think that each time the lawyers would come in, it would lock down more and more; it's actually kind of loosened up more and more. The commerce that was all over it in the first drafts has kind of bled away quite a bit, and so the dystopian view you'd have of this redrafting has kind of not happened, and that's very, very interesting. I mean, Matt will have a much clearer view of it than I have over recent years.

MATT: This isn't going to be anywhere near a comprehensive answer to your question – but can I just offer one example of that, as a counterpoint. One of the other things that we do on that screen, really quite ad hoc, is we'll facilitate people proposing to each other. And probably over the last two years we've had about 20 marriage proposals. They always say yes [laughter]. But really, it's as ad hoc as someone will email or call up my screen programmer and say, "Can you put a slide to say, 'Will you marry me, Julie?' And if we can, we'll do it, and if we can we'll do it for free and we'll sync that up with people. So although we can't get away from the kind of epic aesthetic we've got going on, and the range of different things we've got to

do, we do try to find the little grains of sand in the day. And that's just one example of it, which is, you know, one of the most intimate acts, I guess, amplified to the most exposed circumstances. So there's something in that conversion that is obviously compelling for people.

CECELIA: From the curator's perspective, we spent quite a lot of time actually trying to reinject the art back into the project. It kept running away from us. And I'm very conscious of that. It really was every time we'd be discussing it, I'd be saying, "Where's the art? Bring it back in." And on that term we'd become – so the collision, or collusion between producing and curating then that blurs, and then working with the artists in a more direct manner, it's not like they're just commissioned to do something. I think *SMS_origins* and *Value* was much more that more traditional relationship and then the other two projects were more blended, but the public screens are fluid spaces as well, very much, and it takes a lot of flexibility on the part of all the parties to pull that off.

AMELIA: Yes, flexibility in terms of the transnational element as well. Art Center Nabi have their own curatorial agendas and audiences; they're primarily a high-end media art gallery. The majority of screen works they show have an aesthetic that is very clean, in that well-produced new media kind of way, and so they were understandably nervous about doing these kinds of live, largely unpredictable screen events. But since we've completed the dance projects together, they're now holding a series called *Lunch Beats Seoul*, where they've actually turned one of their gallery spaces into a temporary lunchtime club where the public can come to eat, and dance, so their large screens are now being used in a very different way.

ROSS: And that goes back to the first question about, "Why do you need scale? When is it appropriate to use scale?" and I think it's really around this idea of symbolic value of doing something in a central city space that is addressing a collective audience; that has a particular kind of charge to it. Yes, there's lots of ways in which we do global media now one to one, you know, you can do it on a mobile phone or a laptop, you can use Skype in that way, or with small-scale interventions. But this idea of centrality, which isn't simply geographic, but it is about the kind of cultural visibility that something like the national apology achieves because it took place in that space, or something like the dance battle achieves for hip hop culture in the centre of Melbourne, in the centre of Perth and so on. It's a very different terrain to work in and it certainly has its limitations, but it also has these kinds of advantages to it.

NIKOS: We're going quickly speak to the methodology points, where the researcher is in all of this.

AUDREY: Yes, that's right. How's the survey constructed? We weren't interested in replicating the kinds of surveys that Fed Square already does, the kind of institutional audience satisfaction survey. We wanted to firstly assess our audiences' experiences of interactivity, and secondly focus on the transnational and cross-cultural engagement, so we devised questions with those two themes in mind. Across all the events we kept the questions as similar as possible so that longitudinally we could compare responses.

AMELIA: But we also added questions as we learnt from each event. These are paper surveys, so we literally have teams of researchers on the ground at each event, with clipboards and pens, asking people questions and writing down the answers. We also used voice recorders to capture the more detailed responses as audio files. The data is transcribed, coded and analysed, and then the findings are shared with our partners Art Centre Nabi and with Fed Square, so everyone has access to the audience responses as the project develop; a kind of feedback loop that influences future trajectories.

NIKOS: I want to stress that vital point. Normally the research comes at the end. A key part of this project is that the researcher is present across all stages: technical, curatorial, artistic. And the feedback from the research goes to all parties and influences – in a significant way – that process.

AMELIA: Yes, and instead of researching the affects of existing art works, we were commissioning new works to act as sites of research and affect.

QUESTION: I just wanted to ask, because it really struck me right at the beginning, when you were talking about the Sorry experience: what's the role of architecture and design of urban spaces in relation to engagement? […] It seems to me that there's a lot of architectural questions in this, in terms of designing the screen space, designing the space from which the screen is viewed, and I just wondered if there were any published results or some aspect of the research that get at that. Fed Square seems like a really successful example.

ROSS: I was involved in the development of Fed Square in one particular way, and one of the things that the architects just hammered from the first drawing was this idea of Fed Square as a system of flows with a catchment, with a loose catchment. And the flows are all – imagine extending all of the laneways of the city across to Fed Square, start from that, and then make sure there's a little eddy pool where congregation happens but not capture. And from that simple architectural premise they actually delivered, I think, in that regard. You can argue about the facades and everything, but that flow and catchment and ease of egress they got right, and I do think it's a model for the kind of architecture of an epic screen of some kind. You know, maybe bring it down to the ground a bit more, the screen, etcetera, but these are big issues.

SCOTT: I think the general issue of how we integrate media into urban public spaces is a really important one. People like Roy Ascott have been talking for nearly 20 years about the need to bring architecture and media planning together, and it hasn't happened very effectively in other places. And I think that the issue we often face is that urban spaces are often over-designed in terms of being prescriptive about uses and what the media infrastructure allows as improvisation and creating different ambiences, particularly localised ones that can evolve and so on. I mean, all the stuff we know media art can do very effectively, and I think we just haven't seen really good, substantial models of how we can actually design public space around that particular set of affordances. So that's still to come, hopefully.

QUESTION: And architects are opening up to it, because I worked with the architects on that public space in Auckland.

SCOTT: And I think that's the key, the answer doesn't come in at the end, the answer comes in at the beginning.

QUESTION: Exactly. In terms of exactly what Ross said about flow.

NIKOS: Okay. I'd like to take this opportunity to thank the audience for their interest and engagement and attention, and as you can see, that this project has had a lot of iterations and variations, and confronted many new challenges, some of which we didn't ever anticipate. For instance, we were quite conscious that being in the same, more or less, time zone with Korea would facilitate the process of interaction. What I forgot was the seasons would be the opposite. [Laughter] The Koreans thought the Koreans wouldn't dance, that is the opposite of what happened. Preconceptions were often reversed. This has been an extremely productive and surprising journey that we've been on, and thank you very much. And I'd like to thank this enormous team, which has been a great joy to work with.

Latin American Kinetic Art and its relationship with Electronic Art: Gyula Kosice and Abraham Palatnik

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Abstract

This paper focuses on the works of Latin American artists Gyula Kosice and Abraham Palatnik, looking to trace relationships between kinetic and electronic art in Latin America. Some characteristics they share are the inclusion of spectator participation and the early use of lumino kinetic technology in their work. These artists were both pioneers in kinetic art, as well in the use of technology in art, incorporating movement and technology before the concept of 'Kinetic Art' was introduced by the 1955 exhibition *Le Mouvement* at the Galerie Denise René.

Keywords: kinetic art, electronic art history, Latin American art, lumino kinetic art

This article is part of our research on Latin American kinetic artists and works [1]. Kinetic art is a category of post-war visual arts which originated with the exhibition *Le Mouvement* at the Galerie Denise René in Paris in 1955, and experienced a boom of international exhibitions in Europe and the USA during the 1960s. A wide range of artworks involving movement were created at this time, including works based on optical illusions, or the use of mobile light and mechanical movement (through either natural forces, or the direct action of the spectator, by manipulation or displacement).

Our intention is to read between the lines, searching for relationships that can be established between kinetic art and electronic art. On the one hand we focus on the common problems they share with regard to the central role played by the spectator, and also the factors of space and time which are inherent in the works. On the other hand, the technological character of lumino kinetic artworks established a link between kinetic and electronic art, paving the way, through the use of motors, electric light and electronics, for the inclusion of technology in art.

In order to analyse these relationships in the Latin American context, we focus on two artists who were pioneers in kinetic art, as well as in integrating art and technology: Argentinian Gyula Kosice and Brazilian Abraham Palatnik. Both of these artists developed practices — before the concept of 'Kinetic Art' was introduced by the exhibition *Le Mouvement* — that hinted at an international movement which transcended the kinetic field (included the incorporation of direct dynamism) and had diverse manifestations that were not interconnected, as was the case between Kosice and Palatnik.

The works of these two artists serve as a guide for analysing the two main features of the relationship that we propose between kinetic and electronic art. On the one hand, Gyula Kosice revealed at an early stage the problems common to the participation of the spectator, and the inclusion of time and space in art. In his first works, linked to the Madí International group, he experimented with neon lights and water to make manipulable pieces that include the spectator, thus breaking with the static nature of both painting and sculpture, and opening up his work. On the other hand, Abraham Palatnik used electronics and electric lights as an artistic medium in his first pieces, thus becoming a pioneer of lumino kinetic art, which is characterised by works that directly incorporate mechanical, light and electronic technologies.

Gyula Kosice

Hungarian-born Argentinian Gyula Kosice is an artist, theorist and poet. His poetry is active within his works, and anticipates the basis of his creation, or as he describes it: "Poetry: my manager" [2]. Starting from the context of the Concrete Art avant-garde of Buenos Aires — as promoted by the legendary *Arturo* magazine in 1944 — Kosice, with his early use of water and neon, and his creation of manipulable sculptures, developed a pioneering and diverse international practice within the fields of kinetic art and the integration of art, science and technology. He wrote in *Arturo*: "Man shall not end up on earth" [3]. This statement foreshadowed his *Ciudades Hidroespaciales* (*Hydrospatial Cities*) project which, conceived as a solution for global overpopulation, consisted of floating habitats organised according to five hundred diverse places which range from the poetic to the commonplace, for example "place to forget the forgotten: an annex for free memories" or "place for the unimaginable through personal and collective joy" [4]. Kosice traveled to the U.S. to consult NASA about the viability of his project, "and they told me: It is possible, Kosice, continue you work" [5]. In his proposals, electrolysis would supply oxygen for breathing, whilst hydrogen (through nuclear fission) would provide the energy required in order to suspend and move these 'cities'. Although they have not become reality, due to their high costs, "their impossibility is, in fact, their ultimate reality, because we are forced to rethink the category of that which is possible" [6].

In *Ciudades Hidroespaciales*, life and art exist inseparably. The union of architecture, poetry, urban planning, science and technology is a continuation of the

ideology of *Madí Internacional*, founded in 1946 by Kosice, Rhod Rothffus and Arden Quin; these ideas can be identified throughout the course of Kosice's career. In the *Manifesto Madí*, he writes: "Madí Art will be recognized by the organization of elements of each art in its continuum. This includes the presence, mobile

Fig. 2. Gyula Kosice, *Röyi* (© Gyula Kosice)

dynamic order, and the development of one's own subject, playfulness and plurality as absolute values. Therefore, abolishing any interference of the phenomena of expression, representation and meaning" [7].

The main element in Kosice's work is water —hydro-sculptures, hydro-kinetics, hydro-spatiality, hydro-murals — making him a pioneer in its artistic use with his piece *Una gota acunada a toda velocidad* (*A drop cradled at full speed*) (1948). Water, in combination with air and light, is the origin of life, as well as the energy of the future, the biggest constituent of both our bodies and our planet.

In 1946 Kosice made his *Estructuras lumínicas Madí* (*Madi Light Structures*), the first artworks in the world to incorporate neon lights. This series of works originated from a Madí photomontage by Grete Stern featuring the letter 'M' from a Buenos Aires neon sign for Movado watches, which made Kosice think that if neon was being used in advertising, then why not make artworks with it? Ladislao Gyori, informed by Kosice's writing, wished to achieve his idea of 'Light Courses' using neon, in which light rays result in a work devoid of location, freeing the picture by making a "sculptural projection that makes space palpable" [8].

One of the manifestations of Lucio Fontana's Spatialism is a neon structure made in Milan in 1951, about which Fontana writes to Kosice: "Spatial Concepts. Movement born in B. Aires with your manifesto of 1946 (...) Revolutionary art, neither value nor stone, but motion and light and space" [9].

Kosice was also a pioneer in manipulable sculpture; for example *Röyi* (1944), a series of eight jointed wooden pieces that can be moved and repositioned by spectators. This work raises the issue of audience participation (through the possibility of direct manipulation) — a feature of works as diverse as optical art, lumino kinetics and kinetic art, the source of the movement that constitutes the key to these kinetic works being the active participation of the audience.

A form of this type of participation is present in transformable works that begin with *Röyi* and other Madí sculptures, followed by *Polivolumen* (*Poly Volume*) by Mary Vieira, Brazil (1948), *Espacios transformables* (*Transformable Spaces*) by Ennio Iomi, Argentina (1951) and *Estructuras transformables* (*Transformable Structures*) by Darié Sandú, Cuba (1955). Lygia Clark, in her *Bichos* (*Bugs*) series, which she started in 1960, intended to generate an inner experience in which the 'Sculptural Participant' "experiences the work and, in this experience outside his nature, he lives within himself" [10]. The focus of the neo-concrete work of Clark and Helio Oiticica is interaction with the tactile, the audible, the sense of smell, and relational spaces. Clark works from a psychological perspective, creating 'rites without myth', while Oiticica explores social and environmental issues in his 'action structures', such as his *Parangolé* series, in which the mobile sculptures are worn like costumes in order to interact with the environment. These 'wearable' works resemble the playful *Anteojos para una visión distinta* (*Goggles for a different vision*) (1965) of Julio Le Parc, and *Chromoscope* (1960-69) by Carlos Cruz-Diez.

We see a link between the participatory character of kinetic art and the notion of interaction in electronic art, and agree that it is important to "demystify the idea (that) interactive art originated with digital technologies" [11]. Although 'interaction' implies a relationship with an intelligence system that is not present in kinetic works, a relationship between work and viewer is a common factor, letting us catch a glimpse of the similarities between the two practices, such as the ludic dimension, and the questioning of reality.

In reference to the work of Clark and Oiticica, Simone Osthoff suggests that interactivity "... must be regarded as part of contemporary art's natural development towards immateriality" [12]. We can already see this in the text *Röyi: Myth and Literature* (1944) by Kosice: "The only space that presents an analogy with the flow of time, is the one created by a Röyi articulation (...) a kinetic without alphabets takes on consciousness. Its hidden radar thrives on wood and its water roots are everyone's participation. The Röyi myth and its ascension into literature renew its own language, its projection and volumetric return in space. Without being defined, it recycles its gained memory and triumphantly assumes cosmic dispersion. *This is Röyi interaction.*" [13]

Two decades later, Argentinian Julio Le Parc created randomly varying situations via moving lights. This "immaterial element" was already present in his work with GRAV (*Groupe de Recherche d'Art Visuel)*: "This (element) is not a simple relationship. It is the relationship itself … . When we work with this element; we find that it can slip through our fingers like water. Its very existence … transports us to another field ... simply outward, to an immaterial plane" [14]. At the same time, while the Venezuelan Carlos Cruz-Diez was investigating how to "liberate color in order to throw it into space" [15], he created the *Cromasaturaciones* (*Chromosaturations*), chromatic environments of blue, red and green that, devoid of substance, modify and fill the space. Meanwhile, from 1967, the other great Venezuelan master of kinetic art, Jesus Soto, created the *Penetrables*, born out of a need to 'get inside' the vibration produced by his works, using "elements only to materialize an abstract world of pure relationships" [16] where "it is impossible to say which is more real: the solid object or the immaterial vibration" [17].

Abraham Palatnik

In 1949, by introducing technology into his work, the Brazilian Abraham Palatnik became a pioneer of lumino kinetics (a post-war art movement characterised by a renewed interest in combining light and movement; its forerunners were Wallace Rimington, Hausmann, Wetzel, Thomas Wilfred, the Bauhaus experiments, and the investigations of László Moholy-Nagy).

In Araxá in 1948 (ie. even before Palatnik), Mary Vieira made the electromechanical work *Formas Elétrico-Rolatórias, Espirálicas à Perfuração Virtual* (*Electro-rotary spiral forms with virtual perforation*), a large format spiral sculpture with a rotary motion that aimed to achieve the multidimensionality characteristic of all her work. Viera later abandoned the use of electro-mechanics and prioritised direct participation of the viewer in space and time, thus integrating sculpture and architecture.

Palatnik trained in mechanics, physics and drawing in Palestine, where he grew up. After returning to Brazil in 1948, he was influenced by art critic Mario Pedrosa, who spoke of an experimental 'emancipated art' and introduced the Concrete *Carioca* avant-garde to Gestalt Theory, and to visiting the *Centro Psiquiátrico Nacional Pedro II* (*National Psychiatric Centre Pedro II)*, where, in 1946, psychiatrist Nise da Silveira was prescribing creative workshops as therapy for the patients. Palatnik's 'learnt' notions of art were challenged by his recognition, in the patients, of artists who joined image and language via their subconscious alone. In 1949 he abandoned painting to embrace technology as a medium, devoting the next two years of his life to building his first 'cinecromáticos' (kinechromatic) apparatus — a term coined by Mario Pedrosa to describe the desire to set kaleidoscope images free.

The second of these experiments, *Azul e roxo em primeiro movimento* (*Blue and red in first movement*), was initially rejected by the 1st Sao Paulo Biennial in 1951 because it did not fit into any category; however, when the Japanese delegation failed to arrive Palatnik's work was substituted, and was then awarded an honorable mention by the international jury. This device was made up of 600 metres of cable, 101 light bulbs of different voltages, several cylinders rotating at different speeds (thanks to motors), and a set of prisms and lenses, and was controlled by a console with a separate switch for each bulb. It projected a variety of colours and shapes of light, in cycles of twenty to thirty minutes' duration, onto a semi-transparent plastic screen which covered its front. By 1959 Palatnik had built about 20 kinechromatic devices, and had managed to decrease the cabling to 60 metres and the number of bulbs to 51, with a new automatic control console featuring separate switching for light and movement. In 1964 he was invited to the Venice Art Biennale, and his 'painting machine' subsequently received international acclaim. From 1964 onwards Palatnik created other machines, or 'kinetic objects'. The subtlety of rhythm achieved in them demonstrates the fine poetic tension between discipline and randomness that is common to all his work, "to order the chaos of perception" [18]. "In my work I seek the principles that generate information, those are the principles of order and essence. Information in the universe is usually hidden, disguised in disorder. The mechanisms of perception and intuition are necessary for them to manifest "suddenly". It is this "surprise" for which I have the greatest interest and fascination. The process of exchange begins and I seek to discipline information through the appropriate technology" [19].

In Palatnik's series *Movilidad* (*Mobility*) (1959), he explored this 'exchange' with magnetism; these works were sometimes playful, a characteristic also present in his chess game *Quadrado Perfecto* (*Perfect Square*) and his *Objeto Rotativo* (*Rotary Object*) of 1969, in which "the mechanism of improvisation opens up and playfulness is presented by bringing the human being close to his condition of participation and integration" [20].

Kosice and Palatnik are both pioneers in kinetic and electronic art. The early use of technology in the oeuvres of both of these artists was developed through experimentation with new materials. By using this research as an artistic method, and by leaving painting and sculpture aside to create a new type of work that included movement, these artists broke, at the same time, with both figurative and abstract representation.

Based on Kosice's work, along with the analysis of other manifestations in Latin American kinetic art, we can see how kinetic art transforms the relationship between the work and the spectator (included through the participation of his own visual perception or his direct action). In this interaction, the dimensions of time and space are integrated, arriving, as is the case with Soto, Le Parc and Cruz-Diez, at a dematerialisation of the piece within space – thus presenting aspects that will be shared with digital art, such as the concepts of interactive and immersive. Despite the huge differences in technology in kinetic art, the spectator's participation and the quest for the deployment of the piece anticipate clearly several characteristics of the electronic arts; such charateristics are commonly understood as given in the electronic art context, without the appropriate historical background.

Translated from Spanish by María José Rojas and Lucía Nieves Cortés.

References and Notes

1. The research involves a website with a visual map of the artists created by Yto Aranda: <http://www.cinetica.abierta.cl/>, accessed 8 October 2013.

2. Gyula Kosice, 'Madigrafías' (selection of madigrafías of the Arte Madí), *Universal* magazine, diverse numbers since Nº 0, Buenos Aires, 1947), <http://www.kosice.com.ar/eng/madigrafias.php>. Translated by the authors.

3. Gyula Kosice, 'Statements of 'Arturo'', in *Arturo* magazine, Buenos Aires, 1944, <http://www.kosice.com.ar/eng/afirmaciones-de-arturo.php>. Translated by the authors.

4. Rafael Squirru, *Kosice*, 3th Ed. (Buenos Aires, Argentina: Santiago Luján Gutiérrez Ediciones, 2012).

5. Gustavo Nielsen, 'Water goes', *Página/12* (2010), <http://www.pagina12.com.ar/diario/suplementos/radar/9-6061-2010-04-11.html>. Translated by the authors.

6. Rodrigo Alonso, 'Places for living are not spaces for living', in Squirru [4], p. 200. Translated by the authors.

7. Gyula Kosice, *Madí Manifest* (Buenos Aires, 1946), <http://www.kosice.com.ar/eng/manifiesto-madi.php>.

8. Ladislao Gyori, *Kosice and the technological art*, (Buenos Aires, Argentina: Aero, 2011). Translated by the authors.

9. Mari Carmen Ramírez and Héctor Olea, *Inverted Utopias: Avant-garde in Latin America*, exh. cat. (New Haven, U.S.: Yale University Press in association with Museum of Fine Arts Houston, 2004).

10. Mari Carmen Ramírez and Héctor Olea [10], p. 197.

11. Claudia Giannetti, 'Art and technology. Notes about ludic aesthetic in the participative art in Brazil',in *Brazilian Culture Magazine* No. 6 (2008), p. 110, <http://multimediaienba.files.wordpress.com/2011/05/apuntes-sobre-la-estc3a9tica-lc3badica-en-el-arte-participativo-en-brasil.pdf>. Translated by the authors.

12. Simone Osthoff, 'Lygia Clark and Hélio Oiticica: A Legacy of Interactivity and Participation for a Telematic Future', in *Leonardo* 30, No. 4 (1997), <http://www.leonardo.info/isast/spec.projects/osthoff/osthoff.html>

13. Gyula Kosice, 'Röyi: Myth and Literature', in *Ramona Visual Arts Magazine*, No. 43-44 (2004), p. 26, <http://www.ramona.org.ar/files/r43-44.pdf >. Translated by the authors.

14. Julio Le Parc, *What is immaterial (Rough notes, 1961*, in:Ramírez and Olea [10], p. 521.

15. Ariel Jiménez, *Carlos Cruz-Diez in conversation with/en conversación con Ariel Jiménez*, Kristina Cordero (trans.), (New York, U.S.: Fundación Cisneros/Colección Patricia Phelps de Cisneros, 2010).

16. Guy Brett, *Force Fields: an Essay on the Kinetic*, exh. cat. (Barcelona, Spain: ACTAR,

Museu d´Art Contemporani de Barcelona, 2000). Translated by the authors.

17. Guy Brett [16], p. 31. Translated by the authors.

18. Frederico Morais, 'Abraham Palatnik: A Pioneer of Tecnological Art', OLATS, <http://www.olats.org/pionniers/pp/palatnik/morais_en.php>.

19. Frederico Morais, *Abraham Palatnik: Retrospective*, exh. cat. (Sao Paulo, Brazil: Itaú Cultural, 1999). Translated by the authors.

20. Frederico Morais [19], p. 21. Translated by the authors.

GESTURE, SOUND AND PLACE

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Abstract

This paper discusses two multichannel interactive audiovisual artworks, Action A/V and SoundLabyrinth, that explore approaches to the experience of gesture, sound and place. Both works were situated in a geodesic dome frame and built within the Max, Ableton and Max for Live computer programs, and produced ostensibly similar outcomes, however the approaches taken by the two authors differ in intention, processes, and philosophy.
These approaches were presented and discussed in workshops delivered at ISEA2013, on Sunday June 9 and Monday June 10 2013. In these workshops participants improvised with the two systems, both through moving in the dome and by operating the related software, and discussed approaches and understandings of the three terms listed in the title of this paper.

Keywords: sound, space, place, interaction, gesture, interactive art, workshop

Introduction

Gesture, Sound and Place was an interactive workshop held at *ISEA2013* in which Mark Pedersen and Roger Alsop introduced their approaches to creating interactive audiovisual processes and artworks that engage with and interrogate the concepts Gesture, Sound, and Place.

The breadth of human gestures, as Adam Kendon posits, "can play a role in how interactants regulate each others' patterns of attention; participants in non-speaker roles … indicate their assessment or understanding of another's utterance; … [are] incorporated into discourse as objects of deictic reference, and … used in alternation with spoken elements in discourse, partnering words as syntactic elements"[1].

This understanding is related to a physical action that accompanies a (usually spoken) utterance. However, gestures can encompass much more. They may be physical, such as a wave of the hand; ineffectual, 'just a gesture'; empathetic, 'a kind gesture'; and spontaneous or considered. Cadoz and Wanderley offer a review of various definitions of gesture in a number of contexts [2], and Clynes offers an interesting position on gesture in conducting scored music [3]. There are also mental gestures [4], the gestures that cause affect through " a multitude of perceptual and cognitive mechanisms" [5] or the thoughts that cause physiological results, as explored by Eaton and Miranda [6].

Gestures are also considered to be present in music, painting, narrative, thought, speech and just about every other human action or interaction, and can be either deliberate or unconscious. *Gesture, Sound and Place* focuses primarily on deliberate physical gestures that the gesturer can recognise as having an effect, such as those of a dancer or other performer, or simple movements from one place to another.

Like Kendon's conceptualisation of gesture, sound is a physical event that can be objectively observed and mapped. It has a range of functions, including: transmitting information (through speech), evoking emotion (through music), alerting to danger (it has fewer barriers than sight, and can be registered from all directions), indicating place (through sonar, or simply listening to reverberations), and so on. The understandings/conceptualisations/theorisations of the sound gesture have developed to include more than merely what can be heard; Kim-Cohen [7], Kahn, [8] and LaBelle [9], for example, consider it from conceptual, philosophical and social perspectives.

There have also been a vast number of tools developed regarding the sonifaction of physical gesture, as seen in the work of Rokeby [10] and Winkler [11], and the sonification of data [12].

The same can be said for place, which, like sound, can be considered a natural, geographic event, one that can be objectively considered. It can also be considered experientially, as seen in the discussions of Tuan [13], Bachelard [14], Seaman [15] and Griesinger [16], the last of whom blends objective and subjective experience of place in his discussion of inclusion. Pedersen and Alsop consider the objective place as harbouring and generating a subjective experience; in the geodesic dome created for the *ISEA2013* workshop, the physical gestures of participants generated and mediated the sounds they heard.

Processes

In *Gesture, Sound, and Place*, Alsop and Pedersen contrast switch-based and continuous control interaction paradigms. These two systems are comparable to the piano keyboard, a fixed set of switches which offer depth of variation through velocity, sensitivity and combinatoric complexity, and strings, which offer continuous pitch and timbre variation through such factors as bow pressure and speed, and finger position.

In practice, Alsop uses digital camera input analysed via Max/MSP [17] to make a grid of 16 zones (the switches), which respond to the degree of light change within each zone (analogous to velocity), to generate a set of variable sine tone frequencies output through a surround-sound speaker array.

In contrast, Pedersen uses a Kinect depth-sensing camera to continually track the positions of the participants within the space, and their hand gestures, to create a shifting soundscape of field recordings. Pedersen's tracking devices and speakers are shown in Fig. 1, while Alsop's grid-based input can be seen in Fig. 2 and his Kinect-based tracking system is detailed in Fig. 3, and Alsop's control software interfaces are shown in Fig. 4.

Fig. 1. Sensor and speaker placement in the dome

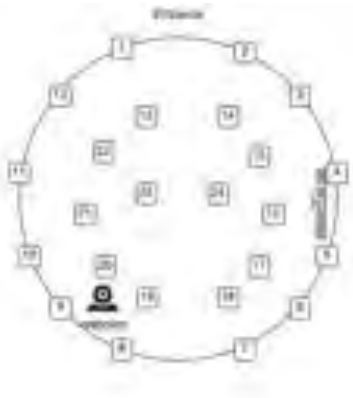


Fig. 2. 16 quadrant camera image, showing the degree of light and light change as numbers in each quadrant.

These systems were developed independently, and are both able and intended to be installed in a variety of environments. Alsop's systems are generally created to fit any environment and technical specifications, while Pedersen's are oriented around a bespoke 24-channel audio system he

designed. Pedersen's system is currently optimised for a domelike environment, in which sound may be easily dispersed horizontally and vertically, as all speakers can be equidistant; however this environment is not a prerequisite to the use of this system.

Integrating the two systems within the dome required adjusting Pedersen's dispersion processes to accommodate Alsop's processes. In the *ISEA2013* workshop Alsop's sound was dispersed horizontally and vertically through the speakers to the left of the dome, and Pedersen's through all speakers, shown in Fig. 1. This fitted the requirements of both approaches to interactive sound dispersion.

Aesthetic approaches

Alsop and Pedersen have complementary approaches to gesture, sound and place, drawn from both their individual aesthetic philosophies and aspirations, and also their respective approaches to the role of sound in art making and its relationship to the environments in which it is presented.

Alsop's position is based on simple approaches to sound art presentations. He recognises that these are made in environments which heavily influence the reception, or perception, of sound, and also subsequently the ways in which participants (those who engage with the work – audience, gesturer, etc.) experience engagement, envelopment [16] [18] [19] and agency. In *ActionA/V* (a continually developing work/program), he explores processes that allow participants to develop a sense of personal engagement, envelopment, and ownership of the artwork that results from their intended and non-intended interactions with *ActionA/V* [20].

This approach has certain core requirements: that the interface between gesture and heard/seen result is robust; that the result of a gesture be easily acknowledged and recognisable by the gesturer; that interface learning comes through play; that it be extensible; and that it is able to create responses which range from completely predictable to unexpected (yet are recognisable as related).

The result is a system similar to a typical musical instrument and music conductor, affording similar gestural control; that is, physical gestures cause and influence timbre, amplitude and frequency. This results in the gesturer creating, and the participants experiencing, rhythmic, timbre, and frequency gestures, and their consequent aesthetic/conceptual interpretation of those gestures.

The *ISEA2013* workshop version of *ActionA/V* used sine waves. Here the heard frequencies ranged from about100 to 16 KHz; this meant that the 16 'players' seen in Fig. 4 (below) could generate 16 different sine waves at different frequencies and amplitudes.

This provides a number of options; for example, if the frequencies to be propagated are set close together, with a variation range of 2 Hz, the gesturer/listener would experience a form of additive synthesis produced timbres as the different sine waves faded in and out, and the location of the gesturer created different phase relationships between the waves. A more traditional 'instrument' would have each player set to frequencies similar to those of a well-tempered scale, allowing the possibility of creating melodies and harmonies similar to those of traditional western music.

The two approaches outlined above indicate the symbiotic relationship between the place, gesture, gesturer and listener that creates the sonic environment. In the first, the slight differences between frequencies (2 Hz as suggested above) creates a subtle sonic, physical environment. Here the interaction between the sonic environment and a participant's attention is perhaps not captured or excited to the same degree as it would be by the comparatively dramatic changes of the second approach, in which there are larger differences between frequencies. This approach creates both introverted and extroverted senses of psychological 'place': one may not overtly expect or inspire the audience's attention, while the other does.

The interface for this version of *ActionA/V*, shown in Fig. 4 (below), offers the opportunity for gesture in the creation and dispersion of the audio. This shows the aspects of the program that can be altered by the participants and, when used in a performance setting, the users/performers.

Alsop sees this kind of interaction as a gesture fitting the understandings and interpretations of the term 'gesture' listed earlier. There is the gesture required to adjust and respond to those adjustments of the controls in the oblong bubbles in Fig. 4, and using a mouse to draw in the matrix to the left of the screen in order to spatalise the sounds.

Alsop's underlying aesthetic requires that *ActionA/V* respond to the physical and mental gestures of the participants as possible gestures, in such a way that learned sociocultural bases are transparent. It should interact with the participant's deliberate, unconscious, composed, and improvised gestures; all are brought to the attention of the participant in a way that inspires further interaction, and develops understanding of the effect of their interactions through play.

Aesthetics and Cognition

In *SoundLabyrinth*, Pedersen focuses on place through the use of evocative field recordings, and the relationship between physical gesture and sound. This approach is inspired/informed by the Embodied Sound Cognition framework developed by Godøy and Leman [21] and others. For Godøy and Leman, knowledge emerges out of a need to act in the environment, not just to collect information for its own sake; hence the focus of the embodied cognition approach is on action. Key to the embodied perspective is evidence of a close coupling between the cognitive processes that underpin movement and perception. Leman [22] provides extensive discussion of this evidence, including the behavioural observation of infants' innate ability to perceive gestures and replicate them, and the neurobiological observation that some of the same neurons which are fired to create a gesture such as grasping-with-the-hand (the so-called 'mirror neurons') also fire when the subject observes another person performing the same action.

The tight coupling of movement and perception at a cognitive level gives rise to the idea that, just as our movements arise from intentions (simulation of the movement), so perceptions of the external world map back to intentions because of the trace left by the shared cognitive processes. This action-oriented ontology suggests that even at the social level, the actions of others are understood in terms our own intentions, that is, our own simulated actions; the moving sonic forms of music, created by a concatenation of sonic gestures, are likewise attributed with intentionality because of the coupling of perception and movement. Thus, because individuals develop their own action-oriented ontology in a similar way by virtue of their common human physiology, if not common culture,

semantic communication is possible through sound and music [23].

Pedersen's particular goal with *SoundLabyrinth* is to create a space in which it is possible to experience an embodied encounter with the sublime, through sound [24]. The intersection of the abstract/virtual and the embodied/actual is the space upon which *SoundLabyrinth* focuses.

The compositional approach is one of gradual intensification of this intersection. Elements of the installation's soundscape respond to simple movement within the space, thus gradually progressing from a natural environment to an aural landscape that becomes more abstracted as the participant delves deeper into the space of the dome (desert winds, snatches of poetry, synthetic drones).

Along the way, the participant may discover another mode of interaction: one that responds to gesture, rather than just location. Through linking physical gesture and sound, there is an intensification of the inherent connection between sound and movement posited by Leman.

Given the casual nature of the relationship, this temporary fusing of participant and installation as a combined performative system only works if the mapping between gesture and sound is grounded in the embodied intelligence of the participant; without an awareness of the relationship between gesture and sound, the sounds generated in response to gesture could feel alien and disconnected, and fail to invite further exploration.

Physical Infrastructure

In *SoundLabyrinth*, the Kinect provides input into a Max/MSP patch which uses the Kinect's skeleton tracking algorithm to provide participant locations as XY coordinates to the main sound management and ambisonic spatialisation patch.

In contrast, *ActionA/V's* quadrant-based analysis of the camera input was mapped directly to a subset of speakers (10–12 and 21–23), which allowed gestures in various quadrants to be mapped to specific speakers, providing spatialisation both horizontally and vertically; **Error! Reference source not found.** provides an overall view of sensor and speaker placement, while Fig. 3 provides a more detailed view of the analysis and spatialisation subsystems.

For *SoundLabyrinth*, a person's position within the dome is used to smoothly transition between different soundscapes. The Max/MSP nodes object provides a zone-based trigger system which can also provide weighted output from each proximal trigger zone, allowing interpolation between triggered soundscapes. This approach provides a natural mechanism for exploration of the *SoundLabyrinth*, as triggered material fades in and out of hearing in response to position, the primary form of agency within the *SoundLabyrinth* component of the system.

The Kinect is also used for gesture tracking of a single participant at a time, with large-scale hand gestures enabling sound objects, or discrete sonic events, to be moved about within the spatialisation system. In addition, these hand gestures apply simple effects, such as reverb or delay amount and feedback, to be applied. The effective range of the Kinect means that participants are only tracked in the left half of the dome closest to the Kinect. The Kinect gesture tracking subsystem is able to automatically recognise and calibrate to any humanoid shape within range, without the need for a specific calibration gesture; hence engagement of the gestural interaction is seamless with respect to the rest of the installation.

In the workshops

Alsop and Pedersen held six workshops, each lasting about an hour, over two days. Their aim was to expose and interrogate the artists' processes for multimedia interaction, to facilitate participants' understanding of the processes, and to discuss and expand on these processes.

Each workshop had between five and twelve participants, and often led to conversations which continued long after the workshop had finished, with participants experimenting with *SoundLabyrinth* and *ActionA/V*, discussing their own processes, and networking.

The loose format for the workshops involved the participants first introducing themselves, discussing their experience in interactive art, their practice and affiliations, and explaining what interested them about the workshop. Participants were then asked to reflect on gestures they considered particularly meaningful and to explain why, and to consider how these gestures might be observed and measured. They were next introduced to concepts of gesture, sound and place, and embodied cognition, as Alsop and Pedersen considered them in their respective art making.

The responses were unique to each group, and to try to distill the responses would make it impossible to accurately represent them. However, responses to the questions asked leaned towards a gesture being a deliberate physical movement, sound being musical when in an art context, and place being a contrived or purpose allocated/specific environment.

When it was suggested that a gesture, sound or space could include those listed above and more, participants questioned and considered those possibilities and acknowledged that such interpretations of the terms could be advantageous, particularly when creating artwork and developing conceptual frames. The contrasting interaction paradigms of *SoundLabyrinth* and *ActionA/V* were explained, in terms of both the conceptual paradigms and a high-level description of the practical implementation.

The six workshops had differing cohorts and interests: some participants wanted to experience the sonified geodesic dome, while others developed or wanted to share understandings of, and approaches to, gesture recognition/mapping processes and systems, and a third group attended just to explore and play.

Often the responses ranged through: waving to someone, proximity to others, dance-like movements, body language, and expressive gestures such as jumping-for-joy. After discussion, a broader sense of what a gesture might be arose, and this was, in some cases, reflected in the gestures participants made in the dome and while using the programs.

Participants' approaches to *ActionA/V* were usually exploratory, as can be expected when any new object or experience is encountered. The physical gestures were initially timid, mostly slowly waving arms. As familiarity and experience grew, however, rapid bodily motion, movement around the dome, and a sense of play became prevalent. After this it was suggested that participants move closer to and farther away from the camera, try to perform as ensembles, and use small torches provided to activate sound.

Participants were also asked adjust any of the parameters seen in Fig, 4, and the approach was similar. When doing so, the activities of the participant(s) in the dome and those adjusting the *ActionA/V* parameters created a two-way

improvisation, as the actions of one influenced the other. The image in Fig. 4 does not clearly show what the variable parameters are, or what they affect. The program, which has a built-in pop-up help and a description of what each parameter does, is available on request from Roger Alsop.

Participants' interaction with the *SoundLabyrinth* components of the installation was initially unconscious, as the system reacted to their position within the space without them needing to actively engage. As participant awareness of the relationship between sound and position developed, more conscious explorations of the sound space that overlaid the physical space occurred.

Participants with a knowledge of gestural systems, particularly those who recognized the Kinect sensor, used arm-waving gestures to explore the gestural affordance of the system. Some participants noted that they would not normally use such gestures in an installation setting, and did not discover these aspects of the system until prompted. Participants remarked on a sense of satisfaction with gestures which mapped to obvious changes in sound, such as the 3D panning of a sound, but were frustrated by other more subtle effects, such as reverb changes, as they did not get a clear sense of agency or relationship.

Developments beyond the workshop

There is much discussion regarding the sonification of gesture which can be seen in the work of the authors listed, and many more not listed. Alsop and Pedersen did not intend to offer commentary on, or a history of, interactive designs, processes, or technologies in *Gesture, Sound, and Place*. Rather, they sought to develop processes within current technologies, and share and develop paradigms and concepts whilst doing so.

The workshops and subsequent works made by Alsop and Pedersen simply build on this work in idiosyncratic ways, and it is hoped that they add to the increasing body of knowledge and of ways of working with interactive technologies, and the opportunities that these provide. In terms of *SoundLabyrinth*, one element emerging from the workshop was the importance of relational gestures, that is, gestural interactions between human participants, rather than gestural interactions between the participant and the system. S*oundLabyrinth* had been conceived as a solo experience for the participant, with interactive elements designed to heighten the participant's individual experience of the sonic space of the installation.

Following on from the workshop, greater emphasis has been placed on enabling the *SoundLabyrinth* system to respond to the gestural relationships between two or more participants. Simple mappings, such as linking the volume of a sound to the distance between two participants, with other variations on the sound being controlled by individual gestures, produced greater sustained interest in the interactivity of the system, compared to the solo gestural mode.

Since the workshops, *ActionA/V* has been developed as an approach to gesture-generation of audio, and is now considered a tool for sonifying physical gestures (whatever they may be). The current goal in developing the work further is to create a process that transparently allows the integration of physical and mental gestures in the creation of an audio and visual environment.

While this may well be a difficult aspiration, as mental gestures are unseen until articulated externally, it is possible to develop a system for understanding and responding to intention, for example: sustained, slow gestures that signify contemplation; gestures in a small space that signify intimacy; sustained gestures on the horizontal plane that indicate expansive intentions; and sustained gestures on the vertical plane that indicate contracting intentions. These interpretations are subjective and arbitrary at best, but can lead to a model from which to develop more accurate interpretations of mental gestures.

Altavilla, Caramiaux and Tanaka see that "gestural-sonic affordances may provide insight into designing future interactive and gestural music systems that balance the morphological characteristics of the sound with its potential cultural identification" [25], and may equally contain morphological characteristics of gesture and place.

As those three authors imply, the field of gestural music systems, while very active, is still nascent and lacking the maturity of traditional instrumental gesture sonifying systems. In linking interactive audiovisual installation practice to traditional instrumental practice, such as cello or piano, through common underlying gestural paradigms, Alsop and Pedersen hope to further develop both the accessibility and the potential for virtuosity in future instances of their work.

Fig. 3. *SoundLabyrinth* spatialisation and sensor system detail

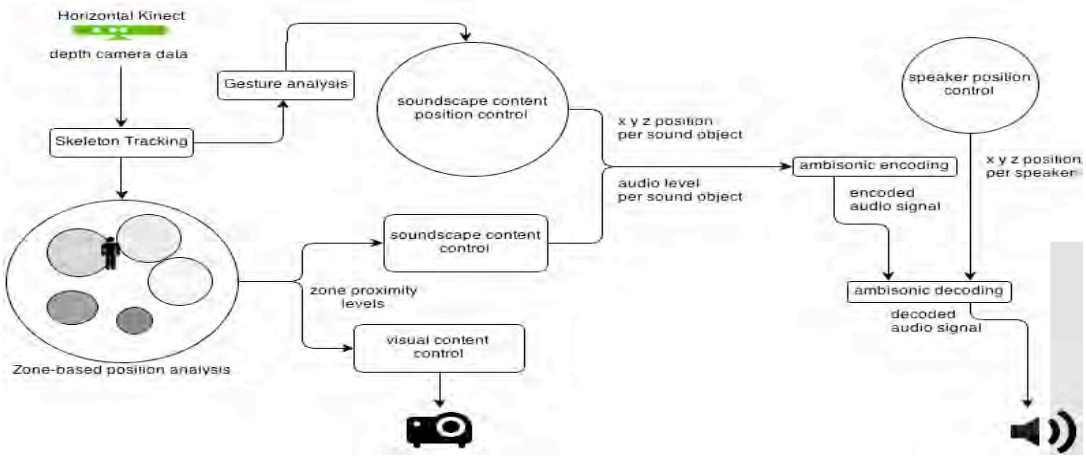
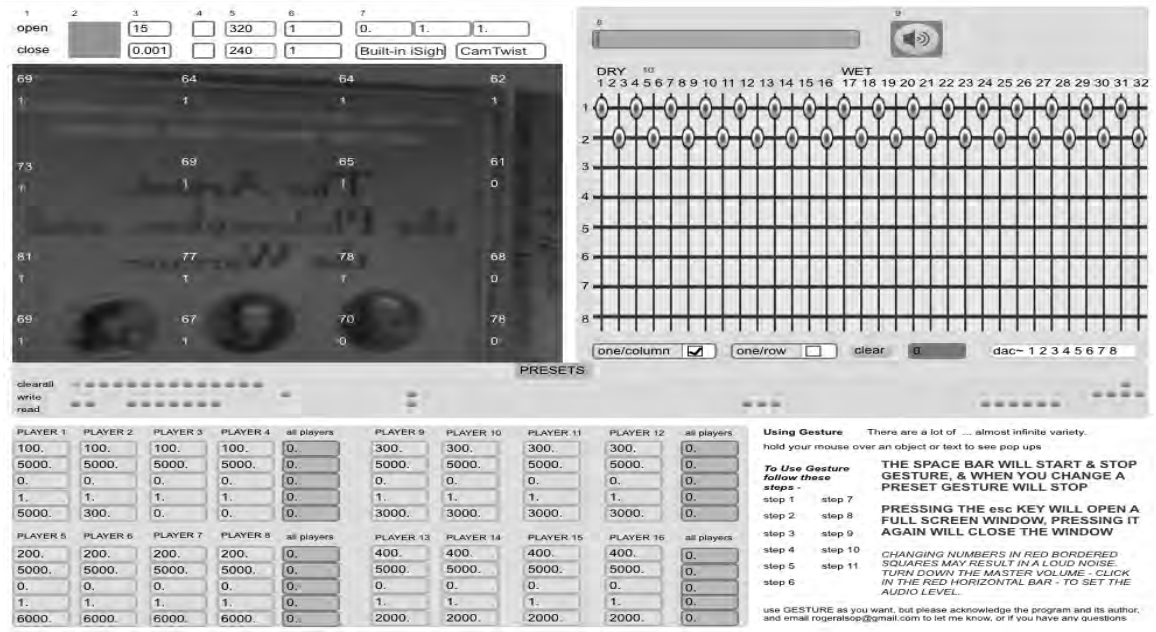


Fig. 4. Developed control surface for *ActionA/V*, as used in *IESA2013* workshop



References and Notes

1. Adam Kendon, 'Gesture', *Annual Review of Anthropology*, 26 (1997), pp. 109-28.

2. Claude Cadoz and Marcelo M. Wanderley, 'Gesture - Music', in M.M. Wanderley and M. Battier (eds.), *Trends in Gestural Control of Music* (Paris: Ircam - Centre Pompidou, 2000), pp. 71-94.

3. Manfred Clynes, 'Living Micro-Microstructure: Instant Rehearseless Conducting Communicates Fine Structure of Musical Intention', in *The Inaugural International Conference on Music Communication Science* (Sydney, Australia: 2007), pp. 27-30.

4. Fernando Iazzetta, 'Meaning in Musical Gesture', in Wanderley and Battier*Trends in Gestural Control of Music*, ed. by M.M. Wanderley and M. Battier (Paris: Ircam - Centre Pompidou, 2000).

5. Christopher Tough, 'Can Gesture Recognition Repair the Disembodiment of Live Electronic Music?', (2013).

6. Joel Eaton and Eduardo Miranda, 'Real-Time Notation Using Brainwave Control' (2013).

7. Seth Kim-Cohen, *In the Blink of an Ear: Toward a Non-Cochlear Sonic Art* (New York: Continuum, 2009).

8. Douglas Kahn, *Noise, Water, Meat: A History of Sound in the Arts* (MIT Press, 1999).

9. Brandon LaBelle, *Background Noise: Perspectives on Sound Art* (New York: The Continuum International Publishing Group, 2006).

10. David Rokeby, 'The Construction of Experience: Interface as Content', in *Digital Illusion: Entertaining the future with high technology* (1998), pp. 27-48.

11. Todd Winkler, 'Creating Interactive Dance with the Very Nervous System', in *Proceedings of the 1997 Connecticut college symposium on art and technology, New London, Connecticut* (1997), pp. 212-17.

12. David Worrall, Michael Bylstra, Stephen Barrass and Roger Dean, 'Sonipy: The Design of an Extendable Software Framework for Sonification Research and Auditory Display', in *Proceedings of the 13th International Conference on Auditory Display, Montréal, Canada* (2007).

13. Yi-Fu Tuan, *Space and Place: Humanistic Perspective* (Springer, 1979).

14. Gaston Bachelard, *The Poetics of Space*. Vol. 330 (Beacon Press, 1994).

15. David Seamon, 'A Way of Seeing People and Place', in *Theoretical Perspectives in Environment-Behavior Research* (Springer, 2000), pp. 157-78.

16. David Griesinger, 'The Relationship between Audience Engagement and the Ability to Perceive Pitch, Timbre, Azimuth and Envelopment of Multiple Sources' http://www.davidgriesinger.com/IOA2011/IOA2011_preprint.doc [Accessed June 6 2012]

<http://www.davidgriesinger.com/IOA2011/IOA2011_preprint.doc> [Accessed June 6 2012].

17. Max. cycling74, San Francisco.

18. Fred Geil and David J. Weinber, 'Concert Audience Engagement - the Perception of Closeness: Engage Us with Sound', 2010. http://www.enjoythemusic.com/magazine/bas/0810/ [Accessed June 6 2012].

19. Guy Harries, 'Embodied Subjectivity and Audience Engagement Via Drawing in the Project Shadowgraphs' (2012). http://process.arts.ac.uk/content/embodied-subjectivity-and-audience-engagement-drawing-project-shadowgraphs [Accessed May 5 2013].

20. The program *ActionA/V* is available by contacting rogeralsop@gmail.com

21. Rolf Inge Godøy and Marc Leman, *Musical gestures: Sound, Movement, and Meaning*, Taylor & Francis (2009).

22. M. Leman, *Embodied music cognition and mediation technology* (MIT Press, 2008), pp 77-102**.**

23. M. Pedersen, `Sound Labyrinth: Exploration Of The Embodied Sublime Through An Immersive Audio/Visual Installation', in *Proceedings of the 2013 International Computer Music Conference* (Perth, 2013)**.**

24 Alessandro Altavilla, Baptiste Caramiaux and Atau Tanaka, 'Towards Gestural Sonic Affordances', in *NIME'13, May 27-30, 2013, KAIST, Daejeon, Korea* (Korea, 2013).

The Future of the Moving Image

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Abstract

Whilst at the Universities of Bristol and the West of England, in collaboration with BBC R&D, I have been responsible for the production of the first higher dynamic range, higher resolution and higher frame rate experiments to measure which combination of these developing parameters of image capture and display best engages the audience. What is essentially happening here is the mapping of the capabilities of imagining equipment to the sensory levels of the eye/brain pathway. But what do the expanding parameters of the digitally captured moving image mean to the viewer and how will this affect future patterns of production, consumption and understanding of moving images?

Keywords: Resolution, Frame Rate, Dynamic Range, Electronic Digital Cinematography.

We now have greater enhancements to our computational abilities that allow us to 'uplevel' the parameters we are testing and more importantly, this increase in itself speaks of what is to come. Our tests have revealed the creation of a sense of depth, without sensory tricks such as binolcular stereopsis, which is reliant on the eye tricking the brain to produce depth. However, trying to predict where technical and aesthetic developments will lead us does a disservice to the subject area. To more fully explore the importance of these developments, in this paper I attempt to explore the narrative that underlies Cognitive Neuroscience as a descriptor that may reveal the nature of that which looks, as being as important as that which is looked at.

Walter Benjamin said:

"The camera introduces us to unconscious optics as does psychoanalysis to unconscious impulses" [1]

If this was thought to be true in the analogue age, in the digital age we might ask: What do new forms of capture and display reveal about our unconscious state? Moore's Law, when applied to the developing process of electronic or digital image capture, creates as profound a change as the invention of slow-motion in Benjamin's day. Increased capture quality and speed, handling and display of data, and the dissipation of bottlenecks in data flow, open new possibilities for how and why images are captured and displayed.

However, there is an underlying conviction in this research that something will be revealed about how these accelerations perturbate or excite the human perceptual system. Traditional forms of exhibition are already accommodating these developments with 4k projector systems, delivery of higher resolution television via terrestrial digital and higher resolution narrowcasting via the internet. Business as usual: but what might this all mean for image making and their consumption outside commercial circuits?

New interfaces are already being designed to control high-resolution, high-frequency images and new research is being undertaken to explore the relationship between humans and their works. What does this mean for the electronic arts community and on a wider level, human development?

Argument

We've now entered an era of electronic capture in preference to photo-chemical capture. One of the paradoxes of Digital Cinematography is that in some senses it has greater similarities to photo-chemical film than digital video or televisual forms:

> "The historically determined optical pathway of digital cinematographic cameras is 35mm or above, and its images are reconstructed from a progressively based, lossless data flow, with one full frame of information at a time. It holds the image in a latent state until it is rendered (or 'developed'), but unlike film, its materialisation is non-destructive of its prior material state. However unlike film, its inception as an image capture mechanism is no longer its sole intent as a medium" [2].

The last point is perhaps the most important. For instance, with the use of two triangulated camera's photo-site grids, we can map 3D space in real Time. Recently we've seen the development of the Kinect but the singular vantage point is problematic in terms of accuracy. Some years ago (around 2008) I saw Studio Azzurro's two camera mapping system in action and was amazed at how little latency and how much accuracy there was in their system. Mapping space will allow us to create defined regions of space with greater and greater resolutions. This idea requires extremely fine tuning of the above triangulation, with high degrees of resolution, plus an auto correction of each partition in computer space to correlate with its position in actual space. However, it seems to me, the conception and manufacture of such a thing is within our grasp. If we can accurately map 3D space then we can create events in a location with gesticulation or voice and therefore trigger events. But not only this, that location could then be mapped over a distant and enabled space, so that events could be created there.

Furthering the above ideas with 'White Light Interferometric Scanning' we should be able to capture spatial images for 3D printing (White light interferometry is an extension of triangulation which can create extremely accurate measurements of X, Y and Z co-ordinates). Further, at a lab at ETH in Zurich in 2010 I was shown lenticular holographic images of a cup and then asked to reach out and 'touch' the cup which I did. The explanation of my sense of 'touching' was that a puff of compressed air had met my finger at the perimeter of the image. The research team had worked on the hypothesis that if a *sufficient* percentage of the brain was involved in one sense, then 10 % of engagement of another sense could convince the brain that the object was 'real' as two senses had confirmed its existence. Lastly, and using the camera more traditionally, we should be able to create images with enough resolution for very large displays. *If* large surfaces can be enabled to carry images then using a suitable material a building could be covered with an image. Building textures could be changed as clothes are changed.

Current Research

At University of the West of England, the center for Data Imaging Research in Electronic Cinematography and Transmedia (DIRECT) will be examining these developments. In collaboration with University of Bristol, my current research strategy now centers on our physiological specificity. I've been working with Professor Dave Bull of Faculty of Engineering and Professor Iain Gilchrist of Department of Experimental Psychology in partnership with Marc Price, a Senior BBC R&D Engineer to examine the immersive qualities of a combination of higher frame rate, higher resolution and higher

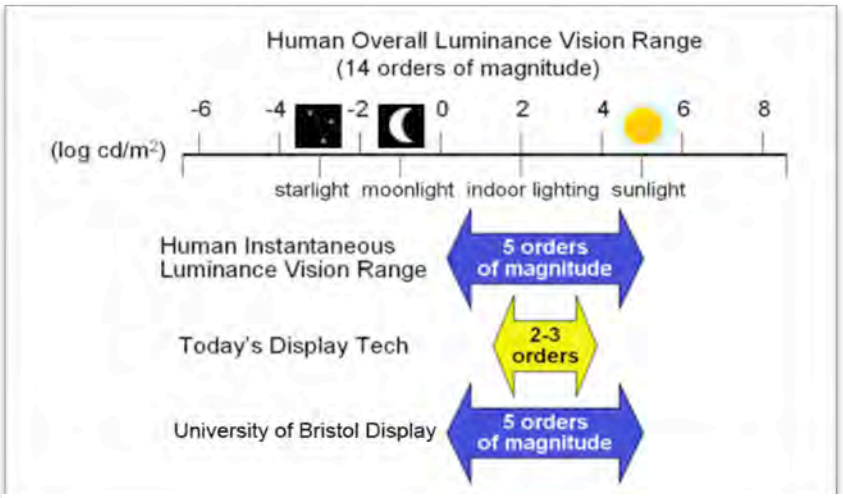

Figure 1: Human Overall Luminance Range. © Flaxton

dynamic range images. In November 2012 we completed the first test shoot for this level of motion image production (50 frames per second and 200 fps), the results of which will be published in a BBC White Paper, September 2013 [3].

If you look at this diagram (Figure 1), it shows that the human eye/brain pathway uses 5 of a 14 order of magnitude scale, sliding this instantaneous facility up and down the scale to deal with starlight at one end and desert sun at the other.

All contemporary displays currently show between 2 – 3 orders of this scale, however we now have a prototype which displays 5 orders. Coincident with this, the BBC in turn have created a 200 frame per second projection system.

By combining variants of frame rate, resolution and dynamic range, we should be able to effectively produce 'the perfect picture'. By calibrating these different parameters to produce a combination that best resonates with our eye/brain pathway, the proposition is that if we can manipulate *all* the factors of the construction of the digital image then conscious immersion may follow.

So far we have built the immersion lab and experiments have matured a post-production pathway to the point that higher dynamic range moving images can be displayed on an HDR display, but we need to refine the process so that true colour rendition also accompanies the so far discoloured images.

Developing the argument with the help of cognitive neuroscience

At this point in time, questions of 'what next on the horizon' do the subject an injustice. That we are interested in expanded parameters of the moving image simply as a product of 'scientific' curiosity is misplaced. Cognitive neuroscience provides us with an idea of the nature of the paradigm change we are undergoing to accompany the invention of the digital. The narrative that develops places the emphasis on what is looking rather than what is being looked at and by whom, and so comes to rest on the nature of the sensorium that is gazing at the moving image - and not the technical construction of the moving image itself.

Within this narrative, cognitive neuroscientists argue that mammals and possibly all animate creatures have within their minds a precise internal map of their immediate environment; that each creature can only maneuver within their world by first imaginatively representing their intentions in that world as a rehearsal for action. I would now like to concentrate on the work of Emeritus Professor Merlin Donald, Queen's University, Ontario, due to his having written the 'go-to' book on the subject in 1991, *Origins of the Modern Mind* [4]. Further quotes I include will be from later editions and papers.

Donald argues that being in the world is an aspect of mind and that human communication developed through three scaffolded phases, built one upon another. He further argues that "Because evolution is conservative, the modern mind retains all previous stages within its complex structure" [5]. Donald argues that the *mimetic*, the first stage of development, came when, say, an ape saw a group of other apes in the distance and came down from her perch in the tree canopy to tell her fellow apes what she'd experienced in her world picture:

> "The Mimetic Domain comprises gesturing, pantomime, dance, visual analogy, and ritual, which evolved early and formed an archaic layer of culture; based mostly on action-metaphor. Mimesis allowed for the spread of tool-making technology and fire-tending, through imitation and ritual." [6]

In telling her tale, she and her watchers physically developed a sympathetic mirror-neuron system so that we primates can empathise with each other's experience. Then, as recently as 150,000 years ago, homids developed larynxes suitable to accurately render and replicate sounds which become more specific than pantomime in conveying details of the world. In uttering controlled sounds, she has changed the physical construction of her own brain and skull. This is Donald's second stage. He argues:

> "Mythic culture is based upon spoken language, and especially on the natural social product of language: Storytelling. Mythic Culture, retains a subsidiary mimetic dimension, manifested in ritual costume and gesture, which is then epitomized in various forms of art". [7]

Here, we can easily see the nascent seeds of theatre, cinema and television – and all their digital grandchildren.

The third stage, the Theoretic, began 10,000 years ago when the hunter/gatherer settled down to farm. The mythic period had become so sophisticated that descriptions of the world were taken up by specialised members of the tribe, such as Shamans, who were the beginnings of the bureaucracy of a priestly class.

There were also accompanying physiological developments as the brain developed to deal with audio culture, which needed more memory storage. Neuroscientists postulate the existence of Engrams – sites within the brain where long-term retention of different kinds of memory are stored.

Though these physiological developments had begun at the beginning of the Mythic period, it was now refined and echoed by one more physical and material development in the real world, Exograms. Certain neuroscientists suggest that an Exogram is a site outside of oneself where

memory can be stored and which then stimulates memory recall: Stonehenge for instance, or a book, or an artwork. Next the third stage arrived:

> "It started very slowly with the emergence of sophisticated writing technologies and scientific instruments, and then, after a long gestation period, became dominant in Western Society after the enlightenment" [8].

Theoretic Culture is symbol based, logical, bureaucratic, and heavily dependent on external memory devices, such as writing, codices, mathematical notations, books - and computers. As theoretic culture develops, internal memory is becoming less important as we externalise our inner selves and remake the world in our own image. Donald continues by saying that theoretic culture and language is still a minority culture that is:

> "disproportionately influential because of its place in the *distributed* cognitive systems that determine such things as our collective representation of the past and our tribal and class identities" [9].

Extrapolating from the idea of a scaffolded evolution, it is now possible to postulate that we are on the edge of a paradigm change and that such change comes when the fundamentally conservative tendencies of evolution can be seen, *metacognitively* speaking, as inhibiting the progress of the species.

Because we have digested the lessons of the theoretic through the Victorian cataloguing and indexing period, we can now understand that innovation is important as it rewires brain pathways, a process which then leads us to experience a sense of comfortableness with very high speeds of change.

Velocitisation, my term for the fourth stage of change, is a means by which we reach back into the picture that mammals have created in their heads *and change it*. In this stage we are manifesting outwardly the most important Exogram of all: *Data*. This development has raced through species' consciousness through virally communicated mimes (ideas distributed through mimetic behavior), exemplified recently in the Harlem shake. This itself is a kinetic moving-image cognitive neural exchange which has been transmitted through YouTube™, itself a cognitive distributive exchange network.

In this mimetic communication, one person expresses difference, and then at an appropriate point all express a response *differently*: In doing this we mimetically express what velocitisation means to us, together, as a common understanding. Velocitisation can be understood through Donald's reflections on the digital period:

> "In other words, the best exographic systems reduce the load on the brain by simplifying some operations, and designing the interface technology so as to focus the mind on a task relevant issue. The juxtaposition of mind and exogram quite literally changes the nature of the task facing the brain. By achieving this kind of redesign, mathematical operations that might have required genius level skills can be rendered accessible to a multitude of less-talented people. While it is still the human observer who makes decisions and judgments with regard to thought and action, it seems that the exographic revolution – the exporting of the human memory record from brains to exographic media – is almost complete". [10]

Here Donald echoes arguments that the professionalization of software programs delivers professionalization to the user of those programs – thus velocitising their behaviour. In this process, which has in turn been both celebrated and lamented, one thing is clear at least in terms of the cognitive neuroscientific narrative: this grand human project, to become at one with reality by utilising our prior sense of otherness, takes hold of the problem of existentialism and reconnects us with our environment in a surprising way. As Donald writes:

> "This process has undoubtedly accelerated the long-standing symbiosis of the brain with the external symbolic world it has created, and put pressure on the young to assimilate more and more technologies. There is no longer any doubt that this symbiosis of brain with communications technology has a massive impact on cortical epigenesis and, with the rise of mass literacy, that this effect is present in a very large percentage of the human population. The driver of this increasingly rapid rate of change, human culture, can be regarded as a gigantic search engine that seeks out and selects the kinds of brains and minds it needs at a given historical moment" [11].

In this statement Donald for the first time goes beyond the boundaries of the terms of the scientific project: there are echoes of both Darwinist and Gnostic sentiments in the above statement. The Darwinist can be seen in the use of the concept of natural selection, yet this is balanced by the belief that reality can be changed through faith – that mountains can and will be moved by the interior spirit of human sentience. As he writes:

> "Whether viewed in terms of the functional Architecture of the brain, or the larger cognitive capacities of the human species, the trend toward externalizing memory and restructuring the larger social-cognitive system has generated a radical change in the intellectual powers collectively at the disposal of humankind" [12].

The original proposition that all sentient creatures create a version of reality in their own mind is now being changed by the externalisation of our world picture. Our exograms are themselves developing to merge with our internal constructs, as the more we reflect on them, the more we physically re-create them and thus in this democratized, creative and innovatory behavior we go beyond the need for theoretic intervention. The position of the artist or shaman is now available to all:

> "Surveyed as a whole the domains of art ultimately reflect the entire structure of the human cognitive-cultural system" [13].

Donald furnishes us with our most profound rebuttal to the governmental (theoretic) argument that the scientist or engineer is understandable in his or her benefit to the community because they build bridges across ravines for us to get to the other side. In the light of that idea, what do we as artists contribute? Within the cognitive neuroscientific narrative

we can confidently answer: the reason we want to cross the ravine at all, is because our basic internal motivation is that of being curious about the world – *Wonder is our response as it is our internal developmental state that powers our desire to cross the ravine*.

Conclusion

The point of examining at length the cognitive-neuroscientific worldview, in this case through the work of Merlin Donald, is that should our theoretic minds grasp at instrumentalised notions of cognitive-neuroscientific methodology to solve the evaluative needs of subject areas, we may simply replicate previous blindspots of theoretic behaviour. The use of what the cognitive neuroscientist might identify as a third stage cognitive construct - which itself contains a commitment to materialistic progress - will not necessarily deliver a fourth stage solution which deals with a combined engrammatic and exographic reality, where the boundaries of the material and the virtual are blurred.

Of course if as researchers we already subscribe to the idea of the substantiality of the world, a world without porous boundaries, then it will remain to others to debate the idea, because in the end unspoken and undeclared interests do not chime in academic, scholarly and theoretic disciplines.

I have been careful in my own work on the expanding parameters of the moving image, to recognize that often simply accumulating details of a process only allows *circumstantial* evidence to be produced which lead to implied truths. That measurable results imply correlations is no real evidence at all. It was for that reason that I called the first HDR movie we made: 'The Human Condition' as a grand and therefore ironic overstatement of the value of our experiment.

It would be prudent for every audience member, every creator and cinematographer, every theoretician, to now recognise the *concept* of the flowing together of both Exographic and Engramatic forms of cognitive neural behavior, because it is a useful metaphor to work with in developing new theoretical positions with regard what moving images actually do for us as a species. Whether viewed in terms of the functional architecture of the brain, or the larger cognitive capacities of the human species, the trend toward externalizing memory and restructuring the larger social-cognitive system in any form of sense-related behavior will continue at a pace. If correct, the notion of externalization and development will generate radical changes in the intellectual powers collectively at our disposal, which in turn will help renovate and renew the human condition. It would also be prudent to thoroughly question that concept too.

References and Notes

1. Benjamin W. Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit, originally published in Zeitschrift für Sozialforschung (1936)

2. Flaxton T. The Developing Capabilities of Digital Cinematography, Paper given at Digital Aesthetics 3, Conference held at University of Central Lancashire, October 2012

3. Price et al. Production of High Dynamic Range Video, 2013 http://www.visualfields.co.uk/HdrIBC2013v7.pdf

4. Donald, M. 1991, Origins of the Modern Mind. Harvard University Press, USA.

5. Donald, M. 2006, Art and Evolution. In Turner M (Ed) The Artful Mind: Cognitive Science and the Riddle of the Human Mind. Oxford University Press, UK, P.8.

6. Donald, M. 2006, Art and Evolution. In Turner M (Ed) The Artful Mind: Cognitive Science and the Riddle of the Human Mind. Oxford University Press, UK, P.8.

7. Donald, M. 2006, Art and Evolution. In Turner M (Ed) The Artful Mind: Cognitive Science and the Riddle of the Human Mind. Oxford University Press, UK, P.8.

8. Donald, M. 2006, Art and Evolution. In Turner M (Ed) The Artful Mind: Cognitive Science and the Riddle of the Human Mind. Oxford University Press, UK, P.8.

9. Donald, M. 2006, Art and Evolution. In Turner M (Ed) The Artful Mind: Cognitive Science and the Riddle of the Human Mind. Oxford University Press, UK, PP.8/9

10. Donald, M. 2010. The Exographic Revolution: Neuropsychological Sequelae. In Malafouris L. & Renfrew C. (eds) *The Cognitive Life of Things: Recasting the boundaries of the mind*. Cambridge, UK: McDonald Institute Monographs, p.76.

11. Donald, M. 2010. The Exographic Revolution: Neuropsychological Sequelae. In Malafouris L. & Renfrew C. (eds) *The Cognitive Life of Things: Recasting the boundaries of the mind*. Cambridge, UK: McDonald Institute Monographs, p.78.

12. Donald, M. 2010. The Exographic Revolution: Neuropsychological Sequelae. In Malafouris L. & Renfrew C. (eds) *The Cognitive Life of Things: Recasting the boundaries of the mind*. Cambridge, UK: McDonald Institute Monographs, p.78.

13. Donald, M. 2006, Art and Evolution. In Turner M (Ed) The Artful Mind: Cognitive Science and the Riddle of the Human Mind. Oxford University Press, UK, P.20

THE MUSIC OF CSIRAC, SOME UNTOLD STORIES

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Abstract

CSIRAC was probably the first computer in the world to play music, although that was never developed. The music was never recorded, but it has been reconstructed to a very high degree of authenticity. A book documenting this, *The Music of CSIRAC*, included interviews of several of the original personnel involved with CSIRAC and the music. This paper fills out some of the stories and background left out of the book.

Keywords: computer music history, CSIRAC, research methods, computing history

This paper provides some supplementary information to my book *The Music of CSIRAC*. There were reasons for omitting this information at the time the book was written, but the information is valuable now. The paper also investigates the research methods used to document and reconstruct the music, and this has been (surprisingly to me) something many readers have found valuable.

Computer music is the great musical adventure of the twentieth and twenty-first centuries, even if it has always been a rather poorly-defined concept. Obviously it has something to do with computers, and something to do with music. The question of why someone would want to use a computer to make music was first asked (in print) in 1959 by Lejaren Hiller. Now, the use of computers in music production and reproduction is ubiquitous, for artists and consumers, so many others must have asked that question. For artists, computer music may still retain the aura of a separate field of academic or artistic endeavour. For consumers, the use of computers in music is a daily fact of life.

The path that led to this usage is the result of many very small steps that were neither coordinated nor goal-oriented - steps that were not labeled as scientific, consumer-oriented, or artistic. The computer's use in timbre creation, experimentation, complex compositional systems, and musical instrument design, as well as the enthralling power of a computation machine, all contributed to a climate in which something that could be called 'computer music' began to be created.

Based on these ideas, an historical narrative could be produced, linking all of these activities in a compelling story of inevitable advances. Perhaps an equally viable narrative would be a chronicle of engineering achievements that accidentally became musically useful - digital computers are one example. In the case of CSIRAC, the hooter circuit could be added to this list, as having a loudspeaker driven by pulses allowed people with skill and imagination to experiment musically.

The technical challenges faced by all pioneers of computer music were enormous, and are difficult to comprehend today; surmounting these challenges was a contribution to what is now a dominant musical activity.

An artistic history might discount some of the initial 'buzzes and squawks' as musically irrelevant; however, a history cognisant of the current artistic, scientific and consumer-oriented reality should also take note of the early effort and dedication that now can be seen as a piece of the overall puzzle, part of the grand musical adventure of the twentieth century: the use of computers in music.

The beginning

I was sitting in my office at the Royal Conservatory of Holland, reading *The Age* (newspaper) online, and came across the obituary of Trevor Pearcey, the designer of CSIRAC. As an undergraduate computer science student at the University of Melbourne I had been fascinated with stories of CSIRAC – it stored information in *liquid metal*! One fact in the obituary stood out to me, that CSIRAC played music in 1951. I *knew* this was wrong; I was working in one of the most prestigious computer music departments in the world (the Sonology Institute of the Royal Conservatory of Holland), and everyone knew that computer music started in 1957 at Bell Labs with the work of Max Matthews. Being an alumnus of the department, I sent an email pointing out the error in the obituary. To my great surprise the head of the department, Peter Thorne, said that he remembered me as a troublemaker and that the 1951 date was *correct* – people remember it, they were there! My colleagues, all highly decorated computer music types, were all either sceptical, or astonished. Apparently there were no recordings of the music, and the machine was no longer working, but the programs allegedly existed on paper tape, there were circuit diagrams for the machine, and several key personnel who worked with CSIRAC were still around.

This started the journey to reconstruct the music played by CSIRAC, as told in the book *The Music of CSIRAC*. Along the way, several problems presented themselves which, naively, I had not expected. A brief summary of these problems are:

- How to reconstruct the music
- How to ensure that the music sounded authentic to the original played in 1951
- How to document that CSIRAC played music in 1951
- How to ensure that both the reconstruction of the music and the 1951 date was rigorously researched or documented, so that it would stand up to the inevitable scrutiny that revising history would attract

The book *The Music of CSIRAC* explains clearly the first two points above, and also covers point three; however the last point is not explicitly addressed in the book, except in an embodied way - that is, it becomes evident through the book that CSIRAC did, indeed, play music in 1951.

The only way I could think of to address this issue was to go to primary sources and research the question of when CSIRAC played music. Luckily, there was a video of Trevor Pearcey saying that they played music in 1949 or 1950. I searched for newspaper reports, but there was nothing. This initially surprised me, but I later found out that the music was not an authorised activity, but something of a 'parlour trick', not publicly acknowledged by the CSIR (the Council for Scientific and Industrial Research, the precursor to the CSIRO), and thus not allowed to be reported.

My best option appeared to be to find the people who remembered CSIRAC playing music, interview them, and document the interviews; this body of evidence would hopefully convince the world, even the sceptics, that CSIRAC did play music in 1951 and possibly earlier. I was still partially a sceptic myself at this time, such is the power of a well-documented 'history' to further a common belief regarding an historical practice.

The stories are largely documented in the book *The Music of CSIRAC*; however, many interesting anecdotes did not make it into the book, as I wished it to be rigorous and to-the-point. In hindsight, I think these untold stories add to the evidence of CSIRAC playing music from around 1949, and this paper documents them for the first time.

Pearcey's story:

Trevor Pearcey was one of the designers of the CSIR Mk1 (later known as

CSIRAC), along with Maston Beard, for the Council for the CSIR. Pearcey was not a musician; none of the CSIR Mk1 personnel were really; however, he understood something of the power of music. Dr. 'Taffy' Bowen, a world-renowned radar expert, ran the CSIR Radiophysics division. Among Dr. Bowen's interests were advanced radar systems, radio astronomy, and cloud-seeding as a way to improve Australian agriculture. The CSIR Mk 1 was always intendedas a prototype for a more capable machine, and after attempts to commercialise it failed, its future was in doubt; thus a campaign was started by the CSIR Mk1 team to popularise the computer. There would be no better way to do so than to make it famous for playing music; Pearcey wanted to have the music played on 2BL radio station, but Dr. Bowen would not allow it; Pearcey says, "… Dr. Bowen, who was then chief, did not think this was good enough. I think he didn't realise the intellectual skill and effort that had gone into actually getting the machine to play specific musical sequences. This was in 1950 or '51, I cannot give a precise date. It was certainly a very early programming exercise. We played it at the conference." In this interview you can hear Pearcey's disappointment, bitterness and resentment. The conference mentioned was the Conference of Automatic Computing Machines, Australia's first computing conference, 7-9 August 1951.

The campaign to popularise the computer continued. According to one report [1], the piece *Bonnie Banks* was programmed, in an attempt to try and interest the then Prime Minister of Australia, Sir Robert Menzies, who was of Scottish descent. This did not seem to work, as Dr. Bowen ordered a review of the computing project in the early 1950s, by a board consisting of one American and two English computing specialists. They recommended that Australia leave computation to England and America, that digital computing had no future because analogue computing was the way forward, and that Australia should concentrate on primary industry. While the decision to close the CSIR Mk1 project was probably justified, the decision to abandon computing altogether is most lamentable.

Hill family stories:

Geoff Hill, the first programmer of the CSIR Mk1 and Australia's first software engineer, first programmed the CSIR Mk1 to play music. Geoff came from a musical family; his mother and sister were music teachers and he, like his mother, had perfect pitch.

This was a crucial and fortuitous development. The speaker on the CSIR Mk1 was electrically connected to the main computing buss, and it was used to indicate where the program was - raw pulses from the computer buss were sent to the speaker to make a sound, and these 'blurts' were used to indicate the end, or a particular stage, of a program. Geoff Hill, as a mathematician from a musical family, would have easily realised that if pulses could be sent to the speaker with a regular period, then a steady tone could be produced. After achieving this (no easy feat with variable memory access timing), the next logical step would be to make a scale.

Geoff Hill's widow, Eileen Hill, was able to relay several interesting stories about Geoff and the music [2]. When Geoff was first working on making the CSIR Mk1 produce a scale, he called his mother one night around 9:30 or 10 pm. Mrs. Hill relates the story from Geoff's mother as follows, "It was very late for those times, and I had Geoff's dinner in the oven. He called and asked me to listen to something. I told him to stop messing around with a piece of paper and a comb and to come home!" Geoff Hill had put the telephone receiver to the speaker on the CSIR Mk1 to ask his mother if the scale was in tune; she thought that he was playing games with a piece of paper and a comb.

Another time, Mrs. Hill related the story of when she first heard of Geoff. As a new student at Sydney University in about 1950, she was a resident in Sancta Sophia College. One night, at the dinner table, another young lady named Mary Thurling said, "Did you hear that Geoff Hill has that machine playing music?" Mrs. Hill continued, "I remember because I said, 'Who is Geoff Hill?' and of course I married him later." It takes little extension to suggest that this young software engineer, having programmed a computer to play music for the first time, was inviting young ladies to come into the lab and hear it …

Other stories:

Dick McGee was a scientist who started working with CSIR Radiophysics in April 1951; during our interview [3], he remembered hearing the CSIR Mk1 play music soon after. While Mr. McGee did not attend much of the computing conference in 1951, he clearly remembered other attendees talking about CSIRAC playing music afterwards, and how astonished everyone was by the computer playing music. What I found most interesting here was that Mr. McGee mentioned in passing that the CSIR Mk1 had run the calculations to find the centre of the galaxy. Apparently Mr. McGee and a colleague were working in radio astronomy, mapping the southern sky's radio sources, and they had found the centre of the galaxy in 1953; this was ratified internationally a few years later.

Whilst interviewing Peter Thorne I said that it was a pity that no composers had been involved with CSIRAC (the name was changed from the CSIR Mk1 to CSIRAC when the machine moved to Melbourne), particularly Percy Grainger, who was known for his advanced musical thinking. I was astonished when Peter Thorne said, "I can remember Percy Grainger walking past the Computation Laboratory at the time CSIRAC was running. Actually walking down the alleyway between what would have been the cyclotron and Physics; the others in the laboratory pointed out of the window and said, "There's Percy Grainger." He was going towards the Grainger Museum. He was that close. It must have been in about 1959. Grainger was at the University when CSIRAC was operating."

All someone had to do was to step out of the Computation Laboratory and invite Percy Grainger in; to think that we were a few physical steps away from advanced musical developments such as microtonality, arbitrary rhythmic and tonality possibilities, and so on with CSIRAC is particularly telling; it underlines that the musical output of CSIRAC was not seen as having any practical or significant application. It was obviously being used for computational and engineering problems, and the imagination of what it could, or should, be used for did not extend much further.

A final note

The imagination of what might be possible seems to be the missing ingredient for CSIRAC to have made an impact on music; this is an ingredient that Max Mathews had at Bell Labs in the late 1950s.

CSIRAC was, I think, the first computer in the world to play music. It was followed not long after by a Ferranti Mark I machine in England, which played *God Save the Queen*. These early developments used the computer as a musical sequencer, to play standard and popular tunes of the day; this is not surprising given that it was engineers pro-

gramming the computer to play something.

At Bell Labs in the later 1950s, Max Mathews had a digital-to-analogue converter to work with the beginnings of arbitrary waveform synthesis. He made some very insightful decisions while developing his Music N software; unit generators and table oscillators are two of the most outstanding. I would also rank high amongst them the decision to ask composers to be involved with the development of music on computers; perhaps it took the particular genius of Max Mathews to realise that computer programmers were not the best people to determine what was needed from computers in order to advance the art of music.

This does not diminish the achievement of CSIRAC playing music in 1950 or 1951. That was a leap of imagination in itself, and the effort involved and the programming complexities were enormous; this was one of those small, uncoordinated steps which have led to the richness and adventure that we now know as computer music. When I discussed the CSIRAC project with Max Mathews [5] he said, “Yes, we heard about these sorts of things in the early days. What was the memory architecture of this machine?” He *immediately* understood the complexities involved with the programming. Who is to say which of these small and uncoordinated steps triggered another? It is possible to postulate that without CSIRAC, the Ferranti Mark I, or some other machine that Max Mathews may have heard about, playing music, then the developments at Bell Labs might not have happened; perhaps it was the initial ‘buzzes and squawks’ that helped to trigger the developments at Bell Labs which, in turn, went on to define computer music.

References

1. Interview with Peter Thorne, conducted by the author, 16 February 2000.

2. Interview with Eileen Hill, conducted by the author, 2 March 2000.

3. Interview with Dick McGee, conducted by the author, 20 May 2000.

4. Paul Doornbusch, *The Music of CSIRAC* (Melbourne, Australia: Common Ground, 2005)

5. Interview with Max Matthews, conducted by the author, at ICMC 2000, September 2000, Berlin.

SHIVERING DOMAINS: TECHNOLOGICALLY MEDIATED EMBODIMENT AND ECOLOGIES

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Abstract

This article examines contemporary developments in the biomedical and ecological sciences and their impact on hybrid art practices in relation to the 'shivering domains' of cross disciplinary discourses and biotechnological research. Examples from the author's projects: *Temporal Interval*, *machina carnis* and *Urban Swarming* [1] are introduced to illustrate the points discussed. Evolving media technologies and historical perspectives are reviewed and located within the framework of an exploration into the permeable membranes of cellular consciousness and the biomedical sciences; which also considers the nature of constructs of corporeality and the 'self' in a socio-cultural context.

Keywords: Embodiment, biotechnology, ecology, non-human others, life sciences, corporeality, interaction.

Introduction

The art/science research projects I will describe in this article aim to encompass a range of strategies through which corporeality is mediated. I will outline several paradigms for meaningful collaborative intersections between art and science that explore what I refer to as the 'shivering domains' encapsulated in the permeable and shifting boundaries of cross disciplinary art/science practice. These paradigms are situated within the contemporary research context and the underlying question posed in this text is: 'how are contemporary discourses on non-human others and recent developments in biotechnology impacting on constructs of corporeality and 'humanness' '?

In order to consider the destabilization of our understanding of corporeality and expand upon methodologies for cross-disciplinary art/science research I will introduce three projects:

Temporal Intervals- which recontextualises an early scientific recording device in conjunction with what was at the time cutting edge internet technology to examine the essence of corporeality through both remote and real-time participant access and interactivity.

Machina carnis - which employs contemporary biomedical research in the laboratory which later forms the basis of an interactive installation where I explore the possible consequences of adult stem cell research and the modification of the human body at a cellular level.

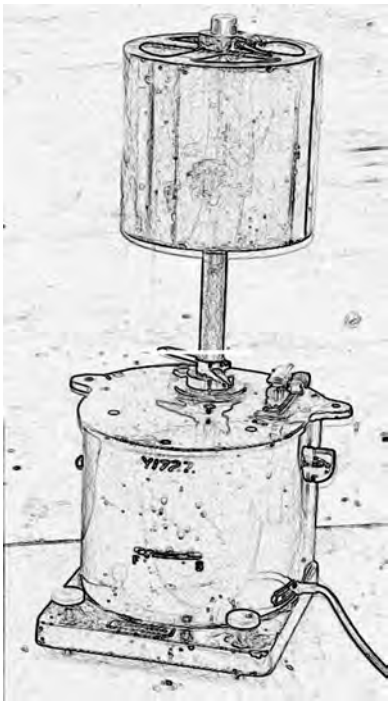
Urban Swarming" - which draws upon my experiences of proximity in a designated honeybee research area and seeks to examine comparative interspecies behaviours and connections.

By expanding upon the rationale behind these artworks' varied installation structures and the ways that they reference both contemporary and historical technologies, I locate them within the current art/science debate on the nature of corporeality, the 'self' and interspecies proximities.

Temporal Intervals

Sometimes apparently random acts like parking a car can have a wider significance. So it was with regard to the genesis and evolution of the artwork *Temporal Intervals*. When parking behind the School of Biomedical

Fig. 1. The kymograph (© Artist. Photo © Artist.)



Sciences at the The University of Queensland I noticed a skip for unwanted objects from a long abandoned University store cupboard. Trawling through the contents of this skip on visits to the laboratory I came across a fascinating, but unknown machine. Captivated by its mystique, I took it home to research its origins. It turned out to be an iteration of a machine known as a Kymograph [2].

At the beginning of the nineteenth century, with the invention of electricity, a whole new generation of scientific machines evolved. Utopian visions held by the scientists of the day were founded on the premise that these new technologies would enable scientists to isolate the individual workings of the human body and thus come to an understanding of its galvanic 'vital force' or bioelectricity [3]. Carlo Matteucci's explorations in the field of bioelectricity when using an early form of kymograph demonstrated the impact of electric impulses on a 'rheoscopic' frog's leg [4]. Needless to say these utopian notions of the potentials of bio-neurology proved as unrealistic as the more recent capabilities promised by virtual technologies and the potentials of digital worlds.

Temporal Intervals took the form of a quasi-scientific experiment which imaginatively connected obsolete scientific machines, such as the kymograph and spirometer, in a structure which was participant interactive. This artwork explored the nature and transmission of information both at the installation site and remotely via the artwork website. Created in 2003, the use of Internet technologies in *Temporal Intervals* that enable remote participant interaction is now no longer cutting edge. In fact, in 2013, it could more appropriately be situated within the media art historical canon. The installation referenced the disparity between the ephemerality of data and the analogue processes of obsolete scientific machines and the informational transmission of a 'corporeal self' over distance. Viewer/participants left fragile traces of both real-time and virtual interactions that created a complex interplay between participants, machines and locations [5].

Fig. 2. Overview of the *Temporal Intervals* quasi-scientific installation. (© Artist. Photo © Artist.)

Machina carnis

The *machina carnis* project [6] had a two-part structure: It began with my participation in a biomedical science experiment and culminated in an interactive artwork of the same name. The project evolved after I read an article in the journal "Science" that suggested the ground-breaking 1999 discovery that

some pluripotent adult stem cells could 'change fates' [7] and become other types of cells should be regarded as the 'scientific discovery of the year' [8].

Excited by the potential to modify the human body through biotechnology I began to collaborate with Dr. Victor Nurcombe [9] in the laboratory at the School of Biomedical Sciences, The University of Queensland. For this pioneering project I used adult stem cells from my un-screened blood. The University ethics committee took almost a year to grant ethical clearance but in spite of this, I considered experimenting on my own cells was vital for developing viewer identification and empathy with the cellular image data to be used later in the installation. It also created a unique model of the artist/researcher as 'human guinea-pig' and both the subject and the object of the research [10].

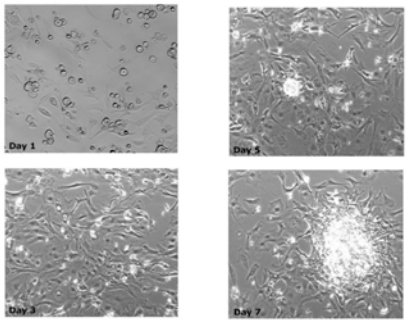
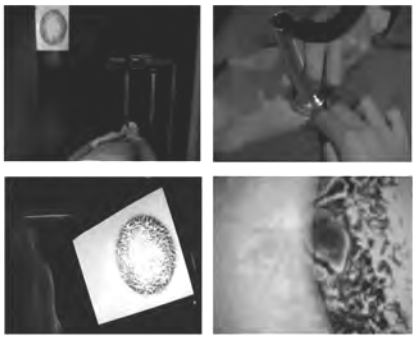


Fig. 3. Digital videomicrograph images of Adams adult stem cells in culture from Days 1 -7. (© Artist. Photo © Artist.)

At the beginning of the *machina carnis* project a doctor took my blood sample from which the stem cells could be separated and cultured under laboratory conditions. After three days the drug 5'AZT and a mixture of cardiac differentiating factors, with one patented ingredient, were added to these cell cultures in order to change the undifferentiated stem cells into cardiac cells. When this unique chemical mix was added to the adult stem cells they began to reproduce, mature and develop the characteristics of heart cells. Fig.3 shows still images of these developments on Days 1, 3, 5 and 7. In addition, each cell has a signature combination of proteins with a fraction of DNA. In the case of heart cells they are drawn to each other to cluster and synchronise their beating. Each cell has recognition modules on its surface membranes that 'interdigitate' or link 'gap junctions' like 'open portholes'. After seven days my modified adult stem cells could be observed forming clusters of beating heart cells that were recorded by time-lapse video microscopy, providing me with my visual data resource.

The resulting digital video micrograph time-lapse images of cardiac cells beating was edited for use as source material for the installation video. Physical engagement with the installation enables viewer/participants to probe diverse constructs of 'humanness'; reflecting on the ways in which their understanding of themselves could be changed by contemporary developments in biotechnology and at the beginning of the twenty-first century.

Fig. 4. Participants interacting with *machina carnis*. (© Artist. Photo © Artist.)



Urban Swarming

During my *machina carnis* laboratory experiments, my close observations of the cells aroused questions about cellular consciousness that I aimed to investigate as artist in residence with Professor Mandyam Srinivasan at the Visual and Sensory Neuroscience Group, Queensland Brain Institute [11]. The Visual and Sensory Neuroscience group carry out their research on the European honeybee in the largest indoor bee facility in Australia. Here, the bees fly around freely from hives to experimental sites and, to my surprise, protective clothing is not routinely worn. In this environment the honeybees and human beings co-existed side by side in their parallel operational spheres. Honeybees and humans were functioning independently – but juxtaposed – within the same habitat. This experience of intersecting domains inspired my video, *HOST* [12]. For this artwork, the scientists trained the honeybees to come and feed on sweet liquid on the palm of my hand. I made use of the available scientific technologies: fast capture cameras, to record the flights of the honeybees at 250 frames per second, resulting in slow-motion digital visual data.

Having been in close proximity to productive communities of honeybees I decided, to use the available photographic technologies to capture the aggressive responses of honeybees. This

Fig. 5. Documentary footage of aggressive bee responses. (© Artist. Photo © Artist.

aggressive behaviour of the previously gentle honeybees led to the creations of the work *Urban Swarming*; an artwork that considers the dangers of extinction to global honeybee populations posed by Colony Collapse Disorder [13]. *Urban Swarming* encourages viewer/participants to envisage human communities in urban surroundings in similar stress to that of the aggressive honeybees. Through a viewing experience played out against the hubbub of commuters in the rush-hour at busy urban locations, a comparative juxtaposition of the behaviours of honeybee and urban dweller is created.

Fig. 6. Video still from the video "a space to cross" which forms the basis for the artwork: *Urban Swarming*.(© Artist. Photo © Artist.)

Urban Swarming takes the ubiquitous, recent technology of the QR Code and instructs viewer/participants to use it to download the video "a space to cross" on to their iPhones in busy urban locations. In this way the video images of desperate honeybee responses are viewed against the backdrop of the rushing mass of the urban population, scurrying hither and thither. Both humans and honeybees exhibit mindless – possibly doomed –

behaviours. I place the emphasis on the location where the viewer/participant experiences this work, thus appropriating a commonplace technology and going beyond its usual function in a way that requires engaged audience participation [14].

Technologies

A recurring theme in my artworks is a love of combining anachronistic, analogue scientific machines and processes with contemporary media technologies and cutting edge science. By bringing together these divergent areas I draw attention to the increasingly rapid changes that are taking place in both scientific and new media art technologies.

As has been mentioned earlier, the kymograph represented the world of nineteenth century bio-neurological scientific research. Latter-day kymographs took on a more mundane role as recording devices in universities. Subsequently, they were superseded by computers, stored and forgotten. In the artwork *Temporal Intervals*, by referencing this recording function, I was able to create a fictive quasi-scientific experimental device with links to a spirometer, also obsolete. Through what were in 2003 cutting edge internet information transmission technologies, I engaged both real-time gallery participants – who are physically present at the exhibition – and remote website viewers – whose corporeal presence is off site – in the gallery-based interactive processes.

The *machina carnis* project contravened accepted scientific protocols when I took a first-person role in both the experimental processes and the actual cellular material. As previously described, by experimenting on my own adult stem cells and using the resulting visual data in the *machina carnis* artwork I aimed to increase participant empathy. Fundamental to the participant's seamless engagement with the installation was my discrete use of interactive technologies. The equipment and pre- programming of this artwork used Max MSP Jitter and iCube accessories The only object that could be manipulated by a participant was the modified stethoscope with which he/she located their heart, causing the cardiac image data to respond to his/her presence and pulse in time with his/her heartbeats (see Fig.4.). Each participant interaction with the artwork organism not only brought it to life but also completed it.

My art outputs during my residency at the Visual and Sensory Neuroscience Group made use of the fast capture image technologies used by the scientists in to record honeybee flights. These technologies enabled me to generate the image data used in the video "a space to cross", which forms the basis of the artwork *Urban Swarming.* The contemporary image capture technologies are complex and require dedicated computers and software to operate them. I was interested in comparing these image capture technologies with the intricate early recording technologies, using the myograph, discovered by Etienne Jules Marey in the eighteen thirties [15]. Marey employed the myograph, a form of kymograph, to capture images of insect wing beats and was able to isolate the pattern formed by these individual beats for the first time.

Fig.7. An example of early image data recorded by Marey showing detailed individual wasp wing moments. © J.Parrikka [19]. Photo © E-J. Marey.

Life Sciences

Computer technologists, and more recently artists, have been drawing inspiration from insect behaviours and biological living systems for the structure of networks and methods [16]. In my case, the research of biologists Humberto Maturana and Francisco Varela proved most insightful, particularly their model of life systems in which cognition is understood as a biological process [17]. In their groundbreaking theory they introduced the term 'autopoiesis' to classify the fundamental dialogue between structure (brain) and function (process). Systems theorist Frijof Capra points to the importance of the concept of autopoiesis as a central insight within Maturana and Varela's Santiago theory of cognition [18]. Here, they refer to circular, self-sustaining autopoietic processes of 'self-organisation,' which connects the process of knowing with the process of life in even the simplest of cells. Therefore, through investigating the complex contemporary theories of consciousness and sentience and the status of my cells as living entities I became aware that at all levels of life, mind and matter, process and structure are inseparably connected. This understanding of living systems encouraged me to create parodies of organic systems through both my immersive engagement with the scientific processes and the structure of the artworks themselves. Indeed, first hand microscopic observations of my adult stem cells in vitro led to queries as to their levels of sentience and consciousness that are explored during the *machina carnis* project.

My centrality in the scientific experimental processes is replicated by the engagement of the viewer/participant, who is essential to activate and complete the artwork system. The impact of the theory of autopoiesis or 'self-making', mentioned above, on the *machina carnis* installation is apparent in the manipulable systems created. All the systems are inter-related and the 'shivering domains' of the boundaries between the body and its environment are in a constant state of interplay and flux. Both the *machina carnis* scientific processes and the structure of the artwork locate the human – corporeal – self as an essential element. When an installation participant observes the digital image data of the human cultured cardiac cells beating in synchrony with their heartbeats it is as if a microscopic simulacrum of their own beating human heart – the vital, functioning, interior engine of their body – were laid bare before them, so deeply are they implicated in the installation systems. This intimate structural relationship embodies the viewer as a network participant.

The *Temporal Intervals* artwork is an example of my previous explorations into a model where the artwork represents a living organism. The installation 'came to life' when participants moved within range of the sensors – the work lit up and one of the kymographs began to slowly rotate, moving a large loop of drafting film stretched around it. The semi-living organism of the artwork was now waiting for the real-time installation participant to interact with it and thus complete a behavioural cycle. Remote access to the work via the website also added a layer of engagement in this life-form and the transmission of information. Viewing the gallery participant via a webcam connected to the installation website, the remote participant could activate the dot-matrix printer in the gallery space. This interaction created a circularity of engagement whilst it

also mobilised the new capacity of the internet to transmit bodily presence in the form of pure information - thus expanding the participatory outreach of the 'living' artwork organism.

In the case of *Urban Swarming* I consider the relationship between the honeybee and its environment and compare its aggressive responses with human behaviours in crowded urban locations. Contrary to the productive community behaviours honeybees exhibit to maintain the hive, when aroused, the honeybees exhibit manic individual aggression. Media theorist Jussi Parrika suggests that environmental contexts and affects can be regarded as primary vectors for the creation of entities and their relationship both to each other and their surroundings, in this case honeybees. Parikka points out that since the nineteenth century, interest has been developing in insect communities, behaviours and social structures and the spatial conditions of variation found in all sentient animals and entities. Natural processes can be said to generate intersections between characteristics of both the natural world and media technologies. In this environmental and affective continuum, honeybees are contextualised in terms of their ability to sense their environment through their bodies [19].

In keeping with the immersive, participatory focus demonstrated in both *Temporal Intervals* and *machina carnis*, the artwork *Urban Swarming* once again places the participant in a central position within the artwork ecosystem. Each individual's locative bodily engagement – in this instance situated in the busy urban environment – is required to explore the artwork's purpose and effect its meaningful completion.

Conclusion

My engagement with cutting edge scientific research and media technologies, both contemporary and historic, has led me to create artworks that have discretely featured the affective qualities of both the life sciences and media technologies. Inserting a personal response into the reinterpretation and recontexualisation of scientific data has involved rejecting so-called scientific objectivity and expanded upon contemporary theories about 'self' and 'corporeality'. Indeed, the newly discovered pluripotent [20] characteristics of many adult stem cells have opened the door for potentially wide ranging changes to our anatomical structure – what once appeared immutably 'human' may no longer be so. Expanded expressions and representations of corporeality, such as those discussed in this paper, embrace open-ended and intersecting territories that accommodate malleable, hybrid identities and investigate the cognitive and sentient behaviours observed in cellular life. My considerations of inter-relational pathways and connections have encouraged me to move beyond customary categorizations and environments to traverse 'shivering domains' encapsulated in permeable cross-disciplinary membranes. Insect responses and their suggested bodily perceptions of the world around them illustrate tensions between pattern and purpose that are relevant to on-going research into media technologies and networked environmental relationships. These developing models of fruitful transdisciplinary art/science collaborative projects provide an on-going research platform for interrogation of biomedical and anatomical shifts in constructs of corporeality at the beginning of the twenty first century and beyond.

References and Notes

1. Further details on these works, Adams (2013), <http://trishadams.tv>, accessed 1July 2013.

2. One kymograph information website: <https://utsic.escalator.utoronto.ca/home/blog/instrument/horizontal-kymograph> , accessed 1 July 2013

3. http://www.britannica.com/EBchecked/topic/6583/bioelectricity>, accessed 1 July 2013.

4. 'rheoscopic' literally means: 'current flowing fluid'. In the case of the frog's leg, Matteuchi was able to trace and record on the kmograph the bioelectricity flowing through the frog's tissues which was making the frog's leg twitch even though it was obviously dead.

<http://neuroportraits.eu/portrait/carlo-matteucci>, accessed, 1 July 2013.

5. Video documentation of the "Temporal Intervals" quasi-scientific installation in action: <http://vimeo.com/channels/115324/12726723>, accessed 1 July 2013

6. Video documentation of participant interacting with the "machina carnis" installation: <http://vimeo.com/115324/12730173>, accessed 1 July 2013.

7. 'Changing fates' describes the scientific intervention which alters the developmental path of adult stem cells so that they become other types of cells.

8. Gretchen Vogel, "Capturing the Promise of Youth," *Science* 286: 5448 (1999) p. 2238-2239.

9. I am deeply indebted to Prof. Victor Nurcombe for his expertise and support during my "machina carnis" project. Without his participation and direction I could not have undertaken the project. Vic has left The University of Queensland and now works in Singapore: <http://www.imcb.a-star.edu.sg/php/vnsc.php>, accessed 1 July 2013.

10. There are actually quite a number of precedents for first-person scientific processes being used to contravene accepted scientific protocols. In the nineteenth century dentists began the practice and this experimental approach has usually been adopted by scientists in extremis, who carry out research on themselves in order to prove a point. The most recent example is the Australian Nobel Prize winner Barry Marshall, who swallowed bacteria to show that bacteria, not stress, cause stomach ulcers. This was his only recourse to break through the hegemony held by the drug companies, who stood to lose large amounts of money if his theories were proved correct: <http://news.bbc.co.uk/2/hi/4304290.stm>, accessed 1 July 2013.

11. Prof. Mandyam Srinivasan provided me with invaluable access and support during my part-time residency with the Visual and Sensory Neuroscience Group, The University of Queensland. <http://www.qbi.uq.edu.au/group-leader-srinivasan>, accessed 1 July 2013.

In addition I would like to thank scientists Carla Evangelista, Peter Kraft and Niko Leibsch for their support and assistance during my research at the Visual and Sensory Neuroscience Group.

12. The video "HOST": <http://vimeo.com/channels/115324/12708853>, accessed 1 July 2013.

13. Colony Collapse Disorder is decimating honeybee populations worldwide, although it has not yet reached Australia. It is a complex disorder, the exact cause of which is not yet known. Currently over farming, the varroa mite or certain pesticides are thought to be the main causes. At the moment scientists cannot decide which one of these three possibilities is the main cause of the disease, or if perhaps all are involved together in some way: <http://science.time.com/2013/05/07/beepocalypse-redux-honey-bees-are-still-dying-and-we-still-dont-know-why/> accessed 1 July 2013.

14. The "Urban Swarming" QR Code:

The optimized on-line access link is: <http://www.trishadams.tv/urban-swarming/>

15. Marta Braun, *Picturing Time: the work of Etienne-Jules Marey*, (Chicago USA: University of Chicago Press, 1995).

16. Beginning with the Macy conferences just after the Second World War, these systems links are well documented: <http://www.asccyberneics.org/foundations/history/MacySummary.htm>, accessed 1 July 2013.

17. The term *'autopoiesis'* was introduced in 1972 by Chilean biologists Humberto Maturana and Francisco Varela to define to the self-maintaining chemistry of living cells.

18. Frijof Capra,*The Web of Life*, (London, UK: Harper Collins, 1996).

19. Jussi Parikka, *Insect Media*,(Minneapolis, USA: University of Minnesota Press, 2010).

20. 'pluripotent' is the term used to describe adult stem cells which are able to change into other kinds of cells.

Theories and concepts expressed in this paper have been touched upon in some of my other publications but the focus of each text is unique.

FORGET THE FLÂNEUR

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Abstract

This paper discusses the connections between the 'flâneur', Baudelaire's symbol of modernity, the anonymous man on the streets of nineteenth century Paris, and his contemporary digital incarnation, the 'cyberflâneur'. It is argued that, although the flâneur could be successfully re-imagined as the cyberflâneur in the early days of the web, this nineteenth century model of male privilege no longer fits the purpose. It is suggested that it is time to forget the flâneur and search for a new model to consider the peripatetic nature of location-aware networked devices in the digitally augmented city.

keywords: flâneur, psychogeography, Paris, situationist, locative media

Introduction

Everyone loves the flâneur, Baudelaire's symbol of modernity, the anonymous man on the streets of nineteenth century Paris- drifting through the urban crowd, strolling through the arcades as a detached observer, part of the crowd yet also aloof from it.

The flâneur has now found his way into the digital world, with the nostalgic notion of the 'cyberflâneur' surfing the (Geocities) arcades of the worldwide web, with no particular place to go. A recent op-ed in the New York Times even blamed Baron Haussmann, in the guise of Facebook, for destroying these cyber-arcades, and along with them the cyberflâneur [1].This paper argues that it is time to forget the flâneur, as this nineteenth century model of male privilege no longer fits the purpose. As Benjamin notes, the flâneur arose from a change in architecture in Paris, and it was the subsequent Haussmannisation, with its clearing of crowded traditional neighborhoods in favor of wide boulevards, that removed his natural habitat and were ultimately to prove his undoing. Similarly, as Morovoz notes, the architecture of the internet has changed, from the 1990s WWW to today's mobile internet, an architecture that I suggest is no longer adequately described by the model of the (cyber)flâneur.

Discussions of the intersection of digital media and physical space, from early Locative Media practitioners onwards, also invoke the notion of the flâneur in his new incarnation as the digital or cyberflâneur, traversing the streets armed with location-aware devices, observing and studying the augmented hybrid spaces of the city "existing in a haze of code" [2]. However, the flâneur was essentially a detached observer, he did not engage in the commerce of the arcade, intervene in the streets he traversed, or seek to change society. A cyberflâneur following this model of detached observer, working within existing structures without seeking to change or disrupt them, is essentially a consumer, operating within the logic of their chosen platform. Indeed, for platforms such as Facebook, any possibility for flânerie has been successfully engineered out. The detached passivity of the flâneur needs to be replaced with an alternative model which is of necessity engaged, a disruptive activist who does not merely observe, but actively seeks to create alternative narratives and shape outcomes.

The Flâneur

Though the notion of the flâneur is well known, more specific details regarding who the flâneur was, and of what the practice of flânerie consisted, are elusive. We can say that the flâneur is defined by his activity, flânerie, the art of strolling and looking, commonly associated with the shopping arcades of late nineteenth century Paris. Popular understandings of the flâneur come from literature, in particular the writings of Charles Baudelaire, for example his essay 'The Painter of Modern Life', and Walter Benjamin's analysis of his work [3].

The flâneur, for Baudelaire was a man who could "reap aesthetic meaning from the spectacle of the teeming crowds – the visible public – of the metropolitan environment of the city of Paris" [4]. Characterized by idleness and acute observation skills, the flâneur read the city as one would read a text. As Keith Tester puts it, the flâneur is the man *of* the crowd, rather than the man *in* the crowd. While immersed in the crowd, his awareness of this position renders him aloof from it. Part but apart, in the words of Baudelaire "a prince enjoying his incognito wherever he goes" [5]. Benjamin's reading (and popularization) of the flâneur sees him as an historical figure, belonging in the streets of a Paris of an already historic time. If the meaning of the city is imposed by the logic of capitalism and commodification [6], then the flâneur "becomes little more than a seeker after mystery from banality" [7], and ultimately a passive spectator who cannot escape the logic of consumerism. In the contemporary internet landscape, where business models are based on user-generated content, which includes records of the user's surfing history, it is difficult to see how the flâneur's detached passivity can render him other than the perfect consumer.

Benjamin identifies the growing rationalism of nineteenth century Paris, exemplified by the allocation of street numbers, and accompanied by a general increase in the pace of life, as a threat to the flâneur. How, he asks, if everything becomes accounted for, could there still be mysteries in the city? The oft quoted predilection of the flâneur to take a turtle for a walk [8] could be seen in this context as a protest against both the increased pace of life, and the rationalism of Taylorist clock time.

The flâneur's idleness, too, is in stark contrast with the scientific management principles of Taylorism, but is, however, also a position of privilege. To be idle implies a comfortable position, in which it is not necessary to engage in the daily grind to make a living.

The gendered nature of the flâneur, in addition, is evident in his ability as a lone male to stroll through the arcades at a leisurely pace, unnoticed and unhindered, while eschewing the temptations of consumerism. At that time, as now, this role was not afforded to all the citizens of Paris.

Some scholars see elements of activism in the flâneur. For David Harvey, the flâneur "maps the city's terrain and evokes its living qualities", with the city "rendered legible for us in a very distinctive way" [9]. This view is echoed by Rob Shields, who sees the flâneur as a figure of resistance to the "work-a-day pressure of the punch-clock" [10], with flânerie acting as a re-appropriation of the street from the logic of consumerism. In these readings, flânerie foreshadows Lefebvre's right to the city [11], or deCerteau's "art of doing" [12]. The flâneur, in these accounts, is engaged in a spatial re-appropriation, in taking back urban space from instrumentalist consumer culture.

However, is the passivity and ambiguous stance of the flâneur enough to count as activism in the context of over-defined location-aware devices, where little option for reappropriation exists? I suggest that whatever resistance can be attributed to these activities, they have been superseded by Lefebve and deCerteau's accounts of spatial reappropriation, which are more appropriate models for considering

location-aware networked devices in urban space. The Situationist concept of psychogeography, and accompanying techniques such as the dérive, drew from readings of the flâneur, but replaced his passivity with an overt political and activist agenda which sought not only to observe, but to actively change. Their activities were more programmatic, and underpinned and strengthened by a cohesive philosophy and an acute awareness of the danger that their actions could be recuperated. Susan Buck-Morss characterizes flânerie as "an ideological attempt to re-privatize social space, and to give assurance that the individual's passive observation was adequate for knowledge of social reality" [13]. At a time when the mining and sale of personal data is a business model for internet companies, the cyberflâneur, rather than a figure of resistance, may in effect be complicit in masking these realities, by presenting a nostalgic view of the internet which fails to address these realities.

The CyberFlâneur

The cyberflâneur [14] emerged from the structure of the 1990s web, typified by Geocities, the web community and the proto-social network, which located its denizens in cyberspace neighborhoods modeled on real cities. On many levels this was an appropriate connection to make in the context of the early web. With no Google or Facebook to organize the internet's information, surfing the web was an art, successfully practiced by the cyberflâneur, the web connoisseur who "just surfed on in" [15]. To follow the analogy, one presumes that as the flâneur resisted the temptations of consumerism, so too the cyberflâneur eschewed the commercialization of the web. However, creativity was essential to early internet communities such as Geocities, in which membership was premised on creating a webpage which showcased a talent or interest. While there may be aspects of flânerie involved in surfing these communities, as a model it failed to account for the essential creative endeavor required.

In nineteenth century Paris, the flâneur was undone by the structural changes brought about by Haussmannisation. The removal of narrow streets in favour of wide boulevards led to a gradual closing of the arcades, which were replaced by indoor department stores located on the busiest boulevards. The demise of protected arcades in favor of the busy boulevards meant that the flâneur's natural habitat ceased to exist, and with it, the flâneur. The digital world has seen similar radical infrastructure changes, from the 1990s web to today's internet-enabled smartphones.

Evgeny Morovoz, in his discussion of the death of cyberflânerie [16], sees structural changes in the internet as the cause of its demise. As the internet has become fully integrated into our everyday lives, he argues, there is now little opportunity for serendipity - a condition which has only increased with the emergence of the app paradigm, which further filters the network to focus on specific, narrow tasks. Google's attempts to predict our interests and serve us the information that they know we want, and Amazon's unnervingly accurate recommendations, are indicative of trends which seek to abolish the need for exploration through data mining our online histories. The internet, once a place to explore and to discover new information by wandering through its far flung recesses, has become functionally enmeshed into our real identities and everyday lives, but is no longer a place to stand and stare.

For Morovoz, the Baron Haussmann of the internet is Facebook, and it is the 'Facebookisation' of the internet that has brought about the end of the cyberflâneur. According to Morovoz, at the heart of the Zuckerberg view of the internet, and Facebook ideology, is the "idea that the individual experience is somehow inferior to the collective". He argues that "everything that makes cyberflânerie possible – solitude and individuality, anonymity and opacity, mystery and ambivalence, curiosity and risk-taking – is under assault by that company" [17].

The qualities that Morovoz identifies as necessary for the cyberflâneur are similarly essential to the preservation of the internet as a space for creation and free exchange, rather than solely a place of consumption, akin to a serendipitous arcade rather than a department store with all its predictability and control. These qualities encourage us to recognize the difference between a public space and a privatized pseudo-public space, which, while offering the illusion of the agora, is in reality a corporate space underpinned by a logic of consumption. However I suggest that these qualities are premised on the internet as a creative space, not only a space of consumption, and that the flâneur's essential passivity precludes the activity of creating new internet spaces, and the communities which this creation fosters. This notion of the cyberflâneur is a nostalgic one which, while harking back to an increasingly idealized period in internet history, crucially omits an essential component of the period.

The Flâneur in Hybrid Space

At one level it seems that the idea of the cyberflâneur should connect to our current situation, best described by media theorist Eric Kluitenberg as 'hybrid space', a condition in which the boundaries between "physical space and informational space" are collapsing, so that it is no longer useful or correct to speak of a separation between the two [18]. As the internet has gone mobile, it has integrated what was once a virtual world into the physical space of the city. The cyberflâneur would now no longer be restricted to virtual domains, but could, as with Locative Media, extend the flânerie into a real yet hybrid space, characterized by the presence of ubiquitous location-aware networked devices. As the Haussmannisation of the internet, in the guise of the walled gardens of Facebook, close off the arcades, the cyberflâneur would be on the streets, attaching notes to real space [19]. However, this already represents part of the Facebook model, and it is difficult to see how a hybrid version of traditional flânerie, working within existing models such as check-ins, could resist Facebook's hegemony, as it must operate within the strictly defined parameters of the platform. To opt out of this vision of the internet new models are required, ones which operate outside the logic of dominant structures. The flâneur's essential passivity limits him to what is, at best, a curatorial role, working within these existing structures and their immanent logic, rather than creating new ones. Locative Media practitioners, in contrast, set themselves the task of establishing new modes of operating which expand the range of possibilities for location-aware technologies, thus making them available to a broader constituency [20]. While aspects of Locative Media practice may superficially resemble flânerie – particularly when they involve drifting through urban space – this neglects the enabling structures created, and so fails to recognize the complete picture.

The question arises as to whether ubiquitous devices serve to disconnect us from the life world [21] spaces of this real city, or do they, as Locative Media

practitioners would argue (and fight for), augment the city, by creating critical spaces, enabled through location-aware data networks, which point toward the histories and meanings of these lived spaces. The latter, it is argued elsewhere, is the trajectory of Locative Media [22]. We live in what Anthony Townsend calls the ‘contested aware city’ [23]; but what does the flâneur, cyber or otherwise, add to this? Walter Benjamin identified “the obliteration of the individual's traces in the big city crowd” [24] as an essential quality of the city, but with the cyberflâneur operating in hybrid space, the (data) traces are never erased. Rather than pass unnoticed, the cyberflâneur amasses a considerable data shadow from the ceaseless checking-in, from merely being connected, not to mention any number of devices phoning home to Cupertino, Mountain View or who knows where. To be digital involves leaving these traces; thus the flâneur’s treasured anonymity and ability to watch unnoticed are replaced, for the cyberflâneur, with not only a *lack* of privacy, but also the commercialization of his data trace as user-generated content.

Discussions of the cyberflâneur, though, are typically associated with what might be called the traditional, rather than the mobile, internet. Mobility and networked location-aware devices characterize the internet today, bringing with them an emergent understanding of the changing boundaries between public and private space. In any discussion of the cyberflâneur, hybrid space, in which the internet permeates all aspects of everyday life, attaching context and location-sensitive information to places, needs to be considered. Whereas the flâneur was always embedded in the city, the flâneries of the cyberflâneur were, by definition, immaterial. Mobile networks have made it possible for the cyberflâneur to operate in the real spaces of the city; however, a flânerie which eschews the development of new approaches which evade the ubiquitous surveillance and data mining of companies such as Google and Facebook can never be anonymous, and is limited to operate within a predetermined mode of operation.

Forget the Flâneur

I propose that it is time to forget the flâneur. In harking back to a previous age, and indeed several re-incarnations of the notion of the flâneur, we have overextended the concept. It is hard to see what once again retrofitting Baudelaire's jaded dandy to a new dispensation contributes, other than the fulfilment of some nostalgic urge. While some work has been done to reposition the flâneur [25], in popular imagination he is still a detached, passive male observer. This detached passivity needs to be replaced with an alternative, more representative model, one which is of necessity engaged; a disruptive activist who does not merely observe, but actively seeks to create alternative narratives and shape outcomes.

What form this might take, as we move toward newer, more mobile structures, is the question. As the internet big four [26] wage what can be considered a war on privacy, from frictionless sharing to extensive collusion between the internet industry and the NSA's Prism surveillance network, do possibilities still exist for alternative structures outside of this panopticon?

A detailed account of the form that this might take is beyond the scope of this paper, however several models point the way to suitable alternatives to the flâneur.

The Tactical Media and Hacktivist movements of the 1990s indicate one approach, combining an overt activist agenda with an ability to work within networks and systems over which the individual has no control. Geert Lovink [27], however, identified one limitation of tactical action, its lack of a sustained engagement capable of altering the conditions under which it operates, in effect rendering it always reactive and never constitutive.

Another approach with more potential is a rethinking of the Situationist concept of the Constructed Situation [28]. Situationist techniques such as the dérive have exerted considerable influence on Locative Media practitioners, suggesting that there are significant connections between Situationist thought and Locative Media practice which could be extended to the constructed situation. The Situationists believed that as human beings are "molded by the situations they go through" and "defined by their situation" [29], they needed to construct situations worthy of their desires, rather than be limited to passive consumerism of the situations in which they find themselves. Unlike the flâneur, they sought to go beyond describing and interpreting situations, and attempted to transform them. I have argued elsewhere [30] that Locative Media art practices have built on Situationist theory, not in a nostalgic or recuperative way, but in a contemporary reworking of this influential praxis, one which addresses current situations and overcomes the limitations of the flâneur identified in this paper.

Let us forget the flâneur, and replace him with a concept more suited to today's situations. We need now, perhaps more than ever, an activist model capable of reading our complex, interconnected and hyperconnected world. I have indicated some of the possibilities in this paper, but more work is needed to develop an appropriate replacement.

References and notes

1. Evgeny Morovoz ‘The Death of the Cyberflâneur’, *The New York Times*, February 4 2012, <www.nytimes.com/2012/02/05/opinion/sunday/the-death-of-the-cyberflâneur.html>, accessed 30 June 2013.

2. Ash Amin and Nigel Thrift, *Cities Reimagining the Urban* (Cambridge. Maldon, MA: Polity. 2002), p. 125.

3. Charles Baudelaire, *The Painter of Modern Life and Other Essays*, Jonathan Mayne, trans. (London: Phaidon, 1970).

4. Keith Tester, ‘Introduction’ in Keith Tester, ed., *The Flâneur* (London, New York: Routledge, 1994), p. 2.

5. Baudelaire [3], p. 400.

6. David Harvey, *Paris, Capital of Modernity* (New York and London: Routledge, 2003).

7. Tester [4], p. 14.

8. Walter Benjamin, *The Arcades Project*, Howard Eiland and Kevin McLaughlin, trans. (Cambridge, MA: Harvard University Press, 1999), p. 442.

9. Harvey [6], p. 55.

10. Rob Shields ‘Fancy Footwork: Walter Benjamin's notes on flânerie’, in Tester [4], p. 64.

11. Henri Lefebvre, *Writings on Cities*, Eleonore Kofman and Elizabeth Lebas, trans. (Oxford; Malden, MA, 2006).

12. Michel deCerteau, *The Practice of Everyday Life*, Steven Randall, trans. (Berkeley, CA, 1984), pp. 29-42.

13. Susan Buck-Morss, ‘The Flâneur, the Sandwichman and the Whore: the Politics of Loitering’, in Beatrice Hanssen, ed., *Walter Benjamin and the Arcades Project* (London, Continuum, 2006), p. 36.

14. Steven Goldate, ‘The Cyberflâneur: Spaces and Places on the Internet’, *Modern Ceramics*, 19 May 1998, <www.ceramicstoday.com/articles/051998.htm>, accessed 30 June 2013.

15. A default comment on 1990s website guest books.

16. Morovoz [1].

17. Morovoz [1].

18. Eric Kluitenberg, ‘The Network of Waves Living and Acting in a Hybrid Space’, *Open*, 11, (2006), pp. 6-16.

19. Ben Russell, *The Headmap Manifesto*, <technoccult.net/technoccult-library/headmap >,

accessed 30 June 2013.

20. See the discussion of the 2004 Urban Tapestries project in Alice Angus et al, ‘Urban Social Tapestries’, *IEEE Pervasive Computing*, 7, no. 4 (2008) pp. 44-51.

21. A point made by Google's Sergey Brin in his ‘Google Glass’ *TED Talk*, <www.ted.com/talks/sergey_brin_why_google_glass.html>, accessed 30 June 2013.

22. See Conor McGarrigle, *The Construction of Locative Situations* (Dublin Institute of Technology, 2012).

23. Anthony Townsend, ‘Locative-Media Artists in the Contested-Aware City’, *Leonardo* 39, no. 4 (2004), pp. 345-47.

24. Quoted in Zygmunt Bauman, ‘Desert Spectacular’, in Tester [4], p. 141.

25. Harvey [6], pp. 54-56.

26. Amazon, Apple, Google and Facebook.

27. Geert Lovink, ‘The Principle of Notworking’ (2005), <http://networkcultures.org/wpmu/portal/publications/geert-lovink-publications/the-principle-of-notworking/>, accessed 30 June 2013.

28. Guy Debord, ‘Report on the Construction of Situations’, in Ken Knabb, ed., *Situationist International Anthology* (Berkeley: Bureau of Public Secrets, 2006), pp. 25-29.

29. Debord [28].

30. McGarrigle [22].

KINECT-BASED RGB DETECTION FOR 'SMART' COSTUME INTERACTION

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Abstract

This paper is an overview of a Kinect-based RGB detection software developed as part of an ongoing 'Smart' (Smart Textiles and Wearable Technology in Pervasive Computing Environments) Costume project. The project involved a multi-disciplinary team in the domains of textile design, engineering and computer science. In this work we aimed to establish initial studies on how the Microsoft Kinect performs in tracking a 'smart' costume that has thermochromic elements under different lighting conditions. We explain the computer application capable of detecting, tracking and measuring colour changes (Red, Blue and Green) created using the Microsoft Kinect API.

Keywords: Kinect, Thermochromics, Smart Costume, Performativity, Textile Design, Multidisciplinary,Colour-change Detection

Introduction

Designing with thermochromic and fluorescent dyes is a carefully planned process where heat and light creates pattern with colour which evolves as the costume changes. The same can be said for designing with the Kinect, using it as a tool to establish another level of design to the overall 'performativity' of the costume and its environment. Thus it is essential to establish precisely how these dyes are perceived by the Kinect under different lighting conditions. This paper describes research undertaken to determine whether or not Microsoft Kinect was appropriate for use as a controller and tracker for a colour changing costume. This research was validated through two distinct experiments in which several thermochromic samples were subjected to four different lighting environmental conditions. The RGB values of each sample were collected under each lighting environment and compared to a benchmark RGB reading taken from a high-resolution digital reading. Our results consolidate existing common knowledge that indicates that lighting conditions significantly affect the Kinect's performance, and that it performs better under higher lighting conditions. This is of particular interest for colour changing costumes that will be subject to a multitude of lighting conditions in the performance space. Our results also showed that lighting conditions significantly affect the colour that is detected through a Kinect device and that green is the colour most affected. This is important as the colour choice of the designer will then be dictated by the performace of the Kinect under different lighting conditions and therefore could be used as a design tool.

A second aim of the project was to create an automated colour detection mechanism through which a change in colour would act as a trigger and work as a catalyst for subsequent colour changes to take place. This would enable a 'Smart' costume to continuously change throughout a performance and create a cyclical process of events. The possibility of combining associate computer vision knowledge and technologies within the performing arts has precedence, and several practitioners [1, 2] have combined dance with the use of pervasive computing and colour changing textiles. There is, however, little prior evidence showing a combination of computer vision knowledge and colour changing textiles in the performing arts. In this project we have looked at the possible integration of the Kinect sensor with an interactive space (dance environment) in which the Kinect device would be used in detecting colour changes in a prototype dance costume (Figure 1). Based on the nature and characteristics of these changes, the system would alter the dance environment (i.e. temperature and lighting conditions). Since the dance environment lighting conditions can rapidly and repeatedly change during a performance, it is essential for this research to investigate:

- The performance capabilities of the Microsoft Kinect under different lighting conditions
- The relationship between lighting conditions and colour detection.

Since previous research related to this particular subject area has mainly been concerned with the reading of skin colour, we decided to concentrate on the core aspect of colour detection and try to understand how, in such a context, lighting can affect the colour detection capabilities of the Kinect.

In this paper we describe the development of a computer application that will be used, among other things, to measure Kinect's Sensor performance under different lighting conditions. We also discuss the building of a colour changing costume and how we use different lighting to produce different colour effects and how the Kinect could be used as a catalyst for change during the course of a performance.

Fig.1. Dance Tutu 1, Origami Structure Screen Printed with Thermochromic and Fluorescent dye on silk with tulle net. (Photo © Lynsey Calder)

Context

This 'Kinect' project is part of a larger research project named 'Smart Costumes'. Initially the project concept was to explore how different technologies could be connected with each other in a system. We created a possible scenario describing how the system could operate, and this was conceptualised as follows: a performer, wearing a colour-changing smart costume and performing a choreographed dance, will be tracked using a Kinect sensor. The Kinect sensor will be connected to a computer that will be running an application that will fire a specific event depending on the colour change detected on the smart costume. The computer will be connected to an electronic switch, which in turn will be

connected to a heat source and a cooling source. Depending on the output generated by the specific application event, the electronic switch will turn the heat source on and the cold source off, or vice versa. This will make the environment or textile temperature change, which consequently will make the colour of the smart costume change. This cycle will be repeated until the end of the performance. During the entire performance, the computer application will also track and record the space position data of the performer.

With regard to this project, being just a small part of a much bigger project, several other requirements were identified. One of the objectives of the 'Smart Costumes' project is to build a complex system integrating smart costumes with emissive and non-emissive colour-changing technology (thermochromic and fluorescent) and interactive spaces. Considering the possible scenario described above, it was required that the application should be able to:

- Track and record the space position data of the performer. (This data will be used later for the creation of beautiful data visualisations or infographics)
- Automatically detect colour changes in the smart costume and, depending on those changes, fire an event that will later be used to turn an electronic switch on or off
- Develop an application that will allow researchers to create new software applications based on the work developed
- Create software documentation

Evaluation Criteria

The following criteria were used to evaluate the success of the project:

- Is the application able to detect colour change?
- Is the application able to track colour?
- Is the application able to track and record the space position data of the performer?
- How well can Kinect perform under different lighting condition?
- How does light affect the colour that is detected by Kinect?

The developed application allows its users to detect and track a certain colour in a real-time image captured by the Kinect Sensor (Figure 2), and perform several different tests based on that image. In order for the process to be simple and easy for a new user to access, a simple interface was created that maintained a common look throughout.

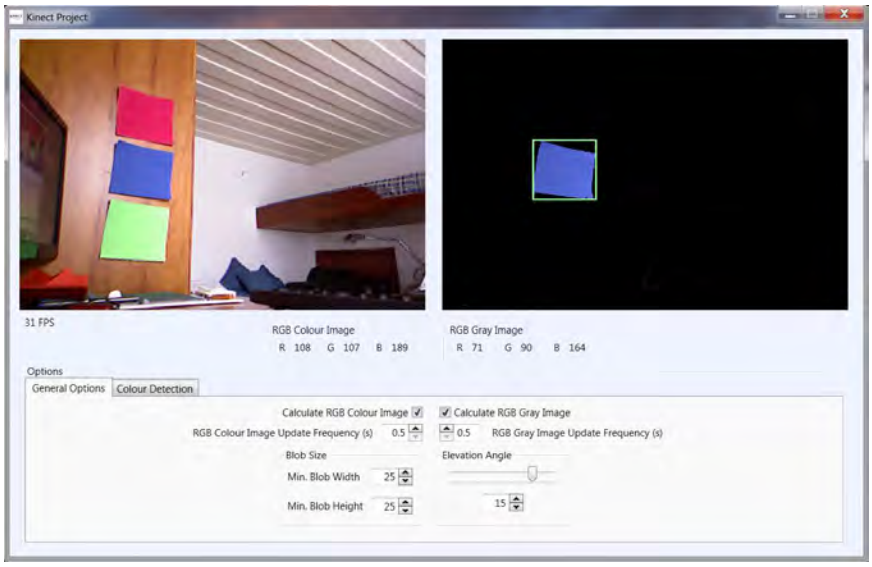


Fig. 2. Application main window (Photo © Jose Magalhaes**)**

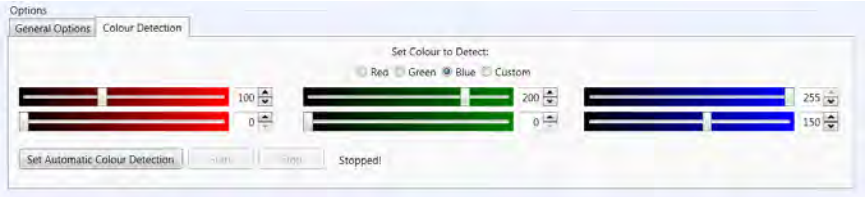


Fig. 3. Colour detection options (Photo © Jose Magalhaes)

Implementation of Colour Detection Mechanism

The application starts by receiving the colour image being captured by the Kinect Sensor – the image displayed on the left hand side window ("Colour Image"). The colour image then goes through image processing routines and the result is displayed on the right hand side window ("Gray Image") where we can see if the colour is being detected or not (see Figure 2).

To treat the received images we had two options:

1. Create a Bitmap every frame, or
2. Create a Writeable Bitmap during the first frame and then use it on the other frames.

Initially it was thought that using the second option of creating a Writable Bitmap during the first frame, and then using it on the other frames would be more efficient than creating a Bitmap every frame. This decision was made during the initial stages of the development and proved to be unsuccessful. At a later stage of the development, when we started to implement the image processing routines, we found that the image saved in the Writeable Bitmap would need to be converted to a Bitmap, so that those and the blob detection routines would work. This led to the creation of a method that converts a Writeable Bitmap into a Bitmap, creating a new Bitmap each time the application fires (which is in each frame).

To perform the colour detection we used an image processing technique called blob detection. Blob detection is a technique that detects points and/or regions in an image that differ in properties, for example brightness and colour, compared to its surroundings [3].

Before the blob detection routine can be applied, the colour image needs to be filtered by colour – the filter removes the background leaving it completely black with only stand-alone objects with a certain colour being visible – and then transforms this into a grayscale image. To perform these operations, some other AForge.NET routines are used. The AForge.NET colour filter filters pixels inside and outside of a specified RGB colour range, keeping the pixels with colour inside the specified range and

filling the rest with a specified colour (in this case, black). The "Gray Image", in the Main Window, shows an image after the filter has been applied. In that image we can see that the filter keeps the pixels that are inside the defined range and fills the rest of the pixels with black. If no filter was applied, or if the RGB colour ranges were all 0 (lower value of red, green and blue range) and 255 (higher value of red, green and blue range), the image displayed would be exactly the same as the one displayed by the "Colour Image".

After this process, the image is converted to a grayscale image using an AForge.NET image grayscaling routine. It is also important to mention that we can see if a certain colour is being detected if, in the "Gray Image", in the Main Window, a green box is drawn around the colour/object.

When a colour is being detected, the average RGB values of that colour are calculated. Those calculations are based only on the pixels inside the green box.

Evaluation Method

Twelve different samples (twelve pieces of fabric, three of which were printed with one colour pigment dye and nine were printed with a combination of a one colour pigment dye and a thermochromic dye) were submitted to two different detection procedures.

In the first procedure, the RGB values for each sample were calculated based on high resolution pictures taken under a specific lighting condition (Light 0), using a digital camera. The aim of this exercise was to measure the RGB values of each sample under a controlled lighting environment and determine a baseline for kinect-based RGB detection.

In the second procedure, we submitted the same samples to three other different lighting conditions (Light 1, Light 2 and Light 3) and measured the RGB values for each sample using a Kinect sensor and the application we developed for this project.

This study used a within-subjects design. There was one independent variable with four conditions: lighting condition (with four levels: Light 0, Light 1, Light 2 or Light 3). Each sample was tested under the four different lighting conditions and for each, the Red, Green and Blue colour values were measured. Both procedures were based on twelve samples (i.e. pieces of fabric printed with one colour pigment dye, or, a combination of a one colour pigment dye with a thermochromic dye) created for this project.

Procedure 1:

To collect the data under a controlled lighting environment, we set up the first experiment which allowed us to take a high resolution picture of each sample. In a dark room two Elinchrom D-Lite 400 lights and a Canon EOS 5D MK II digital camera were set up facing a white marker. After calibrating and configuring all necessary parameters of the machines, we placed our first sample in front of the camera, turned off the lights, and took a picture. For each sample with thermochromic dyes, first a picture was taken before heat had been applied to the sample. After taking that picture, we applied heat to the same sample using an iron. After heating up the sample, we placed it in front of the camera, turned off the lights and took another picture of the same sample, which had now a different colour. This process was repeated for all the other samples. The RGB values for each sample were calculated using the Histogram function (i.e. Mean values) in Photoshop CS5.

Procedure 2:

Once we had collected data for each sample under controlled lighting conditions (procedure 1), we set up an experiment in which we collected data under three other different non-controlled lighting conditions, using our application.

Three different measurements were performed at three different times during a day. At the beginning of each of the three different measurements, we used a light meter to measure the amount of light that the sample would be exposed to at the moment of the experiment. The first measurements were performed in the middle of the day, with high natural lighting (Light 1), meaning the samples were exposed to ≈2490 lux of light. The second measurements were performed at the end of the day, with low natural lighting (Light 2), meaning the samples were exposed to ≈28 lux of light. The third and final measurements were performed at night, with no natural lighting, and recurring to artificial lighting (Light 3), meaning the samples were exposed to ≈71 lux of light.

In a room with plenty of natural lighting, a Kinect sensor, which was connected to a laptop running the developed application, was placed facing a wall. To test the first sample, we attached it to the wall directly in front of Kinect and configured the application to detect the sample colour. When the colour was detected, the RGB values were automatically calculated and that data recorded. For each sample with thermochromic dyes, a first measurement was made before heat had been applied to the sample. After recording the necessary data, we applied heat to the same sample using an iron. After heating up the sample, we repeated the same process as described above. This process was repeated for all the other samples.

Results and discussion

The main result of this study was that Kinect performs better under high lighting conditions rather than low lighting conditions. This result also shows that lighting conditions significantly affect the colours that are detected by the Kinect sensor. This is especially true for low lighting conditions, where the colours detected by Kinect are significantly affected. It is also possible to conclude from these results that, between the 3 different RGB colours, the green colour values are the ones that are most affected by the lighting conditions.

Figure 4 shows the mean values of the Red, Green and Blue colours for each lighting condition. The errors bars represent the 95% confidence interval for the mean. When comparing the measured RGB values under Light 0 with the values measured under Light 1, 2 and 3, it is clear that, as expected, the RGB colour values detected by Kinect are highly affected by light. It also suggests that the RGB values detected by the Kinect are more sensitive under the lower lighting conditions, Light 2 and Light 3, thus providing helpful information as to the

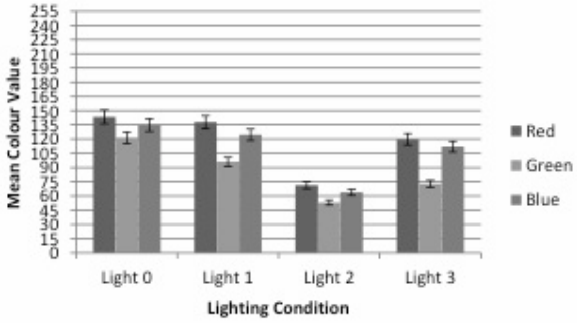


Fig.4. Effect of lighting on RGB detection

Fig. 5. Thermochromic printed textile under three different heat and light conditions (Photo © Lynsey Calder)

potential use of such technology in live performances.

Potential problems could arise in a scenario where the application was developed and Kinect would be used to automatically detect several different colours under very low lighting conditions. One main problem would be the difficulty in distinguishing between different colours. In a scenario where good lighting conditions are used, results suggest that Kinect and the developed application would have good performance, being able to detect a specific colour from a wide range of different colours with a considerable level of accuracy.

It is also important to mention that, although the results showed that there is a significant difference on the colour detected under Light 0 when compared to Light 3, lighting conditions similar to Light 3 would still be possible to use in a real scenario. The performance would be worse, but the developed application and Kinect would still be able to detect different colours with a certain level of accuracy.

Colour changing technologies in performance and performativity

As part of the larger theme of 'Smart Costumes', Silk twill fabric samples were screen-printed with a combination of thermochromic and fluorescent dye systems (Figure 5). The combination of thermochromic dyes (non-emissive) and fluorescent dyes (emissive) provides a transition from dark blue/purple to fluorescent red, orange and pink which glows under UV light. As the thermochromic dyes (which resembles purple in this combination) go through a transition to colourless (on temperature change) the red, orange and pink fluorescent pigments are revealed (see Figures 5, 6 & 7). This combination is designed to create, firstly, a colour change and secondly an emissive fluorescent effect. It is hoped that the development of the Kinect application will be used in combination with the costume seen in Figures 6 and 7 in an interactive dance space. The desire is to use the Kinect to discern a change in the costume appearance (see Figure 8) which can then trigger or fire another event which will in turn create a second change in the appearance of the costume.

Fig. 6. Thermochromic screen printed tutu in unchanged non emissive state (Photo © Lynsey Calder)

Conclusion

As part of the 'Smart Costumes' project, the concept of using the Kinect to detect and promote a colour change through a cyclical chain of events was explored, discussed and evaluated. The initial idea and experiments raised questions about Kinect's performance with respect to detecting colour changes under different lighting conditions.

Through the creation of a new software application that is capable of detecting, tracking and measuring colour, as well as automatically detecting colour changes in real time images captured by the Kinect sensor, we were able to conduct an initial study about the Kinect's performance under different lighting conditions. The evaluation results showed that lighting conditions significantly affect Kinect's performance, and that Kinect performs better under high lighting conditions than under low lighting conditions.

Taking into account the results of this study, we suggest that should the 'Smart Costumes' project make use of the developed application and Kinect in a real dance environment, and that an environment with low lighting conditions should be avoided. Other than that, the developed application and Kinect should display good performance and be able to automatically detect and track changing colours in a smart costume.

This new software represents a tool which can be used by the 'Smart Cos-

tumes' project in their research. Its user-friendly interface will allow current and future researchers to readily operate it in a short period of time. The code was developed and recorded in such a way that will also allow current and future researchers, with technical knowledge, to add new features to the application very easily.

We cannot say, however, that "everything is done", and in that case there is some future work that can be developed. One of the non-mandatory requirements of the developed application was to use Kinect's depth sensor to track and record a performer's space position data, a feature which, due to the lack of time, was not possible to develop. Kinect's depth sensor can be easily integrated into the developed application in the future, which will allow additional features to be added to the application.

The next step in this research will be the integration of the developed application into a pervasive computing environment or dance space as previously discussed. This is something that is currently being explored and the costume, which is close to completion, will be tested with the Kinect and other embedded electronic components. After successful integration, many more studies can be performed based on this project and on the developed application.

It is believed that some technical improvements can also be performed on the application, mainly in the code. However, in terms of technical work, we would like to adapt (port) the application so that it can run on operating systems other than Windows.

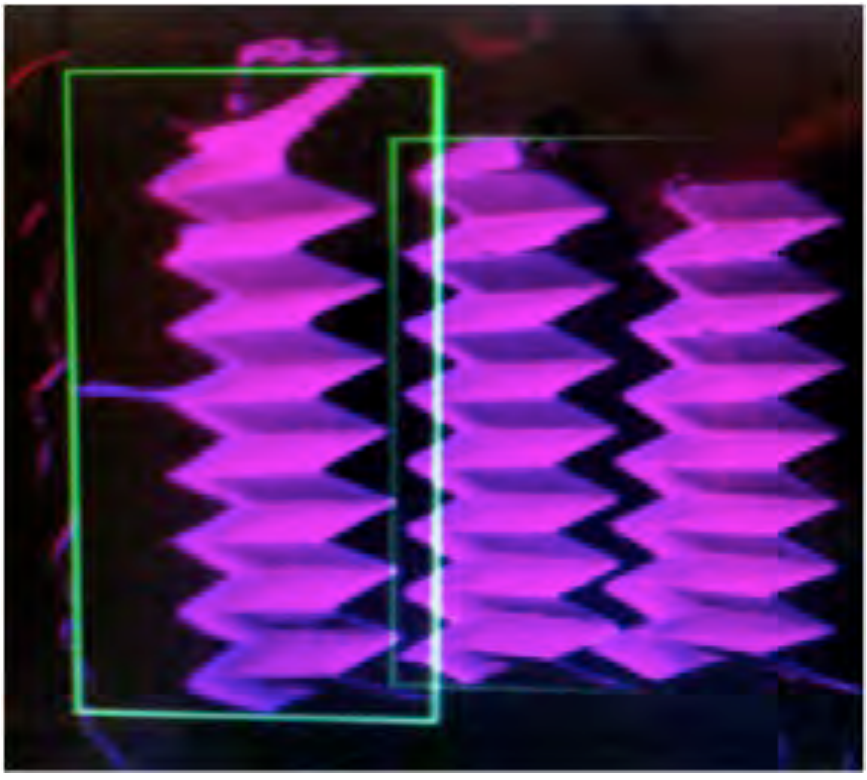
Fig. 7. Thermochromic and fluorescent screen printed tutu in mid change (Photo © Lynsey Calder)

In future research, we hope to perform the same experiments under several different and more varied lighting conditions, especially brighter lighting conditions and UV (Ultra Violet). This would enable the collection of further data which could be used to extend this study further. The fact that the initial experiments were conducted under a non-controlled lighting environment made the possibility of controlling all variables impossible; data collected would almost certainly vary slightly if collected again under the same lighting conditions. Therefore, it would be advisable to perform those experiments under controlled lighting environments. The use of a controlled environment to test the lighting conditions would increase the validity of the results.

In conclusion, different techniques to check how accurate the values read by the application developed could also be used. This would allow researchers to compare the values and analyse the application's accuracy in relation to the 'Smart Costume'.

A discussion of the performativity of the costume itself will form the focus of future publications as the project evolves.

Fig. 8. Kinect software picking up an origami magenta thermochromic sample (Photo © Lynsey Calder)



References

1. Linda Worbin, *Designing Dynamic Textile Patterns, Studies in Artistic Research No1,* PhD Thesis. (University of Boras, Sweden, 2010) pp.139-160

2. Robert Wechsler, "Artistic Considerations in the use of Motion Tracking with Live Performers: A Practical Guide"in Broadhurst and Machon, ed., *Performance and technology: Practices of Virtual Embodiment and Interactivity* (Hampshire, Palgrave Macmillan, 2006)

3. Lu Xia, Chia-Chih Chen and J. K. Aggarwal, "Human Detection using Depth Information by Kinect" *Computer Vision and Pattern* CVPRW (2011),<http://cvrc.ece.utexas.edu/Publications/HAU3D11_Xia.pdf>

THE DYNAMICS OF COLLABORATIVE RESISTANCE NEGOTIATING THE METHODOLOGICAL INCONGRUITIES OF ART, CULTURAL THEORY, SCIENCE AND DESIGN

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Abstract

This paper reflectively explores how the collaborative team behind in potēntia critically and creatively embraces the methodological dialectics that occur when trying to accommodate the different disciplinary approaches of art, cultural theory, science and design. Hosted by SymbioticA – The Centre of Excellence in the Biological Arts, The University of Western Australia, in potēntia is an example of multi-disciplinary collaborative art/science practice pioneered by SymbioticA. Negotiating aesthetics versus accuracy, risk versus rigor, experimentation versus speculation, and problematising versus problem solving, this paper reflexively discusses how cross-disciplinary collaboration, although fraught with friction also presents new and unique opportunities - professionally and personally - for unexpected creative discoveries to emerge.

Key Words: collaboration, multi-disciplinary, bio-art, life, death, personhood

Introduction

Starting from the position that the collaborative dynamics of art, cultural theory, science and design offer fertile grounds to both critique and resist the fetishisation of stem cell technologies, this paper explores how the collaborative team behind in potēntia, critically and creatively embrace the methodological dialectics that occur when trying to accommodate the different disciplinary methods and approaches of art, cultural theory, science and design.

Created by artists Guy Ben-Ary and Kirsten Hudson in collaboration with Mark Lawson and Stuart Hodgetts, in potēntia is a liminal, boundary creature created as an artistic and speculative techno-scientific experiment with disembodied human material, diagnostic biomedicine equipment and a stem cell reprogramming technique called induced pluripotent stem cells (iPS). Beginning with human foreskin cells purchased from an on-line catalogue, we reprogram these cells into stem cells and then differentiate them into neurons. What results is a functioning neural network or "biological brain" created from human foreskin cells. Encased within a purpose built sculptural incubator reminiscent of eighteenth century scientific paraphernalia, in potēntia also includes a custom-made automated feeding and waste retrieval system as well as DIY electrophysiological recording setup that converts neural activity into an unsettling soundscape.

Figure I *in potentia.* Photo ©: Guy Ben-Ary

It is important to note, that the collaborative team behind in potēntia, follow the collaborative structure and philosophy fostered by SymbioticA. Rather than seeing art/science collaboration as one in which art is employed by science as a "legitimate tool to aid scientific research" to "communicate big ideas in an engaging and intuitive manner" [1], SymbioticA - under the direction of Oron Catts – instead positions the role of art as that which critically and openly challenges and critiques new scientific knowledge and application. Rather than seeing art as a tool that simply aids in the engaging visualisation of science knowledge, Catts asserts that artistic research should be "valued for its own merits and its contribution to culture rather than be seen for its potential secondary outcomes of aiding or acting as a research and development arms for other disciplines" [2]. In potēntia thus emerges out of a rich, diverse, collaborative research community, which not only encourages a range of cross-disciplinary collaborative approaches that activate new forms of understanding and critical enquiry, but also encourages better understanding and articulation of cultural ideas around scientific knowledge and informed critique of the ethical and cultural issues surrounding life manipulation. [3].

Cross-disciplinary Negotiation

"Form versus function is the nightmare of my life" – Guy Ben-Ary

Collaboration, states Karen Pearlman in a recent issue of Arts Hub, is hard to define [4]. This is because although the Latin roots 'con' means with and 'laboro' means work infers simply to 'work with', in the creative industries, 'collaboration' connotes more than simply working side by side. Instead, although collaboration within the creative industries often includes individuals working side by side, it also involves times when individuals work on their own, or in a variety of collaborative configurations inside a larger collaborative team, as well as times when all collaborative members come together to debate and negotiate the needs and direction of a project.

Collaborative projects also occasionally draw upon people who are outside the collaborative team if a particular skill-set is required that falls outside the expertise of the collaborative members. When this happens, there is often much discussion within the collaborative team over whether to introduce a new member into the collaboration, or instead to simply outsource the skills required. This decision is often dependent on whether the expertise required is regarded as intrinsic to the development of the project, or is instead a one-off fabrication or consultancy need. Collaboration then is a complex and highly nuanced emergent form of engagement that raises interesting questions about the

Figure II *in potentia.* Image ©: Guy Ben-Ary

nature of negotiating authorship as well as each collaborator's relationship to the work produced.

Although the original concept behind *in potēntia* was initialised by Guy Ben-Ary, over the course of three years, as the needs of the project increased, the project grew to a collaborative team of four – Guy Ben-Ary, Kirsten Hudson, Stuart Hodgetts and Mark Lawson. Over the course of those three years, others were also sought out to contribute – such as glass blowers, glass manufacturers, steel spinners, DIY electrophysiology experts, amongst others – in order to help in the development of the project. However the core collaborative team felt these particular experts had a different level of investment in the project and therefore they were not seen as fundamental to the conceptual and aesthetic artistic integrity of the final piece and as such, were not invited into the collaboration. Instead, they were paid for their time and expertise.

Within the *in potēntia* project, there were five distinct elements that needed to be developed and negotiated:

1. Biologically reprogramming foreskin cells into stem cells and then differentiating them into a neural network using iPS technology.
2. Developing and designing a bio-reactor or life-support system
3. Developing and designing a custom-made electrophysiology system
4. Developing & designing a sculptural object that was also a functioning tissue culture incubator
5. Developing a critical theoretical, conceptual and social context for the project

Working on these elements individually, in pairs, as well as in a group of three or four, we found that we were negotiating not only the limit of what degree of functionality and protocol could be overlooked or bypassed within each of the elements, but also how individually constructed elements could "work" together, whilst still maintaining an overall aesthetic and conceptual integrity. This meant that sometimes we found ourselves working within a strict set of protocols of a specific discipline and other times flying by the seat of our pants as the limits of our knowledge of our disciplines was stretched. Therefore, whilst we found that we were able to make the individual elements "work" on their own, the main challenge was to "glue" these elements together in such a way that they could "hold" – aesthetically, conceptually, and practically.

Not something easily identifiable or immediately accessible, we found this "glue" to be an emergent dynamic element in a collaborative team that developed out of open and honest dialogue with all collaborative members. We use the term "glue" here very specifically, to signal our desire to communicate our acknowledgement of the differences each member of the collaboration brought to the *in potēntia* project, but also how each party came into the collaboration with a sympathy and respect for how each of the collaborative members work . By using the term "glue", what we hope to convey is that rather than seeking, or pretending that, each member is capable of learning the other collaborative member's disciplinary expertise, instead there is both a recognition of difference *and* a desire to come together to create new forms of understanding, language and critique. Therefore, within the *in potēntia* project, as we sought to develop a common language – which we believe is the main ingredient of this "glue" - we found that we became more focused on the needs of the project rather than on the ego of the individuals. By trusting that all of us had the project as our central concern, critical questions and concerns were able to be voiced that were able to enrich the perspectives of the *in potēntia* project, which resulted in a developing self confidence of the partners, which allowed us as individuals and therefore the team, to take more risks.

Cross-disciplinary Mistakes

"Foam is the best form of disaster prevention" - Mark Lawson

Although artists, scientists, designers and cultural theorists can be regarded as similar in that their work starts with questions about the what, why, and how of the world's phenomena, the methods they use to explore and find answers are poles apart. Therefore, whilst we believe that the advancement of a common language helps to enable successful collaborations between artists, cultural theorists, designers and scientists, we also recognise that there are fundamental differences between these disciplines. Moreover, there is also a divide between individual practitioners (regardless of discipline) who remain secure in the territory of their own expertise and for whom moving outside those boundaries to experiment with ideas from other disciplines is too challenging, and those for whom interdisciplinarity is more natural.

Figure III in potentia (in progress). Image ©: Kirsten Hudson

From our experience, we believe successful cross-disciplinary collaboration requires individuals whose enthusiasm is sparked by a process of problem-solving and question asking and whose personalities have a tolerance for risk and time spent in having to incorporate a multiplicity of practical, aesthetic and conceptual requirements. It also needs individuals that can understand that facing a continuing assortment of problems is part of the process, in fact, is essential to the collaborative process, rather than a hindrance to the final outcome. Equally, we have found through our conversations, that any significant development in cross-disciplinary collaboration appears to be led by a desire to create something new [5], and therefore individual reward is not necessarily found in the final project's outcome, inasmuch as in the process of learning, problem solving or learning new skills and ways of thinking outside one's own discipline [6]. Continuity of any collaborative project therefore depends on the ability of the partners to balance these tensions in the relationship. However, difficulties often arise if the tensions grows too much, causing the partners to give up the collaboration.

For example, when developing the prototypes for our bioreactor we tried

out a number of different ideas to simplify the system, as our main focus was trying to simplify and refine the design and aesthetics of a tissue culture and electrophysiology lab so to minimize the lab-based aesthetic, whilst still allowing a functional system that could keep the neural network alive. Our idea was to create an incubator system that would keep the neural network alive for at least 3 weeks without human intervention. To do this, we needed to develop a full functioning tissue culture incubator module that would keep the chamber (where the cells are hosted): heated to 37 degrees Celsius, 5% Co2

80% humidity, as well as various sensors to monitor and control the above conditions.

When we first began designing and developing our bioreactor, we started working with an engineer who brought fresh ideas to the practical design of the bioreactor in ways we hadn't thought of before. However, as we progressed in thinking and designing the bioreactor, he found that he was unable to tolerate the demands of the aesthetic and conceptual requirements of the project, or the excessive time needed to discuss and accommodate these requirements, and therefore he removed himself from the collaboration.

From this experience, we have found that cross-disciplinary collaboration allows four (or however many) people to go faster, work better, and come up with more creative and lateral solutions. However, this can only be achieved if those people work together; that they are able to recognise and respect individual dynamics or need for rest, rhythm and surging. This means that interdisciplinary collaboration always involves looking at others, recognising similarities and differences and thus allocating effort accordingly.

For example: when rowing in a team, it would make sense for each individual rower to paddle as fast as they can. However, if each rower tries to paddle as fast as they can and does not pay attention to the rhythms, dynamics and rests of the others, they do not work together as a team and miss the opportunity to harness the strength gained by all team members working in unison. To work in unison, although each rower may be paddling slower than they could individually, by adapting/changing/accommodating/working with each of their team members, they become part of a whole, and as thus able to go much faster as a team than they ever could as an individual.

Cross-disciplinary Discovery

"Everyone needs to be a Jack of all trades" – Stuart Hodgetts

The protocols of Induced Pluripotent Stem Cell reprogramming that we employed for *in potentia* are extremely complex and require a lab that is set up for tissue culture, molecular biology, virus work and microscopy. However the biological work in which we were engaged for in potēntia is not "new science". One day when we were having a group conversation, Guy and Kirsten asked Stuart about what he felt he was gaining from the collaboration. They felt that although they were working very closely with Stuart, and were able to learn and to carry out the work in his lab, they recognised that the "science" of what they were doing was not adding anything "new" to Stuart's own research. However, in discussing this with Stuart, and asking his reasons for wanting to be involved in the *in potentia* project and what he was "getting out of it", as a group we realised that when individual's engage in cross-disciplinary collaboration, regardless of whether it contributes new knowledge to an individual's own research project, it enables a new kind of approach to an individual's research - one of lateral improvisation or thinking outside of the box that feeds back into own research.

This methodology of improvisation at the heart of cross-disciplinary collaboration not only enables a re-learning how to "do" your own discipline. It also facilitates the discovery of a new skill-set that feeds back into each individual's own research and discipline, giving rise to a range of possibilities previously unimagined within an individual's disciplinary inquiry. When artists, scientists, designers and cultural theorists work together in a collaborative manner, different perspectives and ways of thinking lead to conclusions that (hopefully) combines the best of all individual's disciplinary thinking; in our case, scientists begin to think like artists, designers begin to think like cultural theorists, artists begin to think like designers and cultural theorists begin to think like scientists. This disrupts typical ways of seeing and not only facilitates creative problem solving, but also opens up the ability to ask unprecedented questions. Not contained by any one discipline or methodological expectations, assumptions and protocols, instead, a methodology of improvisation within the practice of cross-disciplinary collaboration provides new perspectives for engaging in an individual's own research that is often unavailable when you are so embedded and invested in your own disciplinary process, protocols, priorities and expectations.

However, it is always important to be aware of the danger that each individual within a cross-disciplinary collaboration can sometimes start fooling themselves into thinking that they are now capable of being a practitioner/expert in the discipline/field of their fellow collaborators – so it is important to know your limits and trust the knowledge and expertise of the others rather than over-estimate your expertise and no longer need the disciplinary insights of your collaborators.

Figure IV in potentia (in progress). Image ©: Kirsten Hudson

Cross-disciplinary Resistance

"I know this might sound like a dumb question, but..." – Kirsten Hudson

Freedom is often associated with creativity, yet recent writing suggests that too much freedom can be paralysing when it provides too many choices [7]. Therefore, although we tend to think that creativity thrives best when constraints are removed, in-fact the opposite is true; creativity thrives when people are challenged by constraints that inconveniences them and forces individuals to be inventive, innovative and creative. Constraints provide us with the opportunity to get rid of everything that is irrelevant and focus on the matter in hand, and to break things down into their component parts and by doing so concentrate on the things that really matter. Over the three years in which we have been working on *in potēntia*, we have all been involved in long periods of discussion and reflection, during which

time a common language has been negotiated out of creative disciplinary collaborative restriction.

Within this space of cross-disciplinary collaboration (pioneered by the collaborative philosophy of *SymbioticA*), ideas have been productively developed and mutual respect has been fostered by an engagement with creative restriction as we sought to negotiate aesthetics versus accuracy, form versus function, tacit knowledge versus discovered knowledge, risk versus rigor, experimentation versus speculation, appropriation versus expertise, protocol versus intuition, known versus unknown, proof of concept versus creativity, and problematising versus problem solving, due to us all having to creatively accommodate, negotiate, debate and challenge the restrictions inherent of all of our disciplines. Therefore, although there is clearly no single model for a successful cross-disciplinary collaboration, we have found that the more individuals from different disciplines learn to talk to one another and embrace the challenges and possibilities of creative restriction, the more likely we will gain a richer understanding of how one another's practice can creatively open up a broader space where individuals gain new perspectives on their own work. This is not to suggest that artists should necessarily understand scientific terminology, or that the scientist should take on the jargon of the art world, or that a designer should be able to converse in cultural theory rhetoric, but rather that a conceptual understandings developed within cross-disciplinary collaborations, offer a rich and creative method to acquire new tools to reflect on some of the bigger issues that concern us all.

References and Notes

1. www.synergyexhibit.org

2. Oron Catts, Through the Looking Glass, www.anat.org.au/2010/07through-the-looking-glass-visualising-science-oron-catts/

3. Oron Catts, Ionat Zurr, White Paper – Biological Arts, www.seadnetwork.wordpress.com/white-paper-abstracts/abstracts/biological-arts/

4. Karen Pearlman, Understanding Creative Collaboration (May 19 2013), http://au.artshub.com/au/news-article/features/arts/understanding-creative-collaboration-195393

5. See Oron Catts, Ionat Zurr, White Paper – Biological Arts, www.seadnetwork.wordpress.com/white-paper-abstracts/abstracts/biological-arts/

6. These insights into collaborative experience have been garnered over many years through conversations with art/science practitioners engaged in collaborations. These include conversations with: Guy Ben-Ary, Stuart Hodgetts, Kirsten Hudson, Mark Lawson, Oron Catts, Ionat Zurr, Perdita Phillips, Tarsh Bates, Megan Schlipalius, Stuart Bunt and Chris Cobilis. However, for a more detailed account of an art/science collaboration and the kind of sympathy required from all parties to manage the tensions caused by different disciplinary methods, material and intents see David H. Weinberg "From the Big Bang to Island Universe: Anatomy of a Collaboration" http://www.astronomy.ohio-state.edu/~dhw/McElheny/narrative.pdf

7. See www.businessweek.com/stories/2006-02-12/creativity-loves-constraints, http://www.businessinsider.com/does-creativity-require-freedom-or-constraints-2011-8?IR=T and Phillip N. Johnson-Laird (1988) "Freedom and Constraint in Creativity" in The Nature of Creativity – Contemporary psychological perspectives, Robert J. Sternberg (ed) Cambridge U Press: Cambridge, New York, New Rochelle, Melbourne, Sydney

EMOTO – VISUALISING THE ONLINE RESPONSE TO LONDON 2012

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Abstract

In recent years we have moved from data scarcity to data abundance. As a response, a variety of methods have been adopted in art, design, business, science and government to understand and communicate meaning in data through visual form. *emoto* (emoto2012.org) is one such project, it visualised the online audience response to a major global event, the London 2012 Olympic and Paralympic Games. *emoto* set out to both give expression to and augment online social phenomena, that are emergent and only recently made possible by access to huge real-time data streams. This report charts the development and release of the project, and positions it in relation to current debates on data and visualisation, for example, around the bias and accessibility of the data, and how knowledge practices are changing in an era of so-called 'big data.'

Keywords: Data, Social Data, Data Visualisation, Data Art, London 2012, Olympics, Twitter.

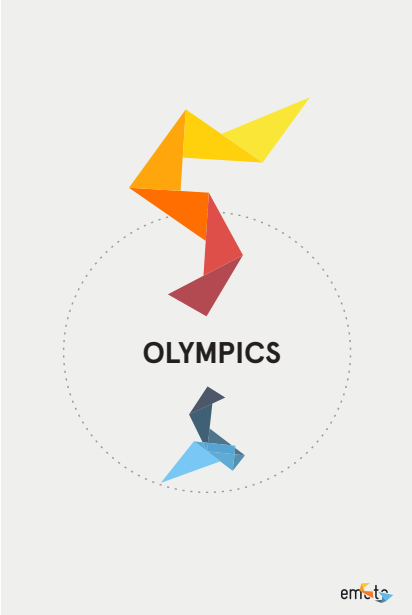

Fig. 1. emoto used origami-like shapes, to display the combination of negative and positive messages for each topic (detail). (© Moritz Stefaner, Drew Hemment, Studio NAND. Some Rights Reserved.)

Introduction

A requirement for data mining, analysis and visualisation has arisen out of new challenges to make sense of an unprecedented upsurge in the amount and complexity of data. This is seen across many domains, from government and scientific research to financial services and smart grids, not forgetting social data, millions of individual interactions that are continuously shared online [1] [2].

As a societal tool, visualisation presents the means to interrogate and make intelligible different data dimensions which overlay our everyday — there follow claims that it enhances cognition through novel techniques for data capture and representation [3] [4]. Combined with such techniques, this ever expanding domain of data has the potential to unlock new forms of insight, and has been described as "a new type of scientific instrument" for the social sciences [5].

This paper describes an artwork – *emoto* – which visualised the online audience response to the London 2012 Olympic and Paralympic Games. *emoto* set out to give expression to emerging online social phenomena that only becomes possible with access to huge real-time data streams. As such, it was among the first projects to visualise in real-time structured insight on the online response to a major global event [6].

The Data Olympics

The Olympic and Paralympic Games are global sporting events, and in 2012, more than any previous Olympics, London played host to a Games with an online audience [7]. *emoto* was proposed and was commissioned as a data artwork creating a new form of engagement for the Olympics audience, within the London 2012 Festival and Cultural Olympiad programme. One of the principles outlined for the London 2012 online and mobile services was the "comprehensive, unbiased provision of results" [8]. In one sense *emoto* was a means to achieve this, given that a central tenet of data visualisation is it is *true to the data*.

The *emoto* team were interested in the Olympics as a big data event – huge amounts of data would be generated, from the stream of medals table data, to the interactions of the online audience. The drama of a sporting event is conventionally experienced in the roar of the crowd in the stadia, or through broadcast media, in the home, a bar or public square, alone or with family and friends. However, the 2012 Olympics, as experienced through the conversations and interaction of people online, presented an opportunity for different ways to observe and participate, and to reflect on the mood of individuals or a nation, as events unfold. Data analytics and visualisation offer a new way to access and read the audience response to the sporting event, and furthermore, the side stories and controversies it engenders – from the staging of the opening ceremony to the number of seats allocated to sponsors. With implications for broadcast and print as well as 'citizen' media, such an approach can portray the Games from the perspective of the sporting fans, and also offer audiences new dimensions to the shared experience of the event [9].

The *emoto* London 2012 Data Visualisation

Launching during the London 2012 Opening Ceremony, *emoto* collected and analysed 12.5 million Twitter messages, consumed in real-time via Twitter's public API, from 27 July to 12 August 2012. As the Games unfolded, *emoto* processed this data stream and analysed the messages for content and emotional tone. Presentation was in three forms: a real-time sentiment visualisation web application, data journalistic analysis of the Games, and a physical interactive data sculpture.

a) Data mapping

In order to measure the online effect of an event in the real world, the project began by considering the most interesting aspects of the Olympics. The team focused on the response of observers to the games, and sought data to support rich and nuanced information. One early solution was to consider placing microphones near public screens around the world to record the audience cheering. However, the most accessible and richest source of data that would encompass the response to London 2012 would be social media, and in particular Twitter [10].

b) Visualisation and design process

The visualisation design process – based on the practice of the design lead, Moritz Stefaner, and Studio NAND – begins by examining the available data, and iteratively coding, prototyping and testing. The challenge was to turn the attributes and patterns of social data into a meaningful visualisation that conveys

Fig. 2. emoto data sculpture and sentigraph. (© Moritz Stefaner, Drew Hemment, Studio NAND. Some Rights Reserved.)

Please reference as: Drew Hemment (2013) 'emoto – Visualising the online response to London 2012' in Cleland, K., Fisher, L. & Harley, R. (Eds.) *Proceedings of the 19th International Symposium on Electronic Art*, ISEA2013, Sydney.
Page numbering begins at 1 at the start of the paper.

the drama of the sporting events. The event used real-time data, so in order to test the concepts, model and predict outcomes prior to the Olympics a similar event and dataset was used, in this case the Golf Masters. Through the Golf event, the team observed the ebb and flow of day-by-day events, and questioned anomalies in order to understand what was occurring [11]. On close examination, the most revealing patterns were discovered to be at the level of individual golfers. This led to a focus in *emoto* on individual athletes – and by extension individual sporting disciplines, nations and other topics related to the Games.

c) Technical design

Working with high volumes and data streams posed the biggest technical challenge. In order to address this, a custom infrastructure was developed to ingest the Twitter Streaming API to capture tweets related to the Olympics, and channels were set up for a predefined list of topics. The sentiment analysis software – *Salience Engine* by Lexalytics – annotated each tweet with a sentiment score, which was mapped to equal sized bins on a diverging scale (from -6 'very negative,' to +6 'very positive') [12]. The tweets were then categorised according to topics of interest (disciplines, athletes, countries), and supplied to the viewer in real time, through the online visualisation [13].

d) Visual language and online interface

An aim of the project was to create a meaningful mapping between data and visual form. *emoto* used origami-like shapes (Fig. 1), developed to communicate at a glance the combination of positive or negative attention for each topic in that moment

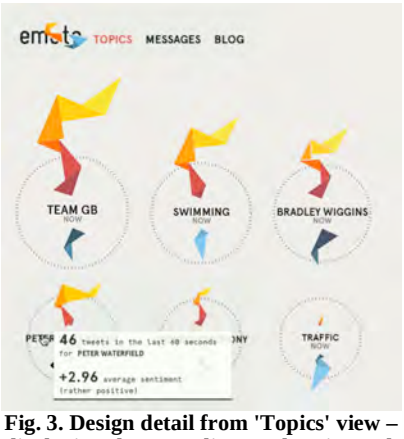

Fig. 3. Design detail from 'Topics' view – displaying the most discussed topics and a sentiment profile for each. (© Moritz Stefaner, Drew Hemment, Studio NAND. Some Rights Reserved.)

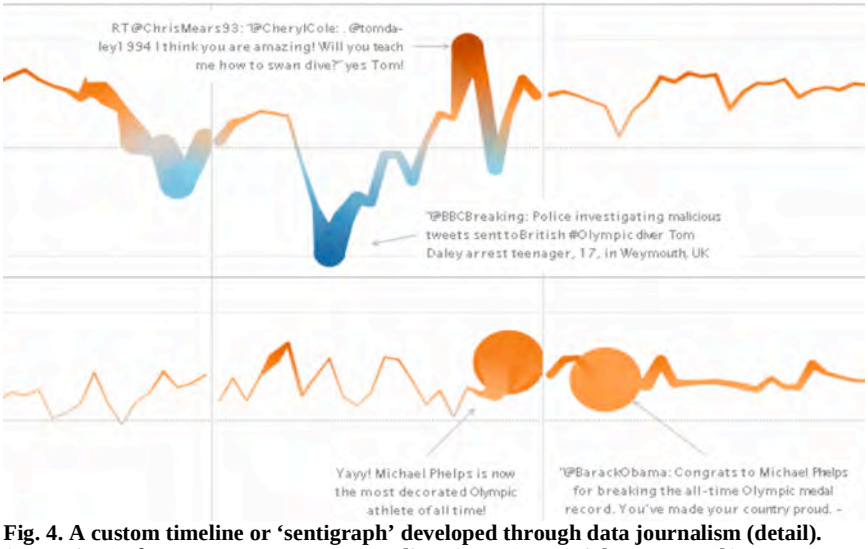

Fig. 4. A custom timeline or 'sentigraph' developed through data journalism (detail). (© Moritz Stefaner, Drew Hemment, Studio NAND. Some Rights Reserved.)

[14]. These shapes redraw and scale to the number of messages received, to enable easy comparison of a number of topics in a single view.

A 'Topics' view (Fig. 3) showed the big picture, which topics were generating the most attention in that moment, and the sentiment profile of each. A 'Message Stream' view showed the ephemeral and anecdotal content of individual Tweets making up the big patterns [15]. The viewer could switch between these scales, or view them simultaneously in 'Hybrid' mode (Fig. 5). The visualisation also presented structured insight on trends and patterns, such as the development of each topic over time, and an overview for each day.

e) Data journalism

During the Games, the team investigated the data record through 'data-driven journalism' [16], giving the opportunity for deeper insight and reflection, as a complement to the fast-moving and ever-changing online visualisation, and shared the findings on the project blog and with interested national teams. Stories were developed and told through charts and graphs (Fig. 4), accompanied by written commentary.

f) Physical data sculpture

Once the Olympics had finished, all of the accumulated data was gathered and transformed into an interactive data sculpture (Fig. 6). Taking the plots from the early experiments as inspiration, the data was milled into 17 objects laid side by side, each representing one day of the Games. Their surface was a relief heatmap, with the height of the sculpture at any point indicating the emotional highs and lows over time. Overlay projections highlighted individual stories and some key themes that emerged during the Games, with visitors able to scroll through them using a control knob, and investigate which stories were trending at a specific time on a particular day. Another dimension to the gallery installation was a physical sentigraph – a 9-metre long wall piece and timeline depicting a high-level overview of average emotional response to London 2012, the story of the Games as seen by *emoto*.

Fig. 5. Design 'Hybrid' view. (© Moritz Stefaner, Drew Hemment, Studio NAND. Some Rights Reserved.)

Observations and Discussion - Data and Knowledge in Today's Media Landscape

i) Social Data: Properties and Limits

emoto gives expression to emotion as it is performed online, and captured and codified as emotion data. In relation to discussions around epistemology and the 'truth' of data visualisation, therefore, it is important to qualify the properties and limits of the dataset. Immediately apparent were the limitations and bias of the dataset being working with – Twitter – and the challenges for a project of this scale, or any scale, in achieving accurate sentiment analysis [17].

Twitter does not represent all people or nations. Access to the Internet is unequal and with social media there is no global space, there is a patchwork of territories, platforms and connectivity. Our visualisation was as 'global' —

Fig. 6. emoto data sculpture with overlay projection. (© Moritz Stefaner, Drew Hemment, Studio NAND. Some Rights Reserved.)

limited and partial — as Twitter (Fig. 7).

The original intent was to integrate social data from around the world (Twitter, Weibo, Orkud, etc.) and support six widely used languages. But this proved beyond the resources and scope of an art project of this scale, and, following an enforced change in technical partner (detailed in this report), *emoto* focused solely on Twitter and english. The majority of users of the online visualisation – more than 65% – were from four english-speaking countries – UK, US, Canada and Australia. Such a limited perspective does not represent "what the world thinks."

Other bias is less trivial to quantify. An evaluation of the accuracy of the sentiment analysis, for example, was beyond the scope of the *emoto* project.

ii) Social Data: Vision and Insight

It is necessary to consider how the practicality of working with big data favours some kinds of insight over others, and forces a particular "model of intelligibility" [18]. Pointing to debates in media theory, we see that a visualisation such as *emoto* reveals as much about the medium (Twitter) as about the message (commentary and opinion on London 2012). As such, the findings of this project contribute to discussions around the dimensions of new and traditional media, and how the two may interact. Furthermore, *emoto* highlights commonplace dimensions of social data, and introduces some novel dimensions of its own.

In some cases, *emoto* revealed similar stories to those seen in broadcast media, but with greater immediacy, and greater scope to see patterns emerge. Viewers could observe the mounting anxiety and then joy in Britain around the wait for Team GB Golds. Other events observed were native to social media, such as the 'trolling' of athletes [19]. Both old and new media at times became the story, such as in controversies surrounding NBC and Twitter. Medium and message were sometimes confused, such as when the BBC received a negative score when it covered a negative story. When the emoto team observed anomalies, they were investigated to see if they were actual events or artifacts of the visualisation [20].

The 'views from above' are instances of a statistical viewpoint that comes from representing social phenomena in a quantified way, through data analysis and computational tools [21]. Similarly the 'ephemeral and anecdotal' is a common frame of reference in social media, wherever there is a stream of social updates pushed out immediately to subscribers.

When captured in digital memory the past is available in new ways. The data from *emoto* is archived in its entirety, making possible data journalism during the Games, and ongoing ad hoc analysis and research of the data after the Games concluded. And yet, there was no option of replay. Within the constraints of time and resource faced, *emoto* was not able to preserve context and hold the data in memory so that a prior moment in the live stream could be simulated and an event be visualised a second time. Here the digital tool places an emphasis on the present moment – the 'perpetual now' – due to the difficulty in accessing and representing historic data.

Novel dimensions in *emoto* also included the option to interrogate and query structured insight, and the use of data journalism to bring new meaning to the data record.

iii) Social Data: Openness and Accessibility

emoto tested the ability of a small artistic team to create its own application for visualising live data, combining bespoke and off the shelf software, something that in the near future might be within reach of everyone. Inseparable from the artistic development was the 'institutional critique' involved in negotiating the many layers of permissions involved, firstly to build relationships with London 2012 stakeholders and secure the commission, and secondly around access to the social data, both with a data reseller and Twitter directly. Through this, questions around the openness of social data emerged.

Twitter has become a defacto newswire for everyday events, by making it very easy to share and observe commentary and opinion. Tweets are publicly visible by default, unregistered users can read posts. Crucially, Twitter provides licensing and APIs so third party developers can build on top of it and Tweets can be accessed through many platforms. All of these factors made it an ideal choice for *emoto*, enabling the team to develop its own interface to visualise Twitter data.

emoto had been offered access to augmentations of the 'Firehose' — the real-time stream of all (100%) the public tweets — by one of two data resellers with full access. Then Twitter tightened their Terms of Service, and limited third party access, in order to better monitor

and monetise the flow of data [22]. Shortly before launch the reseller informed the team that no data or derived insight obtained from them could be publicly displayed in any form [23]. The project faced the real prospect of cancellation. To work around this, it was necessary to build new infrastructure in just two weeks, and also to use the 'public API' – giving access to 1% of the 400 million tweets per day it was theoretically able to access. This highlights a fragility of artworks and, indeed, industries built on the APIs of social media owned by commercial monopolies. And a more general point, that today only the big data companies themselves have complete access to all the data and the means to analyse it [24]. Of note here is Twitter's willingness to undermine its own carefully cultivated USP and reputation in order to enhance profitability.

Conclusions - Learning and Reflections

This report reflects on the development and release of *emoto*, and highlights multiple questions it raises in relation to current debates on data, visualisation, epistemology, media theory and economics – that are beyond the scope of the report to fully address.

emoto provided an instrument to observe and participate in the online emotional response to London 2012. It was an experimental deployment of online social infrastructure combining human and machine agency, a 'social machine' [25]. This was data art [26] [27] as a mode of enquiry. It was an instance of 'visualisation exploration' [28] – self-directed, and idealistic, seeking to investigate the limits of the possible, and to provoke reflection on emerging trends. Reflection on this practice gave us cause to question how accessible and replicable these tools can be, the way knowledge practices are changing, and what it means to perceive and experience events at the scale – in size and connectivity – of big data.

The Internet made the store of human knowledge and culture in principle available to all. One year after London 2012 were revelations about abuses of big data by national security agencies. In light of this, a clear understanding is needed of the legibility social data affords, and wider access to the tools to make it meaningful.

emoto illustrates a tension and contradiction in the emerging landscape of data, information and knowledge. On the one hand, it embodies the fascination that the "global village" has become reality, and it is possible to visualise millions of interactions around the world in real-time. And, on the other, it makes clear the limits of this perspective when we consider issues of ownership and control, or look beyond specific territories (geographic, political or economic) to the world as a whole [29].

The project occurred on the cusp of Twitter's move to a more commercial and closed business model. It brought that into sharp relief, and with it an urgent debate around the openness and accessibility of social data. The 'new scientific instrument' of the social web is arguably one of the greatest resources of our times. *emoto* provides a timely warning that this instrument is not publicly owned, or publicly accountable, it can be switched off on a whim, and its full power is available to only a few.

To conclude, artworks such as *emoto* investigate the potential for data visualisation to enhance insight and experience around emerging social phenomena. Data visualisation combines visual aesthetics and interface design with understanding of data science, and is a practice that strives to be 'true' to its materials of data and code. This report suggests this 'truth' needs to be qualified by consideration of multiple factors, including: i) the properties and limits of the dataset; ii) the model of intelligibility involved; and iii) the openness and accessibility of the data. There is now understanding within the academic visualisation community of the necessity to communicate confidence levels along with a visualisation [30]. boyd & Crawford argue that any big dataset has limitations and flaws, and the outcome of data sampling and cleaning depends on the attributes the analyst has access to and makes use of. Further, there is always interpretation, in any attempt to understand what data means, and hence big data analytics can never present a simple 'objective' truth [31].

Areas For Further Enquiry

This report suggests a need for further research around effective ways to communicate levels of uncertainty, and the nature of uncertainty, in data analysis and visualisation, in view of challenges in making sense of an unprecedented upsurge in the amount and complexity of data, and also the *a priori* understanding that such data is always partial and limited.

It also highlights a requirement for ongoing debate around the openness and accessibility of social data in light of the economic model of today's social networking sites.

In *emoto*, evaluation was through participant observation and reflection by the project team during development and deployment. Only a very early stage user experience study of the online visualisation was possible within the scope of the project. Future iterations would benefit from more extensive study of user experience, evaluation of the accuracy of the visualisation, and further documentation and evaluation of the design decisions and process [32].

Ad hoc analysis and research of the data has continued after the Games concluded. The collected data was supplied to the Data Science Laboratory of the ISI Foundation. This has been used in the development of the *EMOTO Topic Explorer*, an exploratory tool designed to expose the topical and temporal dimensions of Twitter conversations [33].

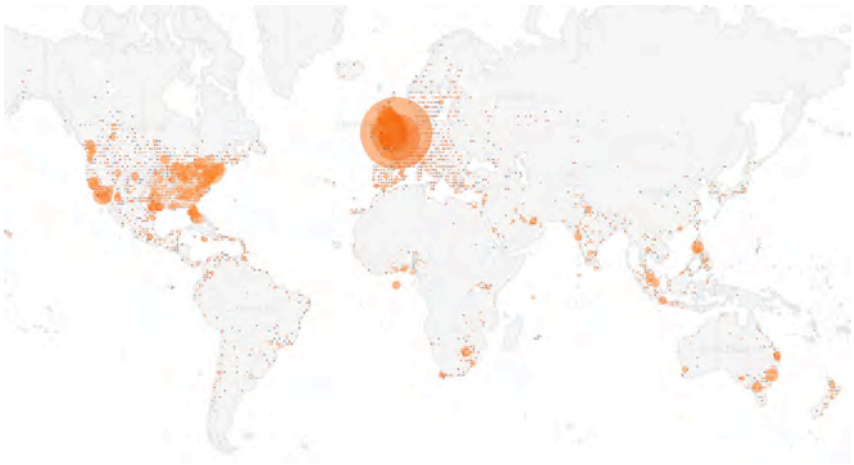

Fig. 7. The location of geo-coded tweets captured by emoto, highlighting a bias towards the UK and North America. (© Moritz Stefaner, Drew Hemment, Studio NAND. Some Rights Reserved.)

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The *emoto* online visualisation was exhibited within London 2012 Festival, 27 July - 9 September 2012. The *emoto* data sculpture was exhibited at *WePlay*, London 2012 Festival/Cultural Olympiad, 7 - 9 September 2012, and *Information in Style*, CAFA Art Museum/Beijing Design Week, Beijing, China, 20 September - 15 October 2013.

Moritz Stefaner was lead designer on *emoto*. He works as a “truth and beauty operator” on the crossroads of data visualization, information aesthetics and user interface design. Stefaner is especially interested in the visualization of large-scale human activity.

Dr. Drew Hemment initiated the *emoto* project and was a member of the artistic team. He is Founder and CEO of FutureEverything, and a Dundee Fellow, Reader at Duncan of Jordanstone College of Art and Design, University of Dundee.

Studio NAND, consisting of Stephan Thiel, Steffen Fiedler and Jonas Loh, were involved in all aspects of creative development, and had a lead role on design of the physical data sculpture. Studio NAND is a multi-disciplinary design practice based in Berlin, practising and researching at the intersection of design, science and technology.

FutureEverything is an art and innovation organisation founded in 1995 which investigates various dimensions of today’s digital culture by commissioning and participating in art and design experiments.

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References and Notes

1. D. Bollier, *The Promise and Peril of Big Data* (Washington, DC: The Aspen Institute, 2010).

2. D. Fisher, R. DeLine, M. Czerwinski, S. Drucker, “Interactions with Big Data Analytics.” *Interactions*, Volume 19 Issue 3 (2012).

3. S. K. Card, J. D. ,MacKinlay, B. Shneiderman, eds., *Readings in Information Visualization: Using Vision to Think* (Morgan Kaufmann Publishers, 1999).

4. C. Ware, *Information Visualization: Perception for Design* (Morgan Kaufman, 2004).

5. D. Hubbard, *Pulse: The New Science of Harnessing Internet Buzz to Track Threats and Opportunities* (John Wiley & Sons, 2011).

6. Related works include: Jonathan Harris and Sep Kamvar, *We Feel Fine* (2006) and Stamen, *MTV: Live Twitter Visualizations* (MTV Video Music Awards, 2009).

7. London 2012 was dubbed 'the social media Games' in the popular press. See for example <http://www.bbc.co.uk/news/technology-18889406> (accessed 30 June 2013).

8. A. Balfour, *London 2012 Olympics and Paralympic Games-time Digital Report.* (LOCOG, 2013), <http://www.slideshare.net/balf/london-2012com-olympic-games-digital-round-up-13-august-2012>.

9. Indeed, during London 2012 social media became integral to the television coverage of the Games.

10. In the early stages, the *emoto* team made the case for making Olympics data freely available using open standards to the New Media team at the London Organising Committee of the Olympic and Paralympic Games (LOCOG). LOCOG did release data through the London Datastore, but in the end *emoto* used data from a single proprietary service, Twitter.

11. In this context, the team developed a chart type it called "sentigraph," which encodes sentiment in color and vertical position of a line, and at the same time the number of messages in line strength. See early process heats maps documented at <http://www.nand.io/visualisation/emoto> (accessed 30 June 2013).

12. *emoto* used the Lexalytics *Salience Engine*, which uses various text processing, natural language processing and text analytics technologies for sentiment analysis <http://www.lexalytics.com/technical-info/salience-engine-for-text-analysis> (accessed 30 June 2013).

13. The project was developed by building on open source code libraries such as Processing.org and D3.js. The infrastructure consisted in a Node.js java based server, sentiment analysis tools developed by a partner, Lexalytics, Redis for fast and flexible storage, and HTML5 for the frontend.

14. One early visual concept consisted in particles representing individual tweets that would coalesce and form humanoid figures representing each discipline. But this approach would work only in a limited set of circumstances – for example, it was not effective with too high or too low numbers of tweets.

15. In *emoto* this featured an "inverse parallax" perspective - where tweets that are "more important" (cited or referred to more often) are larger and float above other tweets, while moving more slowly across the screen.

16. M. Lorenz, “Data driven journalism: What is there to learn?” *IJ-7 Innovation Journalism Conference*, Stanford, CA (2010).

17. A. Pak and P. Paroubek, “Twitter as a Corpus for Sentiment Analysis and Opinion Mining,” *7th International Conference on Language Resources and Evaluation LREC10*, Valletta, Malta (2010).

18. D. boyd and K. Crawford, “Six Provocations for Big Data” *A Decade in Internet Time: Symposium on the Dynamics of the Internet and Society* (2011).

19. In one case, a British diver, Tom Daley, was sent an abusive tweet from a 17 year old, who was later arrested. This threw his sentiment profile from positive to negative, then back to positive, as fans expressed first anger then support.

20. One anomalous event was the Irish triangle. It was observed that Ireland only had one single dominant emotion, “quite positive,” shown as a one large triangle. The explanation lay in the huge impact of teen celebrities on the web – the response captured on Twitter was dominated by one message retweed over 25,000 times, by Niall Horan, member of the boyband “One direction.”

21. L. Manovich, “Trending: The Promises and the Challenges of Big Social Data” in M. K. Gold, ed., *Debates in the Digital Humanities* (The University of Minnesota Press, 2012).

22. Twitter tightened their Terms of Service, and limited third party access <https://dev.twitter.com/blog/changes-coming-to-twitter-api> (accessed 30 June 2013).

23. Upon notification, the *emoto* team asked Twitter for an exception for a non-commercial, one-off artwork, pointing out that the project aimed for a high level of abstraction, and offering to build in a Twitter layer. The team explored the legal definition of data, and made a case that the installations proposed (one a soundscape, one milled onto solid material) are far removed from the data stream and do not "distribute data" in a way that would enable the original information to be reconstructed. The *emoto* team spoke to Twitter in the USA, in Germany, to their Olympics lead in the UK, but to no avail.

24. Manovich [21].

25. N. Shadbolt, D. Smith, E. Simperl, M. Van Kleek, Y. Yang, W. Hall, “Towards a Classification Framework for Social Machines”, *WWW 2013 Conference*, Rio, Brazil Vanilson (2013).

26. G. Judelman, “Aesthetics and Inspiration for Visualization Design: Bridging the Gap between Art and Science,” *International Conference on Information Visualisation*, IV 04. IEEE (2004) pp. 245-250.

27. F. B.Viegas and M. Wattenberg, “Artistic Data Visualization: Beyond Visual Analytic,” *Lecture Notes in Computer Science*, 4564 (2007).

28. A. V. Moere, and H. Purchase, “On the role of design in information visualization,” *Information Visualization* 10: 356 (2011).

29. This observation was made by Moritz Stefaner.

30. K. Brodlie, R. A. Osorio, A. Lopes, “A Review of Uncertainty in Data Visualization,” in J. Dill, R. Earnshaw, D. Kasik, J. Vince and P. C. Wong eds. *Expanding the Frontiers of Visual Analytics and Visualization* (London: Springer Verlag, 2012).

31. boyd and Crawford [18].

32. Evaluation Study: *Emoto* Project, a report by Ege Sezen (2012) for the HighWire Doctoral Training Centre at Lancaster University. Conducted from July 27-Aug 12 2012, this focused on questions around augmentations to the experience of the sporting events, based on analysis of interviews conducted with users following the Games, and by monitoring online comments, web articles, shares and messages.

33. Twitter Topic Explorer <http://www.datainterfaces.org/2013/06/twitter-topic-explorer> (accessed 30 June 2013).

EXPLORATIONS OF ECOLOGICAL AUTARKY IN ART, DESIGN AND SCIENCE

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Abstract

While the notion of autarky is often contested in terms of feasibility and desirability, art and design projects that deal with autarky seem to highlight the positive socio-cultural and ecological effects of autarkic living. This paper will discuss three notable media artworks that highlight these positive effects of autarkic living, and will unify them with opposing views by introducing a social network model of autarky.

Keywords: ecology, autarky, self-sufficiency, climate change, sustainability, media art, art & technology, curatorial practice.

Introduction

Increasing self-sufficiency with respect to ecological resources such as food, energy and water is regarded an important factor in the transition towards a more sustainable future [1, 2, 3]. Greater self-sufficiency arguably leads to independence from the infrastructures that are responsible for climate change (e.g., mass food processing, centralized energy production systems and transport infrastructures), while simultaneously giving rise to greater adaptability to changes in climate [4]. Such autonomy with respect to the external provision of ecological resources is commonly referred to as 'ecological autarky'. Similar to the use of the notion of 'autarky' in economics, where it refers to economies that function without any external relations, applied to ecology the notion implies autonomy with respect to the external provision of ecological resources. Food autarky, for instance, is the degree to which a community can feed itself [5] and electricity autarky refers to independence from imported energy resources and their providers [6]. Although ecological autarky is often contested on grounds of feasibility [7], desirability [8] and even sustainability [9], ecological autarky is a recurring topic in discussions around scenarios for a more sustainable future [10, 11]. What do art and design perspectives on autarky contribute to these discussions? In the following, three notable media artworks are analyzed in the light of this question. The analysis of these examples was conducted as part of the *Energize people* research project [12] in the context of the forthcoming *Energize* festival, which will take place on November 14 - 17, 2013 in the city of Groningen, The Netherlands [13].

Three examples

Although the topic of ecological autarky has firm roots in the history of art and design (see, for example, the work of Buckminster Fuller [14]) and is being addressed across a wide range of artistic disciplines (from fine art [15] to product design [16]), the topic has received substantial attention in the field of media art. Three notable media artworks provide compelling examples.

In 1994, artist Marco Peljhan (SI) initiated a quintessential example of an artistic project exploring ecological autarky titled *MAKROLAB* [17]. Central to the project is a mobile unit that harvests its own wind and sun energy, recycles most of its waste, and offers isolated research and living conditions to four people for up to 120 days. In these isolated conditions, artists and researchers have explored tools and tactics in relation to telecommunications, weather systems and migration. *MAKROLAB*'s greatest achievement has arguably been its contribution to engaging communities around the politics of globalization [18]. Besides the experimentation conducted in and around *MAKROLAB*, the mobile unit itself also has a political dimension. For instance, it proposes that ecological autarky is possible without a return to primitivism [19] and furthermore shows that technology may offer a means to realize a more sustainable relation to nature and foster social exchange rather than alienating us from nature and each other (as for instance suggested by Adam Curtis in [20]).

The intervention project *World in a Shell* (*WiaS*), initiated by artist Hans Kalliwoda (NL), recently revived the discussion around ecological autarkic tools and tactics in art and design [21]. Although it is also centering around a self-sustainable living and working unit, in contrast to *MAKROLAB* WiaS does not aim for interdisciplinary exchange between international experts, but instead proposes to deploy the unit to engage indigenous people at rural sites in discussions about their relationship with nature. The knowledge harvested from these discussions will be documented and will travel with the *World in a Shell* to other locations, where the documentation can inform similar discussions at the new site. By doing so, the project aims to facilitate cultural cross-pollination between geographically disconnected rural communities. Like *MAKROLAB, WiaS* aims to facilitate knowledge exchange on sustainable living, rather than imposing a solution. Nevertheless, both projects deliberately embody an ecological autarkic scenario to facilitate such knowledge exchange. It is important to note, however, that neither *MAKROLAB* nor *WiaS* are fully ecologically autarkic, since both strongly depend on transport infrastructures. *WiaS*, for instance, has even been specifically built to fit a conventional sea container to be able to be relocated using standard logistic infrastructures.

Artist collective N55 (DK) realized an ecological autarkic scenario that overcomes this reliance on transport infrastructures by creating a self-sustainable unit that moves on six 'legs', aptly titled *Walking House* [22]. By using, among other features, solar cells on the roof of the unit to harvest energy and collect rainwater for consumption and agriculture, the unit provides comfortable living independent from existing energy and water infrastructures. Furthermore, *Walking House* features a composting toilet system to dispose of sewage, and it has a small greenhouse unit and a small wood burning stove to provide food and CO^2-neutral heating. While similar modules for water, energy and food autarky have been developed in the context of *MAKROLAB* and *WiAS*, the *Walking House* is unique in that it is also autonomous with respect to transport infrastructure; it does not even require roads, as the structure can basically move on any (flat) surface. *Walking House* thereby seems to have crossed the final frontier in ecological autarky, allowing full self-sufficiency with respect to shelter, waste, food, energy, water *and* transportation. According to N55, the true strength of the *Walking House* is that it relieves humans from owning land and disturbing the environment, resulting in true freedom and peaceful living [23].

Walking House, N55 (DK) 2009. Photo © N55.

Analysis

It seems that all three art projects discussed above, if we set aside the way in which the units are manufactured and resist speculating on ecological gains, suggest that autarkic living may bring along positive socio-cultural effects, such as political engagement of communities, knowledge exchange between communities, individual freedom and overall peaceful living. These socio-cultural advantages of autarky are the direct result of autonomy from ecological infrastructures, allowing more nomadic ways of living. A societal shift to more nomadic ways of living in mobile or portable shelters (that is, 'the age of new nomadism' [24]) would of course have enormous economical, political and sociocultural implications. While scientists and policy-makers generally discuss the political and economical consequences of ecological autarky at a nation-state level [25, 26], artists and designers developing autarkic scenarios seem to rather contribute knowledge regarding the socio-cultural implications of autarky at the individual and community level. Furthermore, art and design put the notion of ecological autarky into practice through objects, installations, performances and interventions that may serve as proof of concept or generate public dialogue. In the absence of such concrete models, socio-cultural effects are easily ignored when evaluating autarkic scenarios from a mere political or economical standpoint. Or, in the words of N55, "[There is] little value in theorizing without producing a physical result" [27]. The speculative models produced by artists and designers therefore seem to play a crucial role in the balancing of ecological autarky with dependency on external provision of ecological resources through infrastructures.

Although ecological autarky may not be desirable or more sustainable at nation-state level, the three examples above show that it may be a desirable and arguably also sustainable alternative at an individual or community level. If one individual in a community for instance grows potatoes, while another grows tomatoes and both trade half their crops, this may be a more efficient use of the ecological resources present in a community than a situation in which each grew their own [28]. At a nation-state level this may however result in dependencies between nation-states that could lead to unsustainable behavior, such as long-distance transport of food and vulnerability to food insecurity [29]. It therefore seems that a sustainable future depends on a balance between ecological autarky at certain levels of social organization, while at the same time dependency on external provisions may be preferred at other levels.

Another way to look at this is to adopt a social network approach to autarky [30]. Looking at society at large as a global network of individuals, autarky could occur at any intermediate level between an individual and the network as a whole. Individuals or communities within the network could even (physically or virtually) cluster to become autarkic together. From this perspective, the question is not whether to live an autarkic life with respect to an ecological resource or to be dependent on an infrastructure, but rather to work out at which level in the social network one could best live autarkic with respect to a certain ecological resource. While for some ecological resources individuals or small communities could be autarkic to the greatest effect, for others autarky at a regional, national or global level may be preferred. Some work on energy autarky even suggests that it is best implemented on all three levels concomitantly to combine the efficiency of centralized energy with the independence of being autarkic at lower levels [31]. Autarkic scenarios should therefore never be regarded as ultimate solutions for all ecological resources at all social levels.

Conclusion

In a time where the threat of climate change calls for a global humanistic and ecological transition, it is important that not only the economic and political consequences of scenarios for a more sustainable future at the nation-state level are theorized, but also that their implications on the level of individuals and communities are explored on the basis of concrete models. As illustrated above, art and design have valuable tools to offer such investigations into the socio-cultural implications of potential future scenarios, such as ecological autarky. To be effective however, such art and design projects should not merely be exhibited, but also be critically evaluated, compared and related to work in other domains. Only then will a strong critical discourse around these projects emerge, one that needs to be heard in the debate over ecological autarky in the realm of policy-making. The social network model for autarky introduced in this paper could offer a relevant platform for research that encompasses both the social and the political level of ecological autarky. Many more examples should be analyzed to further develop and nuance it.

References and Notes

1. Van Andel J. & Aronson, J. (eds., 2006) *Restoration ecology.* Blackwell Publishing, Oxford

2. Hoekstra, A.Y. & Chapagain, A.K. 2007. "The Water Footprints of Nations: Water Use by People as a Function of their Consumption Pattern." *Water Resource Management* 21(1): 35–48.

3. Food and Agriculture Organisation of the United Nations (FAO) 2012 *FAO-ADAPT Framework Programme on Climate Change Adaptation*. Last accessed 05 May 2012. http://www.fao.org/docrep/014/i2316e/i2316e00.pdf

4. IPCC, 2012: *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation.* A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, UK, and New York, NY, USA, 582 pp.

5. Hobbes, M. 2010 *Figuring Rural Development: Concepts and* Cases *of Land Use, Sustainability.* Amsterdam: Amsterdam University Press

6. Schmidt, J. Schönhart, M., Biberacher, M., Guggenberger, T., Hausl, S., Kalt, G., Leduc, S., Schardinger, I. and Schmid, E. 2012 "Regional energy autarky: Potentials, costs and consequences for an Austrian region" *Energy Policy* 47: 211-221

7. Luft, G. Energy self-sufficiency: A realistic goal or a pipe dream? http://ourworld.unu.edu/en/energy-self-sufficiency-a-realistic-goal-or-a-pipe-dream Last accessed May 19, 2013.

8. von Mises, L. 1943 "Autarky and Its Consequences" in Richard M. Ebeling, (ed. 1990), *Money, Method and the Market Process: Essays by Ludwig von Mises* Norwell: Kluwer Academic Press.

9. Reis and Landabaso, 2010 Connecting Smart and *Sustainable* Growth through Smart Specialisation. Last accessed 01 July 2013. http://ec.europa.eu/regional_policy/sources/docgener/presenta/green_growth/greengrowth.pd

10. Hodson, M. & Marvin, S. 2009) "Urban Ecological Security' A New Urban Paradigm?" *International Journal of Urban and Regional Research*. 33:193-215.

11. Hobbes, 2010 [5]

12. Energize People, research project by PSI research group, Centre of Applied research Art & Society, Hanze University of Applied Sciences, funded by the Ministry of Economic Affairs, NL, 2013, http://i-share-energize-people.nl/

13. Energize festival, Ecological Autarky reclaim the power! Hanze University of Applied Sciences, Centre of applied Research Art & Society, research group PSI, led by A. Nigten 2013,

14. Neder, F.,2008 *Fuller Houses: R. Buckminster* Fuller's *Dymaxion Dwellings and Other Domestic Adventures*. Zurich: Lars Müller

15. Mattingly, M. 2009, Waterpod project. http://www.thewaterpod.org/mm.html Last accessed 1 July 2013.

16. Studio Formafantasma 2010 Autarky http://www.formafantasma.com/home_autarchy.html Last accessed 1 July 2013.

17. Peljhan, M. 2003 *Makrolab* London: Arts Catalyst

18. Birringer, J. 1998 “Makrolab: A Heterotopia”, *Journal of Performance and Art*, 60. 66 - 75.

19. Zerzan, J. 1994 *Future Primitive and other essay*s. New York: Autonomedia / Anarchy

20. Curtis, A, All Watched Over by Machines of Loving Grace, 2. The Use and Abuse of Vegetational Concepts**,** TV series BBC broadcast 2011

21. Kalliwoda, H. 2009 *World in a Shell.* Amsterdam: Blindpainters.

22. N55 2008 “Manual for Walking House” Last accessed April 8, 2013. http://www.n55.dk/MANUALS/WALKINGHOUSE/walkinghouse.html

23. Kelly, P. 2009 The Challenging Lifestyle of N55’s Ion Sørvin. Blueprint magazine. http://www.blueprintmagazine.co.uk/index.php/architecture/the-challenging-lifestyle-of-n55s-ion-sørvin Last accessed May 19, 2013.

24. Siegal, J. (Ed.) 2003 MOBILE: The Art of Portable Architecture. Princeton Architectural Press

25. Taylor, P. J, & Flint, C. 2000. *Political geography: world-economy, nation-state and locality.* 4th edition. Harlow: Prentice Hall.

26. Common, M. and Stagl, S. 2005 *Ecological Economics: An Introduction.* Cambridge University Press.

27. Kelly, P. 2009, see [20]

28. Van der Straeten, K. 2006 What and Who is Self-Sufficient? Last accessed 01 July 2013. http://suite101.com/article/what-and-who-is-selfsufficient-a21367

29. FAO 2008 *Climate change and food security: a framework document*. Last accessed 11 May 2012. http://www.fao.org/forestry/15538-079b31d45081fe9c3dbc6ff34de4807e4.pdf

30. Freeman, L. 2004 *The Development of Social* Network *Analysis.* Vancouver: Booksurge Publishing

31. Rotmans, J. 2012, In het oog van de orkaan. Æneas publishers

From Coexistence to Interaction: Influences Between the Virtual and the Real in Augmented Reality

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Abstract

This paper examines the interaction and influences between the virtual and the real in Augmented Reality (AR). We explore how real objects can affect virtual objects and vice versa. Our work is based on theoretical considerations, a review of existing research and artworks as well as our own initial series of experiments. We argue that virtual and real objects can not only simulate influences that exist between real entities, but also influence each other in new and imaginary ways that have no equivalent in the physical world.

Keywords: Augmented Reality, Interaction, Interactive Art, Electronic Art, Mixed Reality, Virtual Reality, Virtual, Real, Interaction Models

In Augmented Reality (AR), virtual content is added to our real environment. This enables new and unique relationships between the two. So far, much work in the field has focused on scenarios where virtual and real objects appear to coexist in the same physical space. By contrast, our research is concerned with AR (art)works in which the virtual and the real not only coexist but also influence and interact with each other. We envision scenarios where real wind moves virtual leaves, where real doors open for virtual objects (see Fig. 1), where virtual singers shatter real glass and where virtual objects get wet when it rains. Moreover, we hope for the creation of works in which virtual and real objects interact in novel ways and where AR allows us to experience influences between objects that cannot exist in a purely physical world.

Our research is inspired by two simple theoretical considerations. First, that the virtual is free from physical laws. Hence new forms of interaction could be possible. Second, that the virtual cannot directly apply forces to real objects. As a consequence, interactions that we know from the physical world might not be possible. This inspires us to ask the following questions:

- What types of interaction between the virtual and the real are possible?
- When/how can the real affect the virtual?
- When/how can the virtual affect the real?
- What makes the interaction believable?
- Which problems do arise?
- Which possibilities do emerge?

In order to explore the possible interactions and influences between the virtual and the real in AR, we have reviewed existing AR (art)works and literature and have also conducted an initial series of experiments. Our research is motivated by our own fascination with the topic and is intended to foster experiments, artworks, exchange, and discussions among scientific, augmented reality, and electronic arts communities. Furthermore, we intend to learn more about the fundamental characteristics of AR and its possibilities for electronic art.

Research Context

We are interested in AR scenarios in which the real affects the behavior of the virtual and/or the virtual affects the behavior of the real.

An interactive installation in which the real environment affects the behavior of virtual objects is the car racing game *Room Racers* [1] by Lieven van Velthoven. Unlike traditional computer games, which are displayed on a screen, this game takes place in real space. Virtual cars are projected onto the player's floor. Real objects, such as shoes, keys and toys are placed on the ground and define the racing course. During the game, players can steer the cars around the track with traditional game consoles. The physical objects act as obstacles that cannot be crossed by the virtual cars. In our work, we are interested in taking influences between the virtual and real one step further. We consider cases in which the virtual is not only affected by something real but also influences the real in return. We call such bi-directional influences interaction.

The idea of interactions between the virtual and the real is also present in AR research. Several studies have introduced physics simulation in AR and with it interaction between virtual and real objects (see, for example, [2,3,4]). What sets our work apart from many existing studies is our interest in novel forms of interaction. We are not only concerned with realistically simulating interactions that we know from the physical world but wonder: Does AR allow us to realize imaginary influences that could not exist in a purely physical form?

Fig. 1. Real doors open for virtual objects. (© Hanna Schraffenberger and Edwin van der Heide.)

Our work can be regarded as a response to the research undertaken by Kim, Kim and Lee [5]. The authors demonstrate that problems can arise when real and virtual objects collide because virtual objects cannot apply forces to real ones. We have observed the same phenomenon and explicitly explore ways in which the virtual can (appear to) affect the real.

We focus on interaction between virtual and real *objects*. The interaction between *users* and virtual content falls out of the scope of this paper.

This research builds upon our preceding work regarding the believability of the behavior of interactive artworks [6] and our studies on the relationships between the virtual and the real [7]. In the latter, we have argued that these relationships are a defining aspect of AR and we have identified interaction between the virtual and the real as a promising area for future research.

Exploration

In order to explore if and how the virtual and real can interact, we conducted an initial series of experiments that test our theories and serve as illustrative examples.

Realism

The first experiments explore to what degree virtual and real objects can (appear to) physically interact like real objects.

Example 1: Bouncing Ball

Our first simulation recreates (what we consider) a simple real-world interaction: a ball that bounces on a surface (similar experiments have been conducted by Valentini and Pezzuti [8], Kim et al. [9] and Chae and Ko [10].) Our setup consists of a laptop that runs self-written

Fig. 2. A virtual ball is bouncing on a real table. Four snapshots from the live-view. (© Hanna Schraffenberger and Edwin van der Heide.)

Max/MSP/Jitter software and a webcam that provides a live-view of the environment. The software integrates the virtual ball in the view of the environment. In order for the ball to react to its real surroundings, we have created a virtual 3D reconstruction of the environment and aligned it with the real scenery. Furthermore, we have assigned virtual physical properties such as mass and restitution to the virtual elements and applied gravitational forces (using the Max/MSP/Jitter physics engine). The experiment is a success: When we start the simulation and view the environment through the screen, a virtual ball appears to bounce on the desk in front of us (see Fig. 2).

The outcome shows that it is possible to simulate certain existing real-world interactions in AR. However, on second thoughts, it becomes clear that the virtual ball does not have any effect upon the real table. In fact, the example only shows that the real can influence the virtual.

Example 2: Dominoes

As a next step, we deliberately chose a scenario that seemed bound to fail. In this experiment, a virtual ball collides with a row of real dominoes (see Fig. 3). Initially the screen shows the virtual ball heading towards the real dominoes. Just like in the previous example, the virtual ball reacts to the real: the moment it hits the first stone, the ball changes its direction and turns back. However, unlike in the real world, the stones do not fall.

This behavior contradicts our expectations and is not believable. We seem to expect a realistic response and want to see the stones falling. Clearly, problems can arise due to the fact that the virtual cannot directly affect the real. This problem has been noted earlier by Kim et. al [11] who call this the 'physical artifact'. Intrigued by the problem, we ask: What possibilities are there for the virtual to influence the real? What forms of interactions are believable nevertheless?

The Virtual Affects the Real

There are several possible ways in which the virtual can affect the real. One possibility is to work with *hybrid objects* that have both a virtual and a physical presence. We have explored these options by extending the previous examples.

Example 3: Falling Stones

In this example, again, a virtual ball is heading towards a row of dominoes. However, this time, when the ball hits the first domino stone, the stones start falling. This happens because we have extended the virtual sphere with a physical body — a real ball acts as the physical counterpart for the virtual ball. While looking at the scenery directly, one sees a physical ball. The screen, however, shows a virtual ball instead. We realized this by analyzing the camera-image and replacing the real ball with a virtual one. What makes this interesting is that we can also replace the real ball with any other virtual object and thereby give it qualities that the real object does not have. This approach is found in the commercial product *Sphero*, a robot ball that – when viewed with the corresponding smartphone app – is turned into a virtual beaver [12].

Example 4: Resonating Desk

Physical interaction cannot only be observed visually. If we compare our bouncing-ball example with the bouncing of a real ball, we notice that something is missing in our simulation. When the real ball hits the table, the collision produces a distinct sound – the table resonates. Also in the simulation, the real should react to the impact of the virtual. In order to achieve this, we have extended the experiment and trigger matching sound samples when the virtual ball and the virtual representation of the table collide (we use the magnitude of the collision to calculate the volume and randomly choose one of several impact-sounds each time). This example shows that sometimes we need to extend real objects (– the table –) by means of the virtual (– the sound samples –) in order to simulate a realistic response.

Actuators

A yet different approach is to extend the real with electronics such as actuators [13]. The virtual can then move or transform the real by controlling these actuators. Kang and Woo [14] have implemented this concept. In their research, they extend a physical toy cart with electronics so that a virtual character can push and pull the cart. Likewise, one can modify those real objects that already are equipped with electronics that react to the environment. For example, automatic doors that open when someone enters the space in front of them can be modified to also open when something virtual moves in front of them.

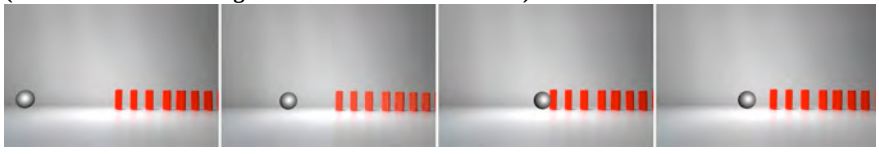
Analogue Interaction

The interactions discussed so far rely on computer-simulation. An artwork that demonstrates that real objects can interact with virtual content without the use of simulation-techniques is *Radioscape* by Edwin van der Heide [15,16]. The installation consists of several radio transmitters that are distributed over a part of a city. Each transmitter broadcasts one layer of a meta-composition. Listeners can pick up several signals at a time with a custom developed receiver. The volume of the single layers depends on the listener's distance from the corresponding transmitters. Due to the chosen wavelength, buildings become conductors and resonators for the transmitted signals. The physical environment is excited by and responds to the transmitted radio waves, ultimately affecting the virtual content and influencing what one hears. Although this interaction happens in the physical domain, we can argue that the virtual content interacts with the physical landscape. Another example of interaction that occurs solely in the physical domain is a virtual opera singer who, when their voice hits the right pitch and is played back at the right volume, shatters a real glass.

Imagination

The preceding exploration has shown that the virtual and the real can influence each other and that real-world interactions can be simulated in AR. In the following, we propose that, besides simulating reality, there is another way

Fig. 3. A virtual ball approaches a row of dominoes (frame 1 and 2), hits the first stone (frame 3) and rolls back (frame 4). Unlike in the real world, the stones do not fall. (© Hanna Schraffenberger and Edwin van der Heide.)



of creating believable influences between the virtual and the real: imagination.

The virtual does not have to obey physical laws. Hence, it can behave in novel and unrealistic but – according to our hypothesis – nevertheless believable ways. We do not think that virtual objects have to move like real objects in order to appear believable. More fundamentally, virtual objects do not have to represent real objects. For example, we can easily imagine a virtual ghost that floats through real walls. Just as we accept imaginary objects with their own behaviors in books, computer games and in cinema, we can accept different sorts of objects and different forms of behavior in AR. Presumably, if the virtual represents a real object and behaves like a real object, we expect it to affect the real environment just like a real object. However, we assume that if the virtual does not appear and behave like a real world object, we do not have such expectations. Are these assumptions true? What makes a certain behavior believable? What influences can we imagine?

Example 5: Attractive Colors

We have explored a first scenario in which virtual objects react to the real environment in an imaginative way. In this experiment, virtual objects are attracted by real objects of like colors. The setup includes a cloud of small virtual spheres – half of them with bluish colors and the other half with yellowish colors and one blue and one yellow rubber ball. As soon as the rubber balls enter the scene, they attract spheres of like colors (see Fig. 4). Although the virtual spheres do not imitate the behavior of real objects and do not obey the same physical laws as real objects, the relationship between the virtual and the real is easily understood, intuitive and believable. The fact that the virtual has no influence on the real is not a problem.

Even though the example is based on physical forces (attraction), it leaves behind the realm of realistic physical interaction as we know it. It becomes clear that the virtual does not have to behave like a real object in order to be believable. Furthermore, the example shows that influences between the virtual and the real bring great possibilities for interaction between an audience/user and the augmented environment: If physical objects influence virtual ones, the audience can interact with the augmented environment simply by interacting with physical objects [17].

Conclusions & Future Directions

Our exploration has shown that influences between the virtual and the real can take different forms. Firstly, they can simulate influences that exist between real entities. In addition to this, they can also take on new and imaginary forms that have no equivalent in the physical world. In line with this, there are two approaches to creating believable influences and interactions: the imitation of reality and the creation of imaginary realities. Kim et al. have claimed that in order for virtual objects to move as if they coexisted with real ones, they should obey the same physical laws as the real objects [18]. Judging from our current exploration, this is not necessary. Future work (both research and artworks) can explore the ways in which the virtual and real can interact in AR in novel ways.

In the course of this exploration, we have focused on visual AR. In the future, it would be especially interesting to explore the possibilities of non-visual, multimodal and crossmodal interactions and to include other physical properties of the environment. For example, real wind might move virtual leaves and the temperature of the environment might affect the behavior of virtual creatures.

We have noticed that influences between virtual and real objects support interaction between users/audiences and the virtual content. We would like to explore this interaction in the future. We hope this research will inspire both researchers and artists to explore the topic further. We believe that relating the virtual and the real by means of interaction can result in exciting artworks as well as novel manifestations of AR. We hope that our research serves as a first step towards works in which the virtual and the real not only coexist but also interact.

Acknowledgements

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References and Notes

1. Lieven van Velthoven, Room Racers (2011), interactive installation, <www.lievenvv.com/Projects/RoomRacers.htm>, accessed 6 July 2013.

2. Changhun Chae and Kwanghee Ko, "Introduction of physics simulation in augmented reality," *ISUVR 2008*, pp. 37-40. (IEEE, 2008).

3. Sinyoung Kim, Yeonjoon Kim and Sung-Hee Lee, "On Visual Artifacts of Physics Simulation in Augmented Reality Environment," *ISUVR 2011*, pp. 25-28. (IEEE, 2011).

4. Pier Paolo Valentini and Eugenio Pezzuti, "Interactive multibody simulation in augmented reality," *Journal of Theoretical and Applied Mechanics* **48**, No. 3 (2010) pp. 733-750.

5. Kim et al. [3]

6. Edwin van der Heide, "Believablity," *AR[t] magazine* **3** (May 2013), <http://www.arlab.nl/tags/art-magazine>.

7. Hanna Schraffenberger and Edwin van der Heide, "Towards Novel Relationships between the Virtual and the Real in Augmented Reality," *Arts and Technology*, pp. 73-80 (Springer Berlin Heidelberg, 2013).

8. Valentini and Pezzuti [4]

9. Kim et al. [3]

10. Chae and Ko [2]

11. Kim et al. [3]

12. Sphero, <http://www.gosphero.com/sphero-debuts-groundbreaking-augmented-reality-app/>, accessed 6 July 2013.

13. Kim et al. [3]

14. Changgu Kang and Woontack Woo, "ARMate: an interactive AR character responding to real objects," *Edutainment Technologies. Educational Games and Virtual Reality/Augmented Reality Applications*, pp. 12-19 (Springer Berlin Heidelberg, 2011).

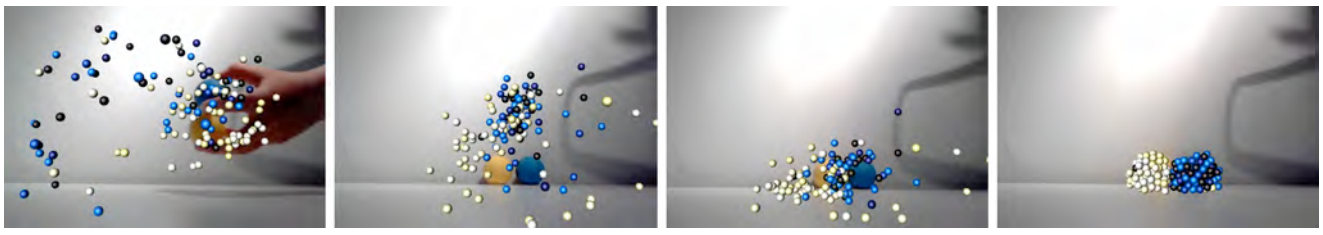
15. Edwin van der Heide, "Radioscape in the context of Augmented Reality," *AR[t] magazine* **2** (November 2012), < http://www.arlab.nl/tags/art-magazine>, see also: <http://www.evdh.net/radioscape/>, accessed 6 July 2013.

16. Schraffenberger and van der Heide [7]

17. Ibid.

18. Kim et al. [3]

Fig. 4. The colored rubber balls attract virtual spheres of similar colors. (© Hanna Schraffenberger and Edwin van der Heide.)



Environmental Data As Sensory Experience

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Abstract

Information visualisations within the field of environmental art are often imbued with an agenda for catalysing changes in behavior. They are political images that rhetorically ask how we might act differently in our relationship to what is being measured. This paper explores the complexity of information visualisations by discussing the radically different informatic strategies deployed in the installation artwork, What the Frog's Nose tells the Frog's Brain. Exhibited at ISEA2013, the work uses smell as a medium for producing information. The politics of smell remain relatively open, making it a rhetorical device rich with possibilities for exploring alternative modes of information production.

Keywords: Information, visualisation, data, electricity, olfactory, perception, infrastructure, smell.

Driven by the quantification of almost all of our activities and surroundings, data visualisation has emerged as a broad category of contemporary creative work. Visualisations and particularly those deployed within the field of environmental art, often present information with an agenda for catalysing changes in behavior. They are political images that rhetorically ask how we might act differently in our relationship to what is being measured. Yet this agenda assumes direct relationships between data, understanding and action- relationships that break down in the face of complex environmental issues such as climate change.

This paper explores the complexity of information visualisations by discussing the radically different informatic strategies deployed in the installation artwork, *What the Frog's Nose tells the Frog's Brain*. Exhibited at ISEA2013, this work explores the possibilities of smell as a medium for producing information. The politics of smell are ambiguous and remain relatively open, making it a rhetorical device rich with possibilities for exploring alternative modes of information production.

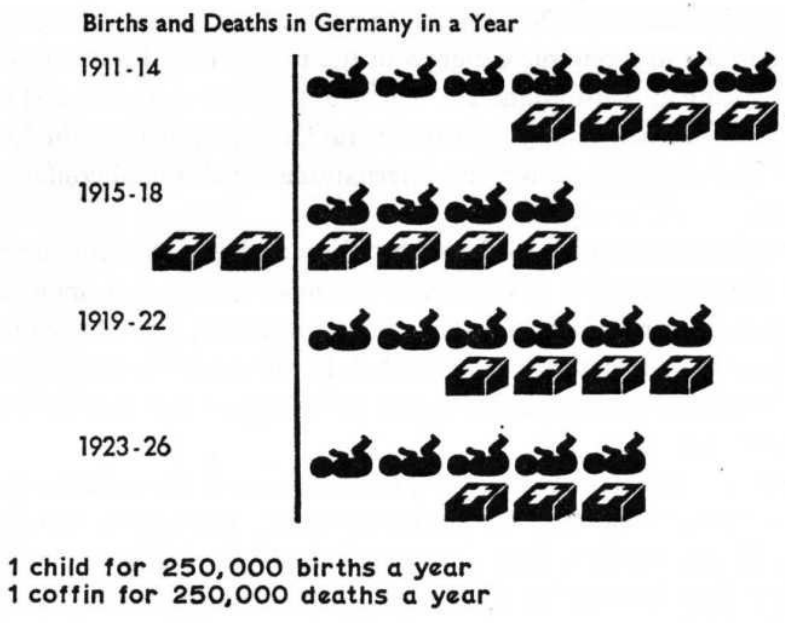
Smell is a mechanism for interpreting the world. In contrast to vision, which occurs via the interpretation of light reflected from surfaces, smell is an embodied experience. Olfactory sensation involves the detection of molecules from the surrounding material world as they are inhaled and lodged in the nasal passage. When in the presence of an unpleasant odor, our reaction is emotional and embodied – we feel disgusted and instinctually want to move away from the source. As such, smell is a powerful medium. In the context of visualisation works, it offers a system of representation that is incompatible with the common visual rhetoric used to convey the relationship between human action and environmental consequence. Deployed in *What the Frog's Nose tells the Frog's Brain* to represent electricity data, the use of smell opens up new possibilities for bringing the viewer into a more intimate relationship with their electricity demands.

Information visualisation has a rich history predating the boom of the last decade, a boom that has been driven by increasing personal computing capacity. Much of this historic work is well documented [1], yet a discussion of some key examples is useful for tracing some assumptions and complexities that persist in contemporary visualisation work.

Otto Neurath was an Austrian political economist and early pioneer in practices of visually articulating quantified information. During the period from 1921-1934, Neurath worked at the Museum of Society and Economy in Vienna where he co-founded the visual language known as the Isotype or the International Picture Language [2]. Isotype symbols remain ubiquitous in public signage today. The symbol of the swerving car that warns of slippery road conditions and the familiar male and female silhouettes on public bathroom doors are all examples of Isotype. This language consists of simplified, abstracted symbols and was developed for the communication of complex statistics in Neurath's museum exhibitions. In these exhibitions, statistical information was represented through visualisations using Isotype and rapidly inspired the further development and use of this graphical approach around the world [3]. Isotype was developed with the political agenda of democratising information and one of Neurath's primary goals was to show people how the world really is [4]. As is shown in Figure 1, quantified information is described through the repetition of simplified visual symbols. Certain graphical strategies, like varying scales or using spatial perspective to indicate quantitative information, are deliberately shunned in the interest of visual simplicity. In this example, the effects of World War 1 in the period 1915-1918 are clearly shown by the number of deaths outweighing the number of births.

Central to the graphic strategies of the Isotype is the elimination of detail and contextual information from the visualisation. Designed to be accompanied by text, these images privilege graphic simplicity in order to draw the viewer's attention to the statistical information within the image. As articulated by Benjamin Fry, a contemporary information visualisation practitioner and author,"(o)ften, less detail will actually convey more information, because the

Figure 1. Otto Neurath's Births and Deaths in Germany in a Year [5]. (© Springer).



inclusion of overly-specific details cause the viewer to disregard the image because of its complexity" [6]. Yet ironically, Fry hits on a central weakness of the Isotype and visualisation work in general. The apparent simplicity of these images obscures the complexity of how the data they contain was collected and what was deemed relevant and irrelevant for inclusion. The obviousness and seeming clarity of visualisations grants these images legitimacy and an apparent objectivity that is open to misuse. In the well-known writings of Edward Tufte, numerous examples are cited of what he refers to as 'chart junk': visualisations that adopt graphic strategies to skew datasets to serve various agendas [7]. What Tufte illustrates is that visualisation is a tool that is as likely to be used in the service of reactionary agendas as it is to be used in the service of clear and objective communication as was Neurath's dream.

The irony of both the Isotype visualisations of statistical information and of contemporary computationally driven visualisation work is that these images actually require an enormous amount of contextual education in order for people to critically engage with them and therefore understand what is being represented. A similar critique is well developed by Benjamin Bratton and Natalie Jeremijenko in *Situated Advocacy*, in which they discuss these issues in relation to environmental data works [8]. In this text Jeremijenko critiques the oversupply of environmental information in art and design projects in recent years, specifically disputing their claim to the production of better knowledge of our environmental conditions. She argues that designers and artists have typically failed to ask how the environmental information was collected, why particular datasets are privileged over others and therefore what ideologies might be reflected in these choices. Although these creative practices aim to provide a critical environmental discourse, they do not adequately interrogate the politics of their information production nor provide their audience with access to this contextual information. This relates to the paradox of visualisation projects: although they aim to communicate information, if this is done uncritically, they concurrently obscure aspects of how and why this information was collected. For visualisations to be effective and truly political instruments, they must engage with the process by which the information is produced.

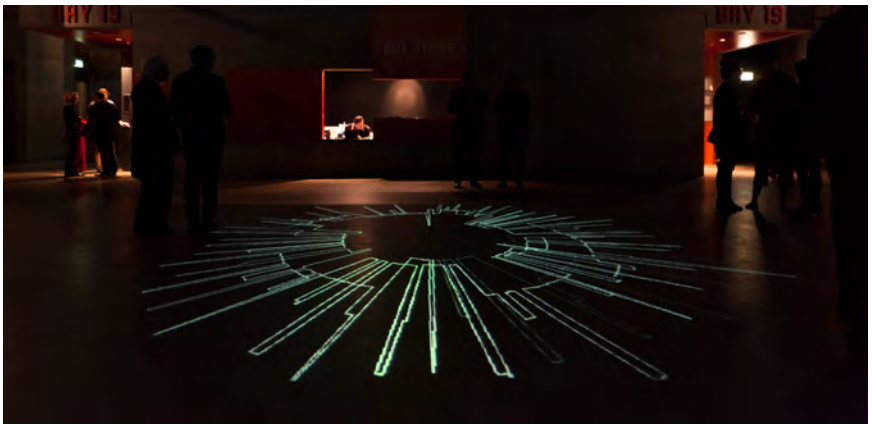


Figure 2. KiloWatt Hours, 2011. (© Tega Brain. Photo © Alex Wisser).

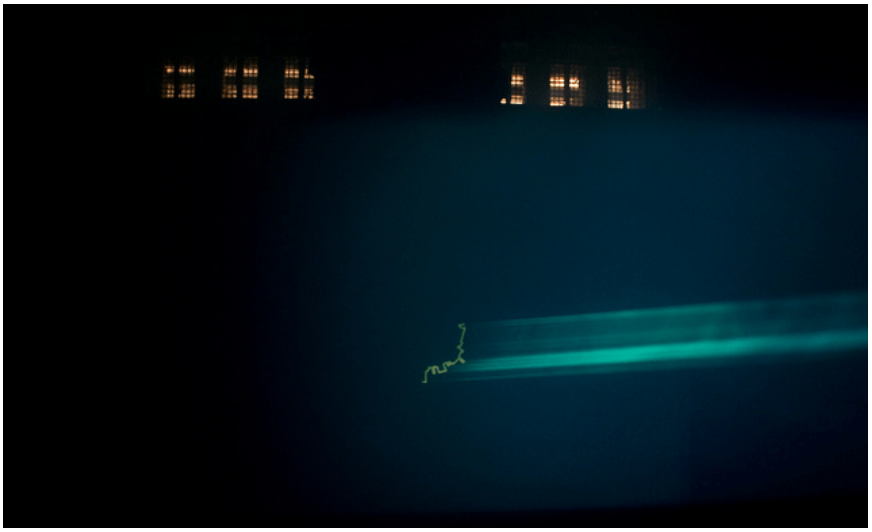


Figure 3. CO2NE, 2010. (© Tega Brain. Photo © Sarah Caufield).

In response to the complexity of information visualisation, in 2012 I began to explore the possibilities of using odour as a medium for information production. I began to explore non-visual aesthetic strategies for creating relationships to environmental information. This exploration built on some of my previous installation works that measure and visualise electricity usage measured from public buildings. These works include *Kilowatt Hours*, 2011(Figure 2) that uses electricity information to inform a projected 2 dimensional animation and *CO2NE*, 2010 (Fig. 3) that renders this information as 3 dimensional space. These earlier works respond to some of the shortcomings of visualisation work discussed here by engaging with the process of collecting the data as well as the process of visualising it. Yet as with much visual media, the information contained within these installations remains at a distance from the viewer. *What the Frog's Nose tells the Frog's Brain* responds to this observation. This installation work uses smell to produce electricity information as a sensory and embodied experience.

Humans are equipped with an incredibly sensitive sense of smell. As observed by Wagner and Jasper [9] in their thorough article *Notes on Scent*, humans are able to detect substances like pyrazines at concentrations of 1 part in 500,000 million – literally by the molecule. However despite this acute sensitivity, smell remains commonly misunderstood as a subjective sensation. As observed by many authors, the human sense of smell is actually incredibly objective – humans are consistently able to detect the same molecules at extraordinarily low concentrations and it is rather our ability to accurately describe a scent that is subjective [10]. What smell lacks is an adequately descriptive vocabulary. As Kant observed in 1798, *"all the senses have their own descriptive vocabularies, e.g. for sight, there is red, green, and yellow, and for taste there is sweet and sour, etc. But the sense of smell can have no descriptive vocabulary of its own. Rather,*

we borrow our adjectives from the other senses, so that it smells sour, or has a smell like roses or cloves or musk. They are all, however, terms drawn from other senses. Consequently, we cannot describe our sense of smell" [11].

The disconnect between smell and language, and the resultant plasticity of its description, was demonstrated by an experiment published by Trygg Engen in American scientist in 1987, in an article titled "Remembering Odours and Their Names" [12]. Participants were asked to first describe a series of scents with no verbal stimulus, and then in a second test, asked to identify the scents via multiple choice. Engen concludes that once a subject has an expectation of what the name of an odor might be, that name will largely control the sensation which will be perceived as fitting the name. By contrast, the presentation of a scent before a name is available does not have a similar effect. The unavailability of a verbal response leaves one in what he calls a "tip of the nose" state, unable to recall a name even though the odour is familiar [13]. For smell, context is everything.

Engen also observes the incredibly tight bind between smell and emotional memory that can persist over long durations of time. Unlike our visual memories, time has little impact on our olfactory memories which can remain intact over many decades. The presence of a scent encountered at a moment of emotional significance can transport us back to that moment with an uncanny vividness. The perfume worn by a first lover or the smell of a hospital after an accident can strongly evoke the emotion and sensation of that experience decades later. Some select smells also inspire an innate and predisposed response. The smell of burning hair is unmistakable and always alarming, the scent of chlorine ironically indicates dirt and the smell of scatole, which smells of faeces, always disgusts us. Could the tight bonds between certain scents and their predisposed responses be exploited for the design of information interfaces?

What the Frog's Nose Tells the Frog's Brain (Figure 4) consists of an experimental device that monitors the electricity use of the surrounding building. When the device measures an increase in electricity usage above a predefined threshold, it deploys a scent in the gallery. The scent selected was that of cade oil. Derived from the distillation of the sap of the tree *Juniperus oxycedrus*, cade oil smells acrid and smoky. The viewer's personal interpretation of this scent defines its emotive potential – it may alarm or unnerve or bring back past memories. However with ongoing use, the presence of this scent would act as an ambient reminder of the viewer's own ecology, of their intimate connection to a system of electricity provision.

Figure 4. What the Frog's Nose Tells the Frog's Brain. (© Tega Brain. Photo © Leigh Russell.)

What the Frog's Nose Tells the Frog's Brain is an information work that breaks away from the visual realm and therefore also from the aesthetic strategies so privileged by Neurath. By producing information via ambient sensation, the work responds to some of the complexities of common data visualisations. Conventional electricity meters typically fail to motivate us to alter our daily behaviours, making these informatic interfaces ripe for redesign. Yet it would be naive to simply add smell to the armoury of communicative strategies available for connecting our actions with their environmental consequences. As my creative experimentations show, smell is a highly rhetorical system of suggestion and one that trades the clarity of the visual for a more ambiguous yet deeper connection to the subconscious. In this way, *What the Frog's Nose Tells the Frog's Brain* draws attention to the innate bias of our own perception of the visual and by doing so, demonstrates that the technological production of information does not simply mediate how we understand our environment, but is potently active in its making.

References and Notes

1. See the numerous publications of Edward Tufte such as:
Edward Tufte, The visual display of quantitative information (Cheshire, CT: Graphics press, 1983).

Edward Tufte, Envisioning information (Cheshire, CT: Graphics press, 1991).

Also more recently published is:
Ben Fry, Visualizing Data: Exploring and Explaining Data with the Processing Environment (California, O'Reilly, 2008).

2. Jordi Cat, "Otto Neurath", *The Stanford Encyclopedia of Philosophy*, Edward N. Zalta (ed.) (Winter 2011).

<http://plato.stanford.edu/archives/win2011/entries/neurath/>.

3. George Pendle. “Otto Neurath’s Universal Silhouettes”, *Cabinet Magazine*, **24** (Winter 2006/2007) <http://www.cabinetmagazine.org/issues/24/pendle.php>

4. Otto, Neurath. International Picture Language; the First Rules of Isotype: With Isotype Pictures. K. Paul, Trench, Trubner & Company (1936).

5. Otto Neurath, "From Vienna method to Isotype." in *Empiricism and Sociology* (Netherlands: Springer 1973) p. 218.

6. Benjamin Fry. Visualizing Data: Exploring and Explaining Data with the Processing Environment, Sebastopol, (Califronia, O’Reilly, 2008).

7. Tufte (1991) [1] p.34-35.

8. Benjamin Bratton & Natalie Jeremijenko “Latent interfaces, Suspicious images” in *Situated Technologies Pamphlets 3* (New York: The Architectural League of New York, 2008).

9. Adam Jasper and Nadia Wagner, “Notes on Scent, How do you smell?” in Cabinet Magazine, 32 (2009). <http://www.cabinetmagazine.org/issues/32/jasper_wagner.php> .

10. Many authors have observed the difficulty in describing smell in language. These include:

Jaron Lanier, You are not a gadget. (Random House Digital, Inc., 2010) p.164.

Trygg Engen, "Remembering odors and their names." American Scientist 75, No. 5 (1987) pp. 497-503.

Immanuel Kant. Reflexionen zur Anthropologie (Rice land,1882).

11. Cited by Jasper and Wagner [9] and translated by these authors from Immanuel Kant. Reflexionen zur Anthropologie (Rice land,1882).

12. Engen [10].

13. Engen [10], p. 501.

LEARNING TO DANCE WITH A HUMAN.

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Abstract

Artificial neural networks are an effective means of allowing software agents to learn about and filter aspects of their domain. In this paper we explore the use of artificial neural networks in the context of dance performance. The software agent's neural network is presented with movement in the form of motion capture streams, both pre-recorded and live. Learning can be viewed as analogous to rehearsal, recognition and response to performance. The interrelationship between the software agent and dancer throughout the process is considered as a potential means of allowing the agent to function beyond its limited self-contained capability.

Keywords: Software Agent, Artificial Neural Network, Dance and Technology, Distributed Cognition, Machine Learning, Interactive Performance.

Introduction

In creating dance performances incorporating live motion capture of dancers within a projected stereo 3D environment, questions arose regarding the integration of immersive digital sound and visual environments as a component of the live dance performance. Motion data can be used as a direct source for visualisation without any analysis by the software environment. While this has led to many satisfactory results within the performances, it raised the possibility that the software environment could have a greater capacity for interpreting and responding to the dancer's movement. This would enable a more complex performing relationship between the dancer and software agent to develop. Artificial intelligence techniques have been used to visualize, sonify, and respond to dancers' movement in performance for many years [1, 2, 3, 4, 5]. We wanted to explore whether it is possible to develop a performance agent that can participate in some way within the choreographic process as well as within the performative outcome. Seminal work in this area has been done by Marc Downie [6] and OpenEndedGroup [7]. However, whereas their work did not make use of skeletal representations for the agent, we have chosen to use the same internal skeletal representation for both the dancer and agent so as to give them both a measure of equality in how they are viewed and represented. We can then use the dancer and agent's movement streams somewhat interchangeably. In this paper we have used a humanoid representation to illustrate the movement of both dancer and agent, for purposes of clarity. Both the dancer and agent are represented by similar avatars (their visual embodiment). In further artworks the representation can be markedly different.

We investigated the Artificial Neural Network(ANN) as a means of allowing the agent to learn movements from the dancer and subsequently recognise and respond using the learnt vocabulary. We modelled the performance development on a sequence of events familiar to the dancer. In our model, movement material is generated by a dancer through a process of selective improvisation. The improvised sequences are recorded and passed to the agent to learn as in a rehearsal. After the agent has learnt the material, the dancer improvises with the trained agent and the movement vocabulary is refined based on the responses from the agent. The refined movement choices become the vocabulary for the performance between dancer and agent. There were two main goals attached to choosing this performance making process. One was to try to integrate the development of the agent into a fairly typical dance developmental process. The other was to allow the experience of the dancer to support the agent as much as possible at all stages in order to maximise its capabilities in performance.

The relationship between the dancer and agent was viewed through the lens of situated cognition [8] and socially distributed cognition [9, 10] as a means of framing their interdependent relationship. Situated cognition suggests that cognition cannot be separated from the context in which it exists. Distributed cognition holds that knowledge can exist not only in individuals but also in their social and physical groupings. A cognitive ecosystem comprising two or more agents allows cognitive processes to be distributed amongst its members [11].

Designing a performing agent

Matt Carter in *Minds and Computers* writes:

… embodied experience was a necessary condition for the development of semantics, which, in turn, are necessary for having a mind. Consequently, if we want to develop an artificial intelligence it must, in the first instance, be connected to the external world in the relevant ways. In other words, it must enjoy sensory apparatus which mediate the relations between it and the external world. Furthermore, our embryonic artificial intelligence must then be able to gather a weight of experience, through which it will be conferred with mental representations. [12]

Memory, the weight of experience, is seen by Carter as a fundamental building block upon which mental representations may be constructed. Carter also introduces two other key concepts, that of embodied experience through sensory apparatus and the fundamental relationship between the agent and environment.

In dance, embodied experience and hence memory is embedded within the morphology of the human body. Memory in dance is procedural, in the

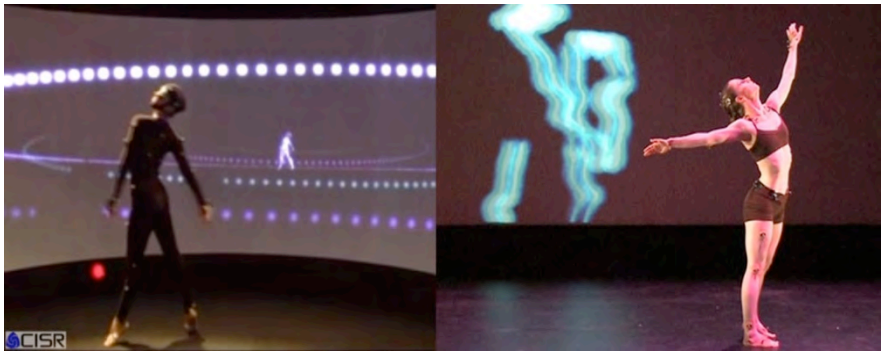

Figure 1. The agent had access to both Optitrack (left) and Motion Analysis (right) motion capture systems for sensory input in live performance environments. Movement sequences captured with these motion capture systems were presented to the agent's neural network during the learning phase. Image © John McCormick 2012

sense that, like expert movement in other elite professions, once learned, complex dance movement phrases are performed without conscious cognitive awareness [13]. Memory, in this case, is enacted only through moving one's body. Erin Manning [14] argues that dance movement is also inherently relational, proceeding from a 'pre-acceleration' that defines intentionality in relation to the world and to other people as well as trajectory. She describes dancing a duet with another person as "…not a learning by heart. It is not a choreography. It is improvising with the already-felt" [15]. Manning's argument suggests that the procedural nature of dance memory does not imply that dance performance is fixed by the past, but rather that the body memory of past movement is brought to bear on the present moment. This process is constituted in terms of felt and experienced physical morphology and structural (skeletal) organisation, because memory encompasses the sensation of movement rather than simply a linguistic encoding of the pathways of joints and limbs in space.

If our agent were to participate in a performance process, it would need access to a form of memory constituted in and by the parameters of human movement. We used full-body motion capture to provide both input and an interactive mechanism for the agent, its sensory apparatus. Two different systems were used, Motion Analysis and Optitrack, illustrating that our agent was independent of specific motion capture systems. The motion capture systems became the sensory input mechanism for the agent, providing it with a distilled view of the dancer's movement that functioned as the agent's source of experience and of sensory connection to the environment (Figure 1). Both motion capture systems are multi-camera optical systems which captured the positions of reflective markers on the body at 120 fps. The MAC system used 40 markers, the Optitrack 34 markers. The marker positions were used to construct a skeletal representation of the dancer in order for the agent to view the dancer in terms of movement of the body and limbs. This also allowed the agent to respond through its own avatar using the skeletal movement it had learned.

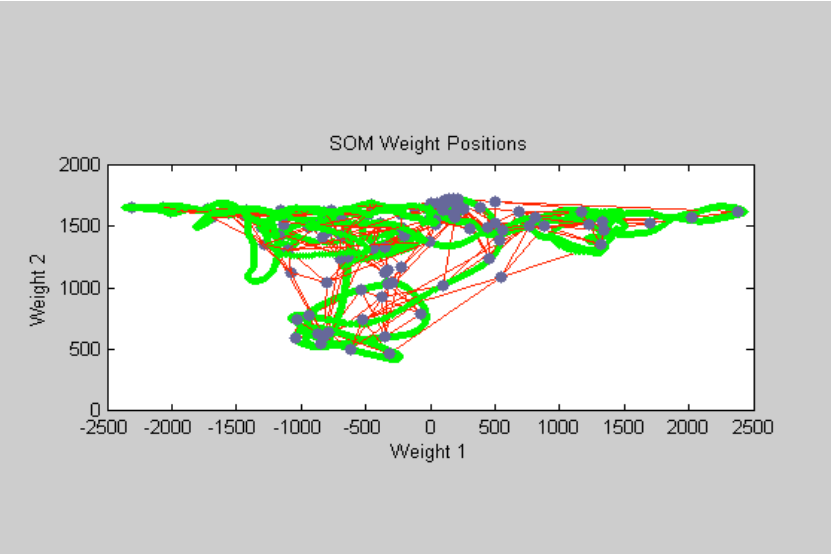

Figure 2. SOM_Weights. The green represents the input, the grey represent the neuron weights. Over time the neuron weights move to match the inputs. This a 2D representation of only the first 2 vectors of 57. In the final network there are 79 vectors or pieces of information that describe the skeletal information. Image © John McCormick 2012

Our synthetic agent was tasked with the goal of being able to recognise a live dancer's movement and responding via animating a 3D avatar with the movement vocabulary it had learnt. In our search for models of intelligence that might guide the development of an ability to synthesise movement elements into sequences, the areas of situated *[8, 16]* and distributed cognition [9, 10 11], seemed to offer an appropriate, if challenging, paradigm within which to explore the development of an intelligent agent within a live performance context. Situated cognition, with its premise of extremely tight coupling of cognitive processes to the environment, seemed potentially aligned with both the desire to more closely couple the dancer and performance environment and the development of a synthetic agent which could also respond intelligently to its environment of which the dancer is the major part. Distributed cognition has been applied to studies of social remembering and cognition, notably between couples [9,10, 11]. We were interested to see if this framework could be extended to include the agent – human relationship.

Situated cognition is broadly based on connectionist models of cognition rather than a computational model of storage and retrieval. Connectionist models favour concepts of neuronal plasticity and deep parallelism of atomistic processes to account for complexity of behaviour. For the synthetic agent, the closest model analogous to the neuronal component of cognition are Artificial Neural Networks (ANN) which have been used extensively to model cognitive processes including human gestures [17,18]. In particular, unsupervised ANNs are employed as they are currently viewed as a close representation of real neural processes [19]. Unsupervised methods of learning allow the neural network to find its own associations within the data presented to it (in this case movement encapsulated within motion captured

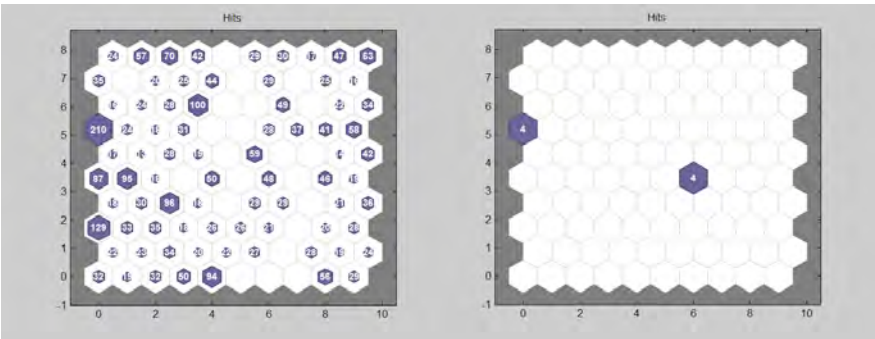

Figure 3. SOM Neuron Hits. Dance sequence as learnt by the network (left) and neurons triggered when test frames are introduced to the trained network (right). Similar postures are clustered within particular neurons as indicated by the numbers of similar postures captured by the neurons (left). Two short sequences of known postures, when introduced to the network, fired the corresponding neurons containing like postures (right). Image © John McCormick 2012

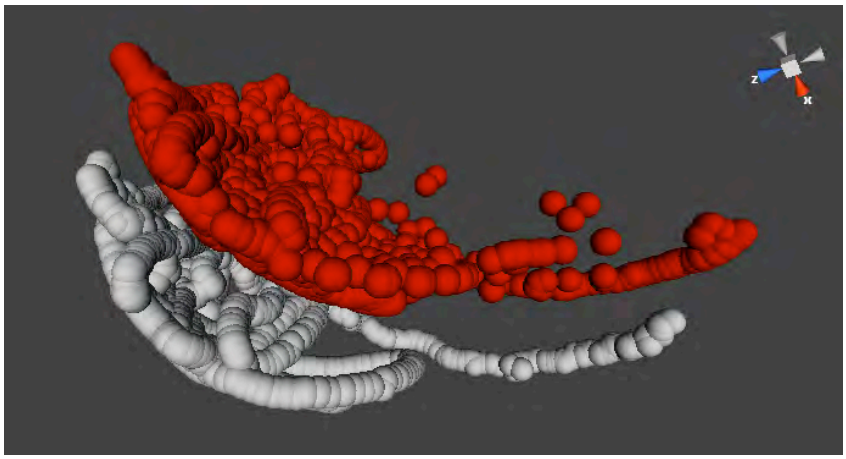

Figure 4. Visualisation of 3 dimensions out of 79, of the input data (grey) and neuronal weights (red) of a movement phrase captured with the Optitrack system and displayed in a 3D game engine. The offset is artificial for visualisation purposes, the neuron weights and input dance data are directly overlaid on top of each other. During learning the information contained in the neurons increasingly matches the movement information. Image © John McCormick 2013

sequences). This differs from supervised methods, which encourage the network to converge on an optimal solution to a known problem.

The somewhat ambiguous or latent potential offered by unsupervised learning could allow the agent greater scope for variability as opposed to known responses when synthesising movement, a feature identified by Kirsh [20] as beneficial to creativity. Kirsh suggests the high level of innovation choreographer Wayne McGregor achieves through setting his dancers tasks, arises from distributing the creative process beyond the limits of his own body and mind, allowing him to recruit ideas from a larger and more diverse pool of creative possibilities. However, this distribution of creativity is more than simply a way of sourcing external inspiration for movement invention, as in Merce Cunningham's throw of the dice [21] or Trisha Brown's alphabet cube. [22] This is not to say that Cunningham and Brown did not also engage in responsive processes with their dancers, however the Kirsh study documents these reciprocal processes in a formal study. Tasks described by Kirsch include *…imagine that their bones are made from firm rubber, or that they should imagine the feeling of being attacked. Their task is to translate those feelings into movements.* [20] In the processes, as Kirsh describes, creativity is accomplished collaboratively between McGregor and his dancers through reciprocal and responsive processes, rather than by the dancers simply providing a larger pool of ideas for McGregor to choose from.

Employing a situated approach whereby the human and synthetic protagonists become part of an extended cognitive system in our process allows the synthetic agent to be supported by the human performer's processes, and potentially allows it increased scope over the relatively rudimentary capabilities it would have as a self-contained entity. This is not unlike human dance development processes in which dancers typically learn by dancing with more experienced artists over a number of years, learning by directly experiencing the embodied knowledge of others.

To enable the agent to gather a weight of experience, a persistent memory of the dancer's movement, a type of Artificial Neural Network known as a Self-Organising Map (SOM) was used [23]. The SOM is an unsupervised ANN in that the network is presented with the movement data without any type of labelling, and finds its own associations within the data. The initial experiments were undertaken in Mathworks Matlab using the Neural Network Toolbox. Initially, a 100 neuron network was presented with a recorded sequence of dance. Over 100 iterations, the network was able to classify similar postures found within the sequence into clusters contained within specific neurons. The input sequences consisted of frames of movement defined as position and joint rotation information describing body postures. There were 99 pieces or dimensions of information to describe each frame of movement for the Optitrack system, and 161 dimensions for the Motion Analysis system. The information or weights contained in each neuron gradually changed under the influence of the input data until the neuron weights closely matched the movement inputs (Figure 2). When the network was subsequently presented with individual postures, the neuron containing similar postures was stimulated demonstrating the network's ability to learn aspects of the movement phrase and to then use this learning to recognise similar postures (Figure 3).

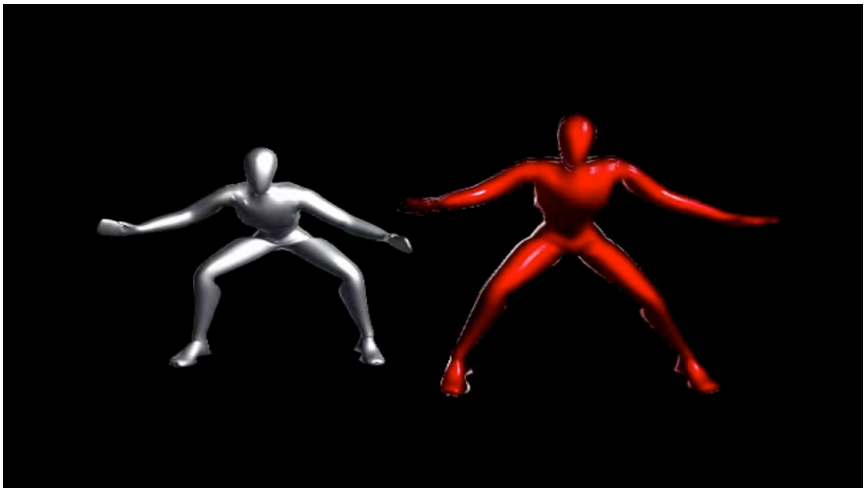

Figure 5. Neural Network Agent (red) responding to the live dancer (silver) with the closest match from its learnt memory. Image © John McCormick 2013

Results

The results using pre-recorded data were very promising. The SOM could learn to cluster similar movement postures into groups within specific neurons within the network, and these neurons responded to incoming movement postures, allowing the remembered movements contained therein to have focus.

The next stage positioned this capability within an agent running in a 3D game environment with live input from a human dancer. We used the Unity game engine and developed the agent and data streaming components in C# and C++. The data stream was reduced to 79 di-

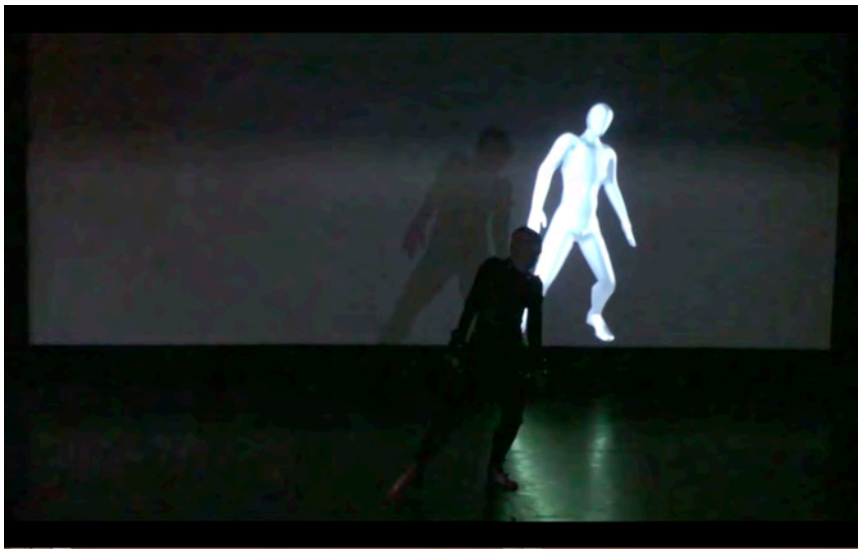

Figure 6. Neural Network Agent responding to live dancer with learnt movement from memory. Image © John McCormick 2013

mensions, optimised for the live context. The dancer created some improvised movement sequences while considering that the agent would use them to learn a shared movement vocabulary, use the learnt movement to recognise what she was performing and follow her, and use the learnt material to generate movement sequences in response to movement "seeds" (postures) that she provided. The agent's neural network was first exposed to the recorded sequences of movement, akin to a rehearsal stage in a creative context, and allowed to learn to classify individual movements contained in the dance (Figure 4). During the learning process, a second map was introduced to capture temporal information in the form of links between neurons as they were stimulated. This created pathways through the neural network that linked movements over time and provided a basis for the agent to navigate its learnt movement memories to synthesise movement responses. Some neurons would accrue multiple possible future pathways and the initial tendency was to follow the last known good connection.

Once the network had finished the learning process, the dancer improvised with the agent to both reacquaint herself with the movement vocabulary (it was improvised not set), and to discover how the agent responded to her movements and the kinds of choices she could make in response. As a trial performance, we tasked the agent to firstly recognise the dancer's improvised movement as best it could and respond with the closest movements it had learnt (Figure 5, 6). Next the dancer could improvise and at any time provide a seed movement which the agent could use as a beginning point for a newly generated movement sequence, until the next seed (Figure 7). The first study tested the agent's ability to continually recognise particular movement postures and produce a reasonable response. The second study tested the agent's ability to use the learnt vocabulary to create appropriate movement responses to a dancer's movement cue. The agent and dancer were confined within a relatively known vocabulary emerging from a semi-improvised structure, however a typical performance might also be confined to a particular, finite movement vocabulary.

Figure 7. Neural Network Agent creating a movement sequence from a seed movement supplied by the live dancer. Image © John McCormick 2013

The SOM chosen for the agent's neural network proved robust in engaging with a dancer in a live performance context. While the SOM is a relatively simple neural network, the results indicate the neural network approach to learning and creating movement sequences in response to a live dancer has definite potential.

Agent as collaborator

Watching the agent's avatar dance with a live performer was like watching a young dancer attempting to learn from a more experienced performer. The avatar's movement closely resembled that of its 'teacher', but with subtle variations. The avatar movement seemed conceptually related to that of the human performer (in the sense that 'conceptual', here, is defined in three-dimensional, spatio-dynamic terms rather than in cultural or gestural ones), but not identical. The agent seemed to be effecting an iteration rather than a copy of the human performer's style.

Having designed the agent with the knowledge that it could draw on the intelligence of the dancer at all stages enabled us to use relatively simple processes to reach a significant outcome. The agent was able to recognise and respond in an appropriate manner to the dancer in a performance setting. The dancer was also able to proceed on a familiar creative trajectory with an understanding of how her creative work would be embedded within the relationship between herself and the agent.

Conclusion

In this project, we designed a performance agent that can become part of a collaborative, creative process, as it does a typical workflow from inception, through rehearsal to performance. Applying principles of situated cognition

prompted us to view the learning acquisition of the agent in terms of increasing effectiveness in performance rather than self-contained accumulation of knowledge. The relationship with the dancer was seen as part of this effective capacity and allowed the agent to become part of a cognitive ecosystem that vastly aided its capabilities in terms of being an effective performer.

One of the possibilities for future research is the ability for the agent to better synthesise movement. While the generated movement is confined within a finite vocabulary, this is not unusual for any one performance. The vocabulary can be easily extended by the dancer recording thematic improvisations and passing them to the agent to learn. New methods of traversing the neural network to create variations on the movement vocabulary are currently under investigation.

References

1. J. Birringer, *Performance, Science and Technology* (New York: PAJ Publications, 2008).

2. S. Dixon, *Digital Performance: a history of new media in theater, dance, performance art, and installation* (Cambridge, Mass, London : MIT Press, 2007).

3. S. deLahunta and F. Bevilacqua, "Sharing descriptions of movement," *International Journal of Performance Arts and Digital Media*, 2007 3, no. 1 (2007) pp. 3–16.

4. S. delahunta, "The choreographic language agent", in *World Dance Alliance Conference*, Brisbane, Australia, 2008. <http://ausdance.org.au/articles/details/the-choreographic-language-agent> accessed July 1 2013.

5. S. Broadhurst, *Digital Practices: Aesthetic and neuroesthetic approaches to performance and technology* (Basingstoke, UK; New York, N.Y. : Palgrave Macmillan, 2007).

6. M Downie, *Choreographing the extended agent : performance graphics for dance theatre*, PhD Thesis, MIT 2005. <http://dspace.mit.edu/handle/1721.1/33875> accessed July 1 2013.

7. OpenEndedGroup, *how long does the subject linger on the edge of the volume*, 2005 Artwork <http://openendedgroup.com/artworks/howlong.html> accessed July 1 2013.

8. Robbins, P.; Murat Aydede, e., *The Cambridge Handbook of Situated Cognition*. Cambridge University Press: 2008.

9. Barnier, A. J.; Sutton, J.; Harris, C. B.; Wilson, R. A., A conceptual and empirical framework for the social distribution of cognition: The case of memory. *Cognitive Systems Research* 2008, *9* (1-2), pp. 33-51;

10. Harris, C. B.; Keil, P. G.; Sutton, J.; Barnier, A. J.; McIlwain, D. J. F., We remember, we forget: Collaborative remembering in older couples. *Discourse Processes* 2011, *48* (4), pp. 267-303;

11. Sutton, J.; Harris, C. B.; Keil, P. G.; Barnier, A. J., The psychology of memory, extended cognition, and socially distributed remembering. *Phenomenology and the Cognitive Sciences* 2010, *9* (4), pp. 521-560.

12. Carter, M, *Minds and Computers : An Introduction to the Philosophy of Artificial Intelligence*, Edinburgh University Press 2007. p. 206

13. C. Stevens & S. McKechnie, "Thinking in action: thought made visible in contemporary dance," *Cognitive Processing: International Quarterly of Cognitive Science*, Vol. 6, 243–252 (2005).

14. E. Manning, *Relationscapes: Movement, art, philosophy* (Cambridge, Massachusetts & London: MIT Press, eBook, 2009).

15. Manning [14] p. 380.

16. A.Clark, D. Chalmers, The Extended Mind. *Analysis* 1998, *58* (1), pp. 7-19.

17. G. Caridakis, K. Karpouzis, A. Drosopoulos & S. Kollias, 2010, 'SOMM: Self organizing Markov map for gesture recognition', *Pattern Recognition Letters*, vol. 31, no. 1, pp. 52-59.

18. A. Shimada, 'Gesture recognition using sparse code of Hierarchical SOM ', paper presented to ICPR 2008. 19th International Conference on Pattern Recognition, Tampa, FL 8-11 December 2008.

19. T. Kohonen , *Self-organizing maps*, 2nd ed, Springer, Berlin, New York, 1997.

20. D. Kirsh, 'Creative Cognition in Choreography', in *Proceedings of 2nd International Conference on Computational Creativity*, Mexico City, 2011.

21. S. Banes, '*Writing Dancing in the Age of Postmodernism*', Wesleyan University Press, ebook, 2011, p. 103.

22. M. Sulzman, *Choice/Form in Trisha Brown's "Locus": A View from inside the Cube*, Dance Chronicle, Vol. 2, No. 2, 1978, pp. 117-130.

23. T. Kohonen, *Self-organization and associative memory*, 3rd ed, Springer-Verlag, Berlin, New York, 1989.

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HIDDEN TOPOLOGY OF LIFE: LIFE AND SPACE

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Abstract:
Taking into account a variety of contemporary definitions of life, I propose to focus on relations between complex systems of life processes and the evolution of our perception and concepts of space. My investigations are closely connected with a series of artistic projects under the common title The Hidden Topology of Being which are realized in cooperation with science research centers both in India and Poland. In this short presentation I do not concentrate to a great degree on the description of my artistic works but on questions of how science, humanities and cultural imageries influence each other and combine in shaping our understanding and knowledge; and how technology modulates these relations.

Key words: art & science, space, life, spatial thinking, multidimensionality, biomolecules, biosystems

Our perception and understanding of the phenomenon of life has been changing drastically in recent decades. Aristotle's concept of life, which prevailed in the humanistic tradition for over two thousand years, was based on the notion of a living organism. Since we have acknowledged that life "happens" on the molecular level, this view has lost its dominant position, giving way to other avenues of approach. Many scientists claim that only DNA is "alive" and what we used to perceive as a "living organism" is merely a part of the much larger habitat of a replicating gene. The essential feature of a gene is that it contains information about its close environment and causes this information to be stored and transmitted. Thus life processes are often identified with processing (preserving / transmitting / exchanging) information.

Furthermore, the Encyclopedia Britannica focuses more on thermodynamic than genetic issues. Following Carl Sagan, it states that a living formation is a distinguished part of space in which, due to the energy flow, entropy decreases periodically. The second law of thermodynamics secures the balance between highly organized living processes and the increasing entropy of the Universe.

Another interpretation of biological processes is associated with the so called "life imprint": a spatio-temporal pattern in the physical environment indicating some highly organized activities which we could recognize as life. All of these definitions are interconnected and refer in one way or another to space.

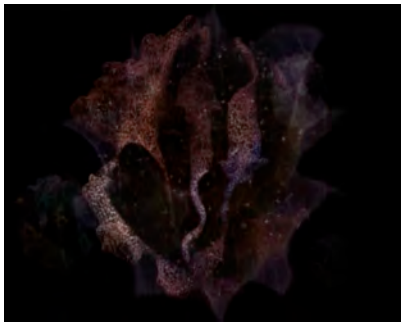

Fig.1. "Hidden Topology of Being" still from the video-animation. ©J.H-D

I found inspiration for my artistic investigation in Stefan Semotiuk's philosophical deliberations at the conference "Space in Contemporary Science"[1]. From Semotiuk's perspective, life can be perceived as a mode of existence of space and, vice versa, space can be treated as a mode of existence of life. This tautological definition not only implies the understanding of a "unit of life" (or an "individual existence") as an integral fragment of its physical environment, but also locates its parameters at the heart of the rich history of human culture, based on the diversity and evolution of our spatio-temporal conception of reality.

In this paper, I would like to share my reflections on the relations between life and space; questioning how science, humanities and cultural imageries influence each other in shaping our perception and knowledge, and how technology modulates these connections.

My inquiries are strongly linked to my long-term project *The Hidden Topology of Being* [fig.1.] which embraces a series of multimedia works realized with the support of research centers in India and Poland: the International Centre for Genetic Engineering and Biotechnology in New Delhi, the CEMA Centre for Experimental Media Art and the National Centre for Biological Sciences in Bangalore, as well as the Genesilico Laboratory of Bioinformatics and Protein Engineering, and the International Institute of Molecular and Cell Biology in Warsaw [2].

Spatial thinking

When we scrutinize the history of the European comprehension of space and time, we can easily notice that it has by no means been homogenous. In fact, the passion for "spatialization" can be seen as islands in the kingdom of Chronos. The group of "geometrizing" philosophers like Pythagoras, Parmenides, Zeno from Elea, Plato or Euclid prevailed for only a few centuries (VI-III B.C.). Then the interest in space diminished because priority was given to human and cosmic existence in time. Even in art, the invention of perspective appeared quite late and after only a couple of centuries, Renaissance techniques of creating illusions of "depth" began to lose their importance.

It was only Johannes Kepler who publicly opposed the domination of Chronos, stating: "Credo spatioso nomen in orbe". His viewpoint was supported by Galileo, Descartes, Newton and others, proving connections between "spatial thinking" and advances in science. In biology, for example, the idea of a torsional space of animated matter, introduced by J.W.Goethe and followed by L.Pasteur, led to the discovery of the double helix of DNA. Chemistry developed crystallography and a single atom became a "scroll of space" using John A. Wheeler's term [3]. Even regularities like Fibonacci numbers, revealed in many natural forms, turned out to be the indication of overlapping spatial spirals in opposite directions.

Looking from today's perspective, it seems that the last century brought the ultimate victory of space over time. The mathematical intuitions of C.Gauss, L.Lobaczevsky, H.Minkowski or E.Lorenz were soon satisfied by Albert Einstein's discovery of united and relative space-time. Time became just one more spatial dimension in the multidimensional nature of our reality.

In modern culture, time also lost its dominant character. Focused on the future, the avant-garde treated it as a territory that ought to be conquered and colonized; a space that one can volitionally shape. This attitude has continued and has been reflected in many fields of human activities from space programs to nanotechnology and genetic engineering.

Anthropomorphic nexus: scales & dimensions

When examined from the biological perspective, the space of every species can be defined by its anatomy, its environment and its activities based on

its morpho-physiology. In the case of the human being, the technological space gives extra-morphological means to reach spaces beyond direct sensual experiences. It influences strongly what can be truly named as "human space": the ratio of a given/inherited space to a constructed one. Their dynamics are clearly uneven and we are subjected to the incessant clash of these two spaces. Then, the expansion of the constructed space dooms us to the effort of the constant translation of its micro and macro scales into the mezzo scale of our direct experiences and imagination.

By nature, each of us feels and comprehends any space from the center of our own space. Thus we cannot entirely avoid the anthropomorphism of space and the perceiving of ourselves as a nexus where all scales and dimensions interact and merge.

The Hidden Topology of Being – Proteios

Searching for a key to the investigation of this nexus through my art, I went to India, to the International Centre for Genetic Engineering and Biotechnology in New Delhi, where my fascination with the protein molecule begun. This "basic brick of life" is made of elementary constituents of cosmic matter: mainly of carbon, oxygen, hydrogen and nitrogen. As we can imagine, their journey from the nuclei of stars to our bodies was extremely long and complex. In its latter part, each carbon atom was photosynthesised by a plant; each oxygen atom was part of an ocean. Our bodies share not only genetic information (coding our proteins) but also environmental information.

There is some optimism in the fact that at the atomic level, inscribed in the cosmic recycling system, we are practically immortal. Even an atomic arrangement of a protein (revealed by treating its crystallised form with X-Rays) can be easily mistaken for a fraction of the starry sky. Yet, it does not hide stories about our gods and ambitions but sequences of amino acids. An unexplainable readiness of nature to connect these short monomers, suggested by the Miller-Urey experiment as well as by the analysis of meteorites, supports both hypotheses of a biogenesis and panspermia.

Still, an amino acid sequence (the primary structure) says very little about the complexity of the unique topology of a folded protein. The amount of dimensions needed to describe its conformation (tertiary or quaternary structures) equals "$3D^n$" where "n" is the number of atoms. This is far beyond the capabilities of our minds to envision. I was already enchanted by the geometrical beauty of the secondary structure, with its folding alpha helixes, beta sheets and turns. They reminded me of the mysterious geometric formations named Calabi-Yau spaces in which, according to the superstring theory, successive dimensions of our world are "curled up" on the subatomic level. I found not only formal resemblances, but also similarities in their evolvement: from a point (an atom) into a linear narrative (a chain of amino acids) shaping, bending and twisting surfaces into complicated spatial structures of interactions.

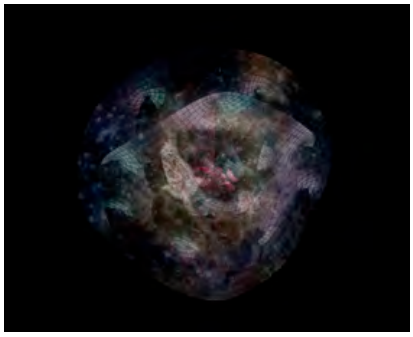

Fig.2. "Proteios", still from the 3D video-animation.
©J.H-D

In a video animation *Proteios*, a fragment of cosmic space folded into a Calabi-Yau form gives rise to a folded molecule of protein, in a poetic way alluding to the complexity of our realm. If the scientific hypothesis about the multi-dimensional nature of the world is true, then Calabi-Yau spaces are everywhere, in each "point" of the space outside as well as inside us [fig.2].

One day, maybe, our brain will be able to perceive how we exist in the multidimensional universe or even multiverse. For the time being, we have only our imagination in command and an enormous diversity of protein globules, each of them suggesting, in a different scale, a blister of some world [fig.3].

Fig.3. "Hidden Topology of Being", still from the 3 video-animation.
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Post-Pythagorean dreams

The more we expand the borders of our cognition the more we discover relations between micro and macro structures of our universe. The holistic attitude is not a new one, but it acquires a new reading of our times when outlined by quantum physics and its interpretations of the physical world as an indivisible dynamic whole or, using Paul Davies's words, "an inseparable web of complicated energy patterns in which no one component has reality independent of the entirety; and included in the entirety is the observer" [4]. A juxtaposition of images, showing neural and intergalactic connections, may serve as an inspiring illustration of such a fundamental unity [5].

Pythagoras was the first person who took up the challenge of connecting the human internal world (*Musica Humana*: the music of a human body and soul) with the universe (*Musica Mundana*, later known as the *Music of Spheres*). His *Harmonia Mundi* was based on numbers and proportion.

The Pythagorean conviction that the essence of our universe is concealed in and governed by numerical relations not only influenced the geometrisation of western cognition, but today, the anthropic principle claims that fundamental physical constants, such as Planck s constant, the speed of light, the gravitational constant and so on, possess exactly such values as to make the biogenesis possible. According to its advocates, the phenomenon of life, and even conscious life, is an imminent feature of the universe, because it evolved from (mathematical) parameters which describe and warrant its existence [6].

In turn, the Pythagorean vision of cosmic unity re-echoes in post-quantum theories, promoting a view of the world as an undivided multidimensional oneness in a constant enfolding and unfolding movement or

"holomovement", as David Bohm named it, throughout the whole of space. [7]

Referring to these studies, in my multimedia installation *The Hidden topology of being* I propose an imaginative journey into the heart of the matter. There, according to scientific suggestions, we find no molecules, no atoms; neither location nor time. On the subatomic level, only relations exist. [fig.4.].

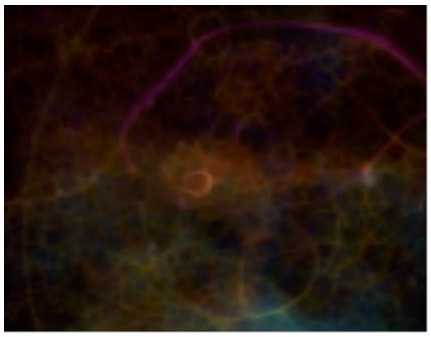

Fig.4. "Hidden Topology of Being" still from the 3D video-animation. ©J.H-D

What we perceive as "matter" turns out to be just energy condensed to slow dense vibrations of micro-strings. All their movements, rotations, joining and breakings, as Saul Paul Sirag put it, are "extremely complicated and rich in harmonics. If guitar strings can make wonderful music in 3D space, how awesome must be the 'string music' of 9D space!"[8]. In my piece I merge my imaginative visualisation of thee subtle dynamics with fragments of Rabindranath Tagore's poetry. Lines from "Ocean of Forms" and "Lost Time" [9] reveal one more, human, dimension that interweaves all the folds and wrinkles of our world.

Secrets of spatial networks

Musical analogies not only revive Pythagorean's search for *arche*, but scientific research proved that the ability to differentiate sonic structures (primarily connected with survival strategies) played a big role in the development of the human brain and its capabilities to deal with complex systems in general. Nothing strange then, about the fact that there has been much effort invested in the translation of molecular structures into sonic ones [10]. In my current projects however, I am not so much interested in illustrating arrangements of monomers but in investigating the energy pathways between them.

If we assume that the essence of life is a piece of information, encoded in a sequence of letters, then this sequence has to assume a proper spatial form to become a message. The information transfer from 22 thousand human genes to 400 thousand highly differentiated human proteins (responsible for most biological processes ranging from shaping an eyeball to determining the way we move) is strongly correlated with energy issues and depends on interactions of the whole molecular network within a cell. This process is depicted in the central dogma of molecular biology and reveals the crucial role of RNA, or rather the multitude of types of RNA molecules, in it. Recent studies have been looking at this biomolecule in a new light, based on our knowledge concerning both life processes and their origin. RNA can assume a form of a double helix like DNA or a folded thread like a protein; it can be both a replicator and an enzyme. It has become the best candidate for the "seed of life". Still, we can only speculate on the environmental conditions of molecular synthesis 3.7 billion years ago. The truth may lie in all of today's hypotheses. Maybe, under some circumstances, a few cosmic amino-acids met an enclave of proto RNA networks breeding in a clay strata which led to the catalysis and replication of molecular sequences. Such a scenario would bring together many cross-cultural myths concerning our beginnings [fig.5].

Fig.5. "Molecule", still from the 3D video-animation. ©J.H-D

This enigmatic molecule became the inspiration of my recent art projects like *Molecule* and *Intrinsic connections* which, developed in collaboration with the Genesilico Laboratory in Warsaw, are focused on the transformation of molecular spaces. *Intrinsic connections* is related to research into a new kind of hybrid RNA which has been given a working name of "werewolf". The scientific task is to merge two RNA molecules of no common evolutionary history (one naturally evolved and one synthesized). Scientific analyses suggest that different neutral (not coding) networks can interweave and intersect each other. The resultant molecule can switch between two different conformations and perform two different catalytic activities (become a "man" or a "wolf"). Novel folds and activities arise too, testifying that not only the exchange of genetic but also structural information can be a source of molecular hybridization and evolution. The practical outcome of the scientific research is to understand how to design transformative RNA molecules and to control the switch between ribosomal functions (wolf/man switch).

As an artist, I was inspired by the multifaceted identity of this molecule and its spatial metamorphosis. Searching for a conceptive tool which would help me to grasp and explore its complexity, I employed a notion of a labyrinth. It turned out to be a lucky and "trans-disciplinary" choice.

Indeed, to achieve its target form, a biomolecule has to overpass the labyrinth of all possible conformations. This labyrinth is not externally imposed on the molecule. It is its inherent feature and emanation. Subjected to energy flow and thermodynamics, its landscape forms many energy traps, hills or valleys.

In *Intrinsic connections* the labyrinth has two determined areas: the state of "man" and the state of "wolf". However, they are neither dominant nor stable, just recognisable. The rest is a dynamic mist of possibilities referring to the immense amount of data remaining beyond the scope of current scientific interpretations. Each point is a different conformation, a fleeting identity, with its own unique position and "point of view". Sometimes they quickly integrate, creating some spatial patterns, or run into the wolf/man zones and, in an instant, disperse again.

The notion of labyrinth has deep cultural connotations often related to identity issues: the acquisition of maturity and wisdom. It is represented as a particular limitation and organisation

of space which can be understood only when regarded as a complex whole. The labyrinth is more than a sum of its parts, just as a molecule is more than an assembly of atoms. It is both a state and a state of becoming.

In *Intrinsic connections* the labyrinth is a model of a self-organising, non-linear system which, as with all biological processes, is far from the thermodynamic equilibrium. There is an immensity of tasks involved today in understanding such systems and in acquiring a holistic view of their complex interactions that make life possible.

At present the mass of data produced by scientific experiments is huge. They are still waiting to be managed and incorporated into the labyrinth of knowledge. Ultra-modern computers, the latest developments in information technology, global databases and networks, make this challenge increasingly feasible.

Advances in our technological space help us to transcend the natural limitations of our senses and to perceive what was previously "unseeable". However, they will not help us to go beyond what the human mind can imagine or interpret. To push these borders we have to use its creative potentiality, which feeds on cross disciplinary and cross cultural inspirations. Cultural imageries provide us with a diversity of powerful means and ways of connecting a human being with his or her physical and mental environments. We have to revalue them in order to create meaningful tools corresponding with contemporary challenges, desires and fears which would help us to understand and deal better with the complexities of the human space we construct.

References and Notes

1. Stefan Semotiuk „Filozoficzne aspekty problemu przestrzeni" in S.Semotiuk, ed., *Przestrzeń w nauce współczesnej* (Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej,Lublin 1998).

2. for more information see my website: http://www.johoffmann.com

3. John A. Wheeler *Spacetime Physics: Introduction to Special Relativity* (W. H. Freeman, 1992).

4. Paul Davis, *Superforce* (London: Unwith Hyman, 1985), pp.49.

5. Millennium Simulation Project, http://www.mpa-garching.mpg.de/galform/millennium/

6. J.Barrow, D.Tipler, J. Frank, *The Anthropic Cosmological Principle (*Oxford: Oxford University Press,1988/2009).

7. David Bohm, *Wholeness and the Implicate Order* (London: Routledge, 1980)

8. Saul-Paul Sirag, "Hyperspace Crystallography" in Bob McGown, ed., *Music of Spheres: Astronomical Connections* (Rose City Astronomers, 2004).

9. Rabindranath Tagore, "Ocean of forms", "Lost Time" in *Gitanjali,* http://www.ics.uci.edu/~ashish/tagore-rabindranath-1861-1941_gitanjali.pdf

10. H.J. Shi, Y.Y.Cai, C.W.Chan „Electronic Music for Bio-Molecules Using Short Music Phrases" *Leonardo* 40, No. 2, (April 2007) pp.137; The World of Molecular Music http://www.molecularmusic.com/

GREEN'S ART: NEW MEDIA AESTHETICS IN PRE- AND POST- ELECTION EVENTS IN IRAN

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Abstract
Digital media has played a very significant role in anti-government protests in the Middle East (in Iran, Egypt, Syria and so on) over the last four years It has changed the rules of political struggle and established new expectations and rules of confrontation for both protesters and authoritarian governments in the region. The Greens' Art research project will be a curated exhibition of digital art and other works developed during the pre- and post-election period (2009-11), situated alongside participants' accounts of the role of these works in the grassroots Iranian Green Movement.

Keywords: Iran, Green Movement, Digital Media, Art, Protest, Iran, Artivism, Greens' Art

Introduction

To explain briefly, the Iranian Green Movement refers to the grassroots protests that arose after the presidential election in 2009. These protests engaged different classes and layers of society, spread quickly, and transformed into one the most significant social and political movements of Iran's contemporary history. According to the evidence of street protest and turbulence, the Green Movement was formed, peaked and declined over a two year period from 2009 to 2011. The period brought considerable turmoil, with militarized reactions of the government to protests, along with the death and imprisonment of a large number of citizens. The Green Movement has been defined and interpreted in a variety of ways. Some commentators say that it has 'died' whilst others insist that despite its temporary absence it is alive, and simply looking for another chance to appear on the streets. Some Iranian citizens see the Green Movement as a thing of the past, while others still carry green elements like wristbands.

Looking back to the pre-election period, one sees that the campaign of the reformist candidate Mirhossein Mousavi, called 'the Green Wave', applied various artistic strategies in promoting him; after the election was rigged, his campaign became the core of the Green Movement, and engaged in further non-violent protests against the results of the election, thereby gaining Mousavi widespread support from a huge number of famous artists inside and outside the country. In addition, after the election a number of lesser-known and amateur artists joined the protests. Along with street demonstrations and protests, the volume of artworks[1] created by ordinary citizens and unknown artists rose markedly. Created by all available means (such as Photoshop, Windows Movie Maker and Microsoft Paint), these artworks were distributed to audiences via social networks, email and other available digital means.

The *Greens' Art* project is a combination of an online exhibition of artworks about both the Green Movement and anti-movement responses, and a repository of related materials, including interviews, comments, and theoretical debates. This paper addresses the background theories and ideas on the placement of art and digital media in political affairs, and discusses the role and significance of *Greens' Art*, both as a current research project, and as a curated exhibition which aims to undertake a deeper and more comprehensive examination of the relationships between protest, art and digital media during the crisis period in Iran.

New Media and the Green Movement

The world was totally surprised when Iranians broadcast their news, photos and videos in the post-election period on a huge scale. Who could believe that, despite the government's control of cyber activities and its brutal reactions to cyber-protests, people would make such an effort to report and show true stories online? Undoubtedly, digital media has been one of the most vital means for the Green Movement to achieve a voice.

The level of Iranians' contribution to the digital arena during the period 2009-11 seems all the more remarkable when we compare it to the realities of the regulated mass media and the government's ideological control of online information channels (through using complicated filtering systems to prevent the Internet from being used effectively by the public). During the post-election period, when protesters were totally isolated by national radio and television, digital media played a particularly significant role in circulating information, feelings and political expression within Iranian society.

Commentators on the role of digital media in Iran in the wake of the 2009 election could be categorized into three major groups. The first group enthusiastically believes that social media tools, such as Twitter and Facebook, played a vital role in the emergence and resistance of the Green Movement [8-11]. The second group is convinced that the effectiveness of various social media tools is just an illusion, and recognize people themselves as being the Green Movement's main engine. They believe that the government's controls on cyberspace and military reaction against any kind of protest have reduced these tools to information services [12-16]. The third reaction to the role of digital media in political struggle is more cautious and inconclusive, remaining ambivalent regarding the value of social networking services such as Twitter [17-18].

Despite positive and negative opinions on the role of technologies and digital media in the pre- and post-election period, there is no doubt that new media tools were very effective in the creation and distribution of artworks. Circulation of artistic materials through social media and satellite channels accelerated the emergence of sympathy and solidarity among protesters at the beginning of the crisis. One of the remarkable aspects of this phenomenon is the evidence of activists' and ordinary people's capabilities in using digital technologies, and the fact that they became audiences and producers of new media products. This phenomenon is in line with Benjamin's essay 'The Work of Art in the Age of Mechanical Reproduction'. As well as blurring the borders between author and public, Benjamin argues that mechanical reproduction changes the reaction of the masses toward art, and renders it accessible for everyone: "At any moment the reader is ready to turn into a writer" [4]. A version of this has

[1] Categories: Documentary Videos, Clips, Animations, Short Movies, Long Movies, Paintings, Graffiti, Posters and Illustrations, Website Banners, Cartoons, General Drawings, Lyrics, Poems, Novels, Short Stories, Political Humors, Slogans, Music, Photos, Sculptures, Performing Arts, Costumes and Accessories.

happened in Iran, with many everyday citizens and users becoming citizen journalists and cultural producers. During the post-election period, protesters used digital media not only as an information channel and a way of organizing themselves, but as an artistic outlet, a means of expression for people lacking freedom of political expression.

Art and the Green Movement

As a socio-political movement, the Green Movement's relationship with art can be considered within the broader field of 'politics and art'. This field includes a range of debates and practices, from propaganda and political art, through community and protest art, to 'artivism' - a combination of art and activism. Historically, there has been much debate about the connection between politics and art. Many theorists, with a variety of points of view, have investigated why art deals with political affairs, and the significance of such political art. For example Marcuse, from his leftist perspective, focusing on "the Beautiful" (associated with art since the mid-nineteenth century), believes that sensuousness is what gives art a political power:

> "The sensuous substance of the Beautiful is preserved in aesthetic sublimation. The autonomy of art and its political potential manifest themselves in the cognitive and emancipatory power of this sensuousness. It is therefore not surprising that, historically, the attack on autonomous art is linked with the distinction of sensuousness in the name of morality and religion" [1].

Carol Becker summarizes Marcuse's ideas about the role of art in political affairs as follows: "art with political aspirations should utilize the subversive power of 'beauty' when appropriate" [2].

Historically, ideas similar to those of Marcuse have been adopted by both governments and social movements in different ways. The most wellknown governmental examples are the Soviet Union's socialist realist school, and the Nazi's propaganda system. However, Iran also has a long history of moments in which art has been used as a means of engaging with politics. Four such events in recent history are: the Constitutional Revolution (1907), the 28 Mordad Coup (1963), the Islamic Revolution (1979) and the Green Movement (2009). The increasing centrality of religion since 1979 provides a particularly clear example. Immediately after the Islamic Revolution, the government established the Islamic Advertisement Organization, investing considerable effort (and the capacities of the Ministry of Culture and Islamic Guidance) in the control of social, political and cultural matters through a variety of means, including artistic. This idea can also be seen in what British-based Iranian media lecturer Khiabany calls 'Islamic Exceptionalism', which along with 'De-Westernizing' make up "the pillars of Islamism" [3].

On the non-government side, there is a considerable tradition of artivism, both on a worldwide scale and in Iran's history. One approach is to ask how art is functioning in the hands of protesters. Walter Benjamin suggests that in a social context, art can play a role in undermining social habits, and has the power to shift a politically passive population into the position of critics:

> "… Distraction as provided by art presents a covert control of the extent to which new tasks have become soluble by apperception. Since, moreover, individuals are tempted to avoid such tasks, art will tackle the most difficult and most important ones where it is able to mobilize the masses" [4].

During Iran's -election crisis, aesthetics were used in political activism with the clear intention of mobilizing the Iranian people, as in Benjamin's theory. The art of this period was, as Cohen-Cruz puts it, an art which "directly responds to a controversial public action or is intended to challenge public perception about the status quo" [5]. Criticizing the government, reproducing/adopting crucial moments, and showing the plight of victims were the main themes of this period's artworks, with a clear mission of increasing audiences' sensitivity to the ongoing events.

While some figures insist that art has an important role to play in protests, Josh On does not see artivism as a determinant factor during political struggles. He argues that while art can enthuse and challenge the mind, in the end people have to act through their protests to overthrow the system. His article 'From They Rule to We Rule' attempts to evaluate the role of artivism in current political affairs; this essay is based on his previous creative project 'They Rule', which aimed to provide a glimpse of some of the relationships amongst the US ruling class. He also asserts that artists have the same political responsibilities as other members of society, and does not have extra expectations of them [6].

Similarly, the widely-read yet anonymous Mikhak website commentator views the role of art in the Green Movement's progression more pessimistically. In an article entitled 'Aestheticization of Politics', the author argues that insisting on artivism reduces the whole movement to a fruitless political act, and has transformed serious political matters of death and life into enjoyable entertainment.

In line with this idea, Hamid Dabashi, an 'Iranian Studies' professor in the US, takes a relatively controversial position. In his interview with Radio Farda entitled 'The Transfiguration of Artistic Reconstructralism', Dabashi discusses the relationship between art and the Green Movement. Whilst he is against the regime, he says that Iranian society should not impose any political expectation on artists, and that a political agenda is not a necessary element for an artwork, even during protest [7]; a position which fundamentally opposed a majority of Iranian protesters' expectations at the time.

Thousands of artworks created and distributed by both the government and the protesters in the pre- and post-election period provide us with both a captured history, and also a current framework for further discussion and examination of the political potential of art.

Greens' Art Website

Greens' Art provides a space in which to collect, categorize, contextualize and exhibit the distributed artworks made by professional and amateur artists, including some pro-government, who created works related to the pre- and post-election period in Iran. The project's aim is to preserve history through an artistic approach, whilst also both bringing the material to life for

people, and avoiding it being lost over a period of time.

The best means to illustrate the cooperation of protest, art and digital media in the Green Movement, and give a comprehensive overview of the artivism during the period, seemed to be a curated database (exhibition) of all sorts of related works. The prototype, including 1400 works in 24 categories created, by both Iranians and non-Iranians, was launched on May 15, 2013 (URL: http://www.greens-art.net/?lang=en) [19].

The project is not entering the area of criticism at this prototype stage; its main purpose is to restore and categorize the artworks and their related information. The online exhibition will present all the information in both Persian (Farsi) and English, in order to engage international audiences. Currently all the basic data such as titles, events and artists' names are translated; in the next step, artworks' stories and additional information will be added to the dataset, to make the materials more accessible to English-speaking audiences. Besides entries for the works of professional and amateur artists and citizen journalists, related resources will be added over time, including interviews with specialists, artists and ordinary people, and multimedia layers will be added to facilitate access to the collected documents. Eventually, the *Greens' Art* project will become a multimedia history project, providing audiences with an opportunity to (re)approach events through the collected art and other materials.

Visitors to the current version of the website can choose between different options (such as category, artist, origin and event), search the artworks by keywords, or use the calendar section to reach a desired item. For instance, by viewing a documentary photo taken with a very ordinary digital camera on a cell phone, the visitor can view what protesters experienced on a Tehran street on December 27, 2009, (Fig. 1), or see how people kept their hope in the most desperate situations (Fig. 2). These are just small examples of the power of the visual history compared to the written word; it "can inspire and provoke questions" as On says [6].

Fig.1. Military forces using gas tear against people in Bloody Ashoora (December 27, 2009)

Fig.2. An injured protester shows the victory sign after being beaten by military forces

One of the important factors that should be considered in criticism and comment regarding such works is the situations that they were created in. Presumably, we cannot compare these works with artworks or documentaries which are created in politically neutral situations or less controversial conditions, and evaluate the technical and aesthetical aspects from the same perspective. When the government started to react brutally against the protesters, many professional artists rationally ceased their support of the Green Movement. This could be one of the reasons why some amateur artists instinctively entered the scene, and worked hard to respond to the demands of that time. It could even be said that the amateurs' presence was bolder than the professionals', if the quantity of current artworks is considered a significant indicator.

To evaluate the artworks in this context, another interesting factor is their durability. Obviously, durability is guaranteed in most professional artists' works, due to their technique and experience. However, although this characteristic may be an important consideration in art, it should be asked, what is more important during a crisis: durability or a timely response? This issue - what Becker call the 'subversive power' [2] - is especially important when a piece of work is used to organize or advertise a specific act or event. A simple illustration created in Photoshop, by an amateur with minimal graphic design skills, to invite protesters to a rally (Fig. 3) may provoke a greater response for the movement than a professional poster with a general message against the situation (Fig. 4).

Fig.3. A poster designed by an amateur artist calling for a rally on international Worker's Day

Fig.4. An illustration designed by a professional international artist

The first illustration might be less memorable for users of social media, for many reasons, including lack of a mature creativity, and the specific event that it is related to has probably been forgotten (Fig. 4). At the same time, however, we cannot ignore it as an artwork; many factors, such as color, composition and typography, are clearly recognizable in it. In addition, the related event somehow validates this piece of work; its responsiveness to an ongoing situation in society is, according to Cohen-Cruz, artivism's duty [5].

Thanks to digital technologies, the new 'mechanical reproduction' tools,

there are thousands of such works available on the internet; from a Benjaminian perspective, most of them are made by 'readers' who turned into 'writers' when it was necessary [4]. Due to their quantity and effectiveness during the pre- and post-election crisis, we cannot now ignore or exclude them, just because they are not technically durable.

During the first few weeks following its launch, the *Greens' Art* website received not only a great deal of supportive feedback from visitors, but also more than 900 more artworks, to be archived in the project. These 'donations' were a combination of personal collections and amateur and professional artworks. The most inspiring and unique collection among them was sent by a former political prisoner, and included a collection of artworks created by political prisoners in Evin Prison during the crisis period. These works will be categorized and archived, to allow the website's future audiences a deeper perception of the scale of the engagement of art and politics in this case study.

Conclusion

Investigating the relationship between art, digital media and the Green Movement is not only important for Iran and the Green Movement's supporters; this is also a rich chapter in worldwide digital media and art history. Technical issues aside, these works clearly have an ability to aesthetically convey to their audiences the facts and stories of those days, facilitating a clearer and more comprehensive image of the happenings; an image which is less affected by political affiliations and biased interpretations. Contextualization and theorization of the artworks by *Greens' Art* project will provide a unique platform for future discussion and relevant research, and allow a deeper insight into the nature of artivism in the age of digital media.

References and Notes

1. Herbert Marcuse, *The Aesthetics Dimension: Toward a Critique of Marxist Aesthetics* (Boston, USA: Beacon Press, 1978).

2. Carol Becker, 'The Subversive Potential of Art', *Alternate Roots* (2010), <http://alternateroots.org/node/713>, accessed 23 June 2011.

3. Gholam Khiabany, *Iranian Media; the Paradox of Modernity* (London, UK: 2010).

4. Walter Benjamin, 'The Work of Art in the Age of Mechanical Reproduction', *UCLA School of Theater, Film and Television* (2005), <http://www.marxists.org/reference/subject/philosophy/works/ge/benjamin.htm>, accessed 10 October 2011.

5. Jan Cohen-Cruz, 'An Introduction to Community Art and Activism', *UCLA School of Theater, Film and Television* (2005), <http://www.communityarts.net/readingroom/archivefiles/2002/02/an_introduction.php>, accessed 21 October 2011.

6. Josh On, 'From They Rule to We Rule: Art and Activism', *Ars Electronica* (2002), pp. 367–372, <http://90.146.8.18/en/archiv_files/20021/E2002_367.pdf>, accessed 12 September 2011.

7. Hamid Dabashi, 'Transfiguration of Artistic Reconstructralism', *Radio Farda* (2010), <http://www.radiofarda.com/content/f35_Dabashi_Protests_and_Artists/2076726.html>, accessed 14 Nov 2011.

8. Andrew Sullivan, 'The Revolution Will Be Twittered', *Theatlantic* (2009), <http://www.theatlantic.com/daily-dish/archive/2009/06/the-revolution-will-be-twittered/200478/>, accessed 13 August 2011.

9. Sysomos, 'A look at Twitter in Iran', *Sysomos* (2009), <http://blog.sysomos.com/2009/06/21/a-look-at-twitter-in-iran>, accessed 27 August 2011.

10. Lev Grossman, 'Iran's Protests: Why Twitter Is the Medium of the Movement?', *Time* (2009), <http://www.time.com/time/world/article/0,8599,1905125,00.html>, accessed 27 October 2011.

11. Hui Chen, Maihemuti Sali, 'A Qualitative Study of Iranian Facebook Users' Perceptions of Using Facebook in Iran's Participation Activities', *Örebro University (*2010), <http://oru.diva-portal.org/smash/get/diva2:372479/FULLTEXT01>, accessed 26 October 2011.

12. Evgeny Morozof, 'Iran: Downside to the Twitter Revolution', *Dissent* (Fall 2009), pp. 10-14.

13. Alex Burns and Ben Eltham, 'Twitter Free Iran: An Evaluation of Twitter's Role in Iran's 2009 Election Crisis', *Record of the Communications Policy & Research Forum* (November 2009), pp. 289–310.

14. Mitra Fakhim, 'M. Freedom of the Internet: Myth or Reality?', *Mitra Fakhim* (2011), <http://mitrafakhim.wordpress.com/2011/06/27/>, accessed 25 October 2011.

15. Hamid Tehrani, 'Internet and the Green Movement', *Deutsche Welle* (2010), <http://www.dw-world.de/dw/article/0,,5558977,00.html>, accessed 16 June 2011.

16. Mikhak, 'Fictions of the Green Movement', *Mikhak* (2011), <http://mikhak.info/?p=430>, accessed 12 December 2011.

17. Devin Gaffney, '#iranElection: Quantifying Online Activism', *Web Science conference* (2010), <https://www.zotero.org/groups/11_atpoltwit/items/itemKey/6MA3DK2N>, accessed 10 Oct 2011.

18. James Jay Carafano, 'All a Twitter: How Social Networking Shaped Iran's Election', *Backgrounder* 2300 (2009).

19. Greens' Art (2013), <http://www.greens-art.net/?lang=en>, accessed 1 June 2013.

20. I respectfully acknowledge the creators of the images used in this paper. These photographs were taken by artists and protestors who published them on the internet anonymously.

WO. DEFY – DESIGNING WEARABLE TECHNOLOGY IN THE CONTEXT OF HISTORICAL CULTURAL RESISTANCE PRACTICES

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Abstract

This paper presents the design process and technical development of Wo.Defy, an interactive kinetic garment that explores a suffragette cultural critique of the 'Self-Combing Sisters', a group of women in early twentieth century Chinese society who challenged and questioned the role of women's agency.

Through elements of self-connection with hair and breath, Wo.Defy investigates intimacy with natural materials and technology that are close to one's skin, and provokes self-actuation through critique of social expectation within one's culture. We gathered feedback from participants at 5 exhibitions through open-ended interviews. Self-reported experience illustrated that wearable interaction can support self-reflection contextualized through cultural artifacts such as interactive clothing.

Keywords: wearable technologies, breath interaction, kinetic garment, feminist design, human hair, critical cultural design, somaesthetics.

Transformation through Resistance

Zì shū nǚ (自梳女) is translated as the 'Self-Combing Sisters' in Chinese. This group of women resided in the rural regions of China's southern Canton province [1]. They pursued celibacy as a political resistance to arranged marriage from the late 19th to mid-20th century. The Self-Combing Sisters signified their pursuit of economical and personal independence through their controversial stance against societal expectations regarding women's domestic roles and arranged marriages [2, 3, 4].

Their name signifies the social practice of combing one's own hair into a braid or bun, which differentiated them from other single Chinese women who left their hair loose and unbound [5]. The women's bound hair represented an inverted aesthetic. This self-binding and its concealment of a traditional female expression of beauty, sensuality and desire signified the desire for freedom from being tethered by marriage.

The Self-Combing Sisters challenged the cultural norm of submission by transforming their domestic roles. They were favored over married women in the silk-making industry due to their freedom from family structures and duties [6], and their financial and labor contributions within their families and communities enabled them to redefine women's role in society, re-presenting them as independent and self-sufficient individuals.

Our Cultural History

The design process of Wo.Defy reflects the designers' own cultural origins, while its representation is a living process. The research and development are based on material and body exploration integrated within contemporary DIY wearable technology practices. The cultural and historical research references patterns, materials, and forms associated with the Self-Combing Sisters, which provided a foundation for the design and construction of the dress.

Inspired by the Somaesthetic [7] framework, the research and design integrate the values of 1) the wearer's own experience; 2) poetics inspired by cultural appropriation, style and history; 3) the materiality of silk and human hair; and 4) interaction semantics [8]. Based on this framework, Wo.Defy explores a feminist construction of agency and self-reflection [9].

The design practice of Wo.Defy exemplifies these principles by revealing, questioning, and transforming the act of wearing and modifying garments through interaction with the work.

By questioning historical examples of identity construction through clothing and hairstyle, the Self-Combing Sisters transformed societal conventions by implementing changes on themselves, and thereby creating an impact on others.

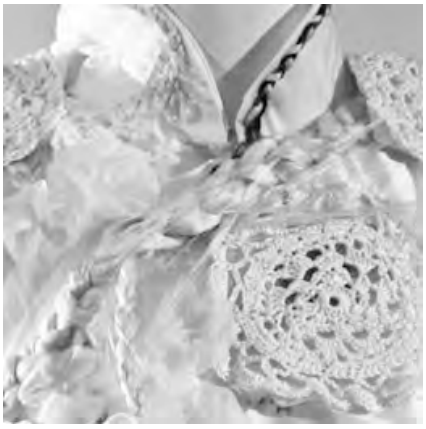
The design of Wo.Defy reminds both designers and wearers of critical questions and reflections that act as catalysts for change, transforming assumptions and norms within cultures.

Blurring Identity

Wo.Defy is situated within a history of feminist art and soft sculpture involving materials, domestic processes, and technologies that have democratized art making. The combination of female-connoted and male-connoted art practices within wearable technology blurs the gender associations in art. This blurred line is expressed within Wo.Defy by selecting narrative wearable design tropes of the Self-Combing Sisters.

Wo.Defy reconstructs gendered elements of the Self-Combing Sisters by appropriating the Qípáo (旗袍), the traditional Chinese dress. The design choices reflect these re-designs of the original Qípáo, which are: 1) The neckline is inverted from a left side closing to a right side closing, thus appropriating the male neckline to indicate a shift in cultural perception agency and responsibility. As the women had neither husband nor children, they had more time to amass financial resources through working full-time in silk weaving factories, enabling them to contribute financially to their own nuclear and extended families. By taking on roles in society inhabited primarily by male counterparts, the mirrored direction of the collar represents the blurring of gender identity. 2) The broadened shoulder design of the dress, characteristic of male fashion, represents the Self-Combing Sisters' ability to 'shoulder' and support additional expectations and financial responsibilities, due to their personal and financial independence. (Fig. 1)

Fig. 1. The right-sided neckline and the broadened shoulder design of Wo.Defy. (Photo © Emily Ip)



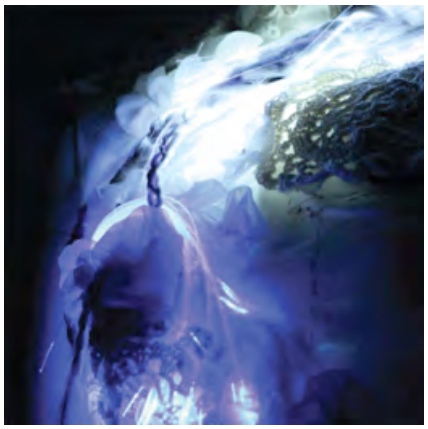
Defying Convention: Choice through Self-Grooming

The aesthetic choice and interaction design of Wo.Defy challenges the conventions of Chinese traditions. 1) Wo.Defy uses a palette of whites, which in Chinese culture is an explicit reference to death and mourning. This implication represents the death of the oppressed self, and also symbolizes opposition to societal norms of marriage. The Self-Combing Sisters' defiant act of self-grooming signifies women's choice to go against Chinese rituals. 2) The fluidity of the visual and kinetic responses embedded in the dress suggests a state of active transformation, contradicting social expectations of marital, financial and domestic roles (Fig. 2). This exposure of physiological responses challenges the creation and modification of identity through the use of social technology.

Attention, Breath, Corporeality

Body data, specifically breath, is used as an indicator of choice. Inspired by the embodied techniques in Noh theatre,

Fig. 2. The LEDs and fabric flowers on the garment respond to the breathing and kinetic changes of the wearer. (Photo © Emily Ip)



breath was selected as an input to the garment to reflect an autonomic body rhythm which can also be altered through self-choice [10].

In Eastern physiological mindfulness practices of embodiment and personal expression, breathing is understood to contain both behavioral and emotional information [11]. Behavioral breathing responds, and also adapts subconsciously, to new breath patterns affected by the environment or situation. This adaptation to a cultural situation or environment is referred to as emotional breathing, and occurs in order to adjust the physical body to the inner life of the body.

Wo.Defy demonstrates this shift from behavioral breathing to emotional breathing through kinetic and light responses which are made possible through a DIY breathing sensor worn around the rib cage, linked to microcontrollers...

To Express the Choice to Reveal or Conceal

Wo.Defy uses DIY interactive technologies to express the choice to reveal or conceal the wearer's state through breath. Inspired by the ability of breathing to effect change in body state [13], the perception of breath is magnified as the 'controller' for the glowing and dimming of optical energy and the opening and closing of silk organza flowers on the garment.

Input: A custom-made breathing band is worn around the rib cage of the wearer. The force sensor within the band collects the rhythmic pattern of expansion and contraction, while a tri-axis accelerometer collects the wearer's motion. These data are used as inputs to express the choice to reveal or conceal the wearer's state.

Output: Reveal or Conceal to Reflect - An Arduino Lilypad and an Arduino UNO Microcontroller control the response of the kinetic contractions and the light response, through the use of two servomotors and a series of light emitting diodes (LEDs) (Fig. 4). Located on the frontal pelvic region of the dress are silk organza flowers, which are linked with two servomotors through a network of translucent threads. When activated, the rotating servos translate into the contractions (enclosing/withholding) and expansions (widening/revealing) of the flowers. The form and quality of movement represent the intimate relationship between the breath and the pubococcygeus muscles from within. Extending from the series of LEDs, stands of fiber optics are interwoven between the silk doilies and fabrics. The stands produce a glowing response to the wearer's breathing pattern that reveals breath quality.

These characteristics of withholding and revealing personify the Wo.Defy garment, enacting metaphors of self-control and self-agency.

Tactile, Textile, Touch & Narrative

Material choices in Wo.Defy reflect tactile and textile responses to their proximity to skin. Materiality of body, garment and technology defines the designers' production practices. Human hair and raw silk were used to weave a narrative of choice, agency and human materials.

Human hair has a direct correlation with the memory and with health, and is used in Chinese medicine to indicate readings of the body's 'health and vitality' [12]. Like a memory capsule, human hair documents the life and death cycle. The transition from black to white hair portrays the generation and degeneration of traditional historical ideas of beauty, from black to white, life to death, external control to personal choice.

As the dominant material used on the garment, silk was chosen for its reference to the Self-Combing Sisters' economic independence. Various forms of silk, such as duppioni silk, silk chiffon and raw silk fibers, were hand sewn to make the 'body' of Wo.Defy, incorporating soft-circuits that are interwoven to express the narrative of the Self-Combing Sisters (Fig. 3), symbolizing the lives of these women.

Respond, Retract, Resist, Reconstruct

Wo.Defy uses the act of breathing, specifically the muscular contractions of the diaphragm, to gather continuous body data. The breath's physiological and emotional patterns are expressed through the pulsation of LEDs and the contraction of the soft fabric flowers located on the front and back chest to pelvic region of the garment.

These sensors and actuators reveal body states, and are poetically aligned to concepts of choice, vulnerability, sensuality and agency. We gathered feedback from participants at 5 exhibitions through open-ended interviews. Initial results from participants' verbal feedback indicate that the garment has a potential to shift the participant's attention to awareness of her own body responses.

Fig. 3. Wo.Defy is made of human hair and raw silk fibers. (Photo © Emily Ip.)

This included the participant's observations and reactions to wearing the breathing sensor, and her reflections on observing the garment's response. As one participant described: "I feel that this is an experience of history that helps me understand the strong choices that the self-combing sisters made." We also

Fig. 4. The Lilypad Arduino is one of the microcontrollers used in Wo.Defy. (Photo © Emily Ip.)

discovered that many participants wanted more clarity of interaction around the choice to reveal or conceal their body data. This was indicated by the fact that participants asked questions such as: "What if I don't want to show how my breath data which reveals my feeling?" or "What if I want to keep my privacy?" These initial findings helped us to design the next stage of interaction, particularly around the choice of revealing or concealing body data, and will be used for a more formal usability study.

The design process and interaction within Wo.Defy represent a growth in self-awareness and self-agency similar to those of the Self-Combing Sisters.

Outcomes and Future Work

Wo.Defy's design process provides insights that support our personal journey as designers. Through the use of anthropomorphic material, soft circuits and technology, we established an interaction that enables the wearer to reflect on their experience of self, which we have documented and analyzed in our preliminary study.

Collecting initial feedback from participants during conferences and exhibitions allowed for informal data gathering. Early results showed positive responses on the communication of historical references and personal agency. The preliminary study also revealed limitations and questions of privacy and self-control, which will be further investigated in our research study.

The Self-Combing Sisters have provided a historical and cultural marker and reference for self-determination during our design process. They were able to transform their own relationships, leading to changes within family and community.

As designers, we work with the design strategy that self-awareness is a significant phase in transforming others, community and culture. We plan to explore the influence of an interactive wearable on the wearer in a more formal usability study, the structure of which will be based on our preliminary findings.

References and Notes

1. Li-Jun Wang, 'On the Study of the Self-Bunning Ladies' (2011), pp. 66-67.

2. Jiang-Ming Li, 'Dec-hair-ation – A Lively Perspective into China's Zishunv', *Women of China* (February 2009), pp.42-45.

3. Yi-Fei Shao, 'Origins behind the customs, composition, and basic characteristics of Zishunu', *Cultural Heritage* (*Wén Huà Yí Chǎn)*, No. 2 (2012), pp. 143-151.

4. Janice E. Stockard, *Daughters of the Canton Delta: Marriage Patterns and Economic Strategies in South China, 1860-1930* (California, U.S.: Stanford University Press, 1989).

5. Fei [3].

6. Fei [3].

7. Richard Shusterman, *Body Consciousness: A Philosophy of Mindfulness and Somaesthetics* (New York, U.S.: Cambridge University Press, 2008).

8. Thecla Schiphorst, 'soft(n): Toward a Somaesthetic of Touch', *Proc.CHI EA'09: ACM Press* (2009), pp. 2427-2438.

9. Shaowen Bardzell & Jeffrey Bardzell, 'Towards a Feminist HCI Methodology, Social Science, Feminism & HCI', *Proc. CHI'11: ACM Press* (2011), pp. 675-684.

10. Jessica Floeh, "Exchange: Networked Breathing Devices", *Parsons the New School for Design, New York, U.S.* (2009). <www.jessicafloeh.com/exchangee2/Exchange_Floeh.pdf>

11. Ikuo Homma, Yuri Masaoka, and Naohiko Umewaka, 'Breathing Mind in'Noh' ', *Breathing, Feeding, and Neuroprotection*, Part IV (2006), pp. 125-134.

12. Shao [1].

13. Floeh [9].

POST DIGITAL PUBLISHING, HYBRID AND PROCESSUAL OBJECTS IN PRINT

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Abstract

The influence of digital on publishing has reached a preponderant level, questioning the very core of the practice. But more than speeding up a much touted "definitive transition" from traditional to fully digital publishing (still to be accomplished on mass) there are various practices which are pervading the timeless stoicism of the printed page with calculated processes, transforming it into something new. This had lead to the creation of "hybrids" which can be considered as new types of publications with the potential for having both physical and digital qualities, and which are helping to pave the way towards more complex transitions.

Keywords: post-digital, publishing, artist book, e-publishing, e-books, hybrid publishing

Introduction.

This paper analyses the evolution of printed publishing under the crucial influence of digital technologies. After discussing how a medium becomes digital, it examines the 'processual' print, in other words, the print which embeds digital technologies in the printed page. The paper then investigates contemporary artist's books and publications made with software collecting content from the web and conceptually rendering it in print. Finally, it explores the early steps taken towards true 'hybrids', or printed products that incorporate content obtained through specific software strategies, products which seamlessly integrate the medium specific characteristics with the digital processes.

How a medium becomes digital (and how publishing did).

For every major medium (vinyl and CDs in music and VHS and DVD in video, for example) we can recognize at least three stages in the transition from analogue to digital, in both production and consumption of content.

The first stage concerns the digitalization of production. It is characterized by software beginning to replace analogue and chemical or mechanical processes. These processes are first abstracted, then simulated, and then restructured to work using purely digital coordinates and means of production. They become sublimated into the new digital landscape. This started to happen with print at the end of seventies with the first experiments with computers and networks, and continued into the eighties with so-called "Desktop Publishing", which used hardware and software to digitalize the print production (the "prepress"), a system perfected in the early nineties.

The second stage involves the establishment of standards for the digital version of a medium and the creation of purely digital products. Code becomes standardized, encapsulating content in autonomous structures, which are universally interpreted across operating systems, devices and platforms. This is a definitive evolution of the standards meant for production purposes (consider Postscript, for example) into standalone standards (here the PDF is an appropriate example, enabling digital "printed-like" products), that can be defined as a sub-medium, intended to deliver content within specific digital constraints.

The third stage is the creation of an economy around the newly created standards, including digital devices and digital stores. One of the very first attempts to do this came from Sony in 1991, who tried to market the Sony Data Discman as an "Electronic Book Player" - unfortunately using closed coding which failed to become broadly accepted. Nowadays the mass production of devices like the Amazon Kindle, the Nook, the Kobo, and the iPad – and the flourishing of their respective online stores - has clearly accomplished this task [1]. These online stores are selling thousands of e-book titles, confirming that we have already entered this stage.

The processual print as the industry perceives it (entertainment).

Not only are digitalization processes yet to kill off traditional print, but they have also initiated a redefinition of its role in the mediascape. If print increasingly becomes a valuable or collectable commodity and digital publishing also continues to grow as expected, the two may more frequently find themselves crossing paths, with the potential for the generation of new hybrid forms. Currently, one of the main constraints on the mass-scale development of hybrids is the publishing industry's focus on entertainment.

Let's take a look at what is happening specifically in the newspaper industry: on the one hand we see up-to-date printable PDF files to be carried and read while commuting back home in the evening, and on the other hand we have online news aggregators (such as Flipboard and Pulse) which gather various sources within one application with a slick unified interface and layout. These are not really hybrids of print and digital, but merely the products of 'industrial' customisation — the consumer product 'choice' of combining existing features and extras, where the actual customising is almost irrelevant.

Even worse, the industry's best effort at coming to terms with post-digital print (print embedding some active digital qualities) is currently the QR code — those black-and-white pixelated square images which, when read with the proper mobile phone app, allow the reader access to content (usually a video or web page). This kind of technology could be used much more creatively, as a means of enriching the process of content generation. For example, since they use networks to retrieve the displayed content, printed books and magazines could include QR codes as a means of providing new updates each time they are scanned – and these updates could in turn be made printable or otherwise preservable. Digital publications might then send customised updates to personal

printers, using information from different sources closely related to the publication's content. This could potentially open up new cultural pathways and create unexpected juxtapositions [2].

Printing out the web.

Many possibilities emerge from the combination of digital and print, especially when networks (and therefore infinite supplies of content that can be reprogrammed or recontextualized at will) become involved. A number of different strategies have been employed to assemble information harvested online in an acceptable form for use in a plausible print publication.

One of the most popular of these renders large quantities of Twitter posts (usually spanning a few years) into fictitious diaries. *My Life in Tweets* by James Bridle is an early example realized in 2009 [3]. The book compiled all of the author's posts over a two-year period, forming a sort of intimate travelogue. The immediacy of tweeting is recorded in a very classic graphical layout, as if the events were annotated in a diary. Furthermore, various online services have started to sell services appealing to the vanity of Twitter micro-bloggers, for example Bookapp's Tweetbook (book-printing your tweets) or Tweetghetto (a poster version).

Another very popular "web sampling" strategy focuses on collecting amateur photographs with or without curatorial criteria. Here we have an arbitrary narrative, employing a specific aesthetic in order to create a visual unity that is universally recognizable due to the ubiquitousness of online life in general, and especially the continuous and unstoppable uploading of personal pictures to Facebook.

A specific sub-genre makes use of pictures from Google Street View, reinforcing the feeling that the picture is real and has been reproduced with no retouches, while also reflecting on the accidental nature of the picture itself. Michael Wolf's book *a series of unfortunate events*, points to our very evident and irresistible fascination with "objets trouvé", a desire that can be instantly and repeatedly gratified online [4].

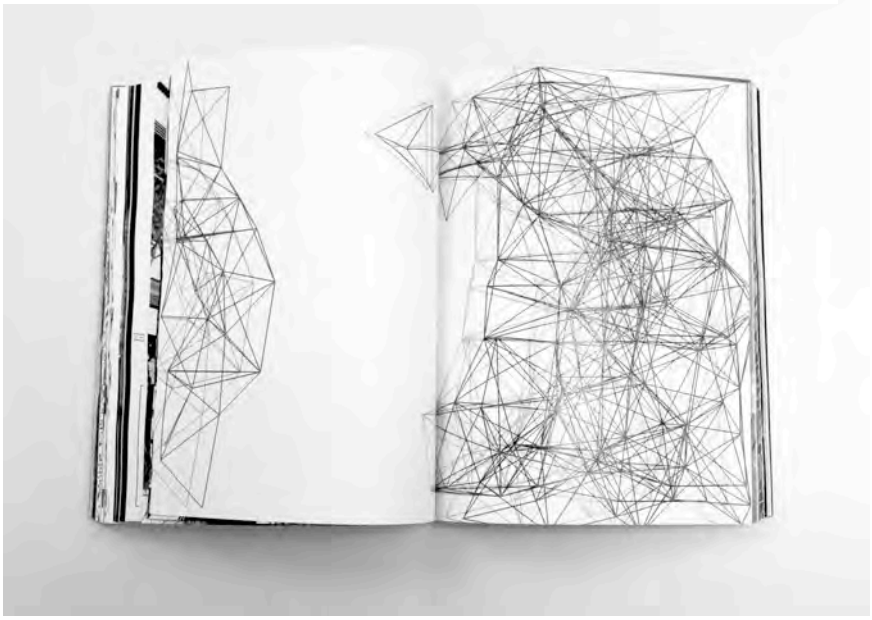
Finally, there's also the illusion of instant-curation of a subject, which climaxes in the realization of a printed object. Looking at seemingly endless pictures in quick succession online can completely mislead us about their real value. Once a picture is fixed in the space and time of a printed page, our judgments can often be very different. Such forms of "accidental art" obtained from a "big data" paradigm, can lead to instant artist publications such as Sean Raspet's *2GFR24SMEZZ2XMCVI5... A Novel*, which is a long sequence of insignificant captcha texts, crowd-sourced and presented as an inexplicable novel in an alien language [5].

There are traces of all the above examples in Kenneth Goldsmith's performance *Printing Out The Internet* [6]. Goldsmith invited people to print out whatever part of the web they desired and bring it to the gallery LABOR art space in Mexico City, where it was exhibited for a month (which incidentally also generated a number of naive responses from environmentally concerned people). The work was inspired by Aaron Swartz and his brave and dangerous liberation of copyrighted scientific content from the JSTOR online archive [7].

It is what artist Paul Soulellis calls "publishing performing the Internet" [8]. Having said all this, the examples mentioned above are yet to challenge the paradigm of publishing - maybe the opposite. What they are enabling is a "transduction" between two media. They take a sequential, or reductive, part of the web and mould it into traditional publishing guidelines. They tend to compensate for the feeling of being powerless over the elusive and monstrous amount of information available online (at our fingertips), which we cannot comprehensively visualize in our mind.

Print can be considered as the quintessence of the web: it is distributing a smaller quantity of information available on the web, usually in a longer and much better edited form. So the above mentioned practices sometimes indulge in something like a "miscalculation" of the web itself - the negotiation of this transduction is reducing the web to a finite printable dimension, denaturalizing it. According to Publishers Launch Conferences' cofounder Mike Shatzkin, in the next stage "publishing will become a function... not a capability reserved to an industry..." [9]

Fig. 2. Martin Fuchs, Peter Bichsel, "Written Images"



Hybrids, the calculated content is shaped and printed out.

This "functional" aspect of publishing can, at its highest level, implies the production of content that is not merely transferred from one source to another, but is instead produced through a calculated process in which content is manipulated before being delivered. A few good examples can be found in pre-web avant-garde movements and experimental literature in which content was unpredictably "generated" by software-like processes. Dada poems, for example, as described by Tristan Tzara, are based on the generation of text, arbitrarily created out of cut-up text from other works [10]. One of the members of the avant-garde literature movement Oulipo created a similar concept later: Raymond Queneau's *Cent Mille Milliards de Poèmes* is a book in which each page is cut into horizontal strips that can be turned independently,

allowing the reader to assemble an almost infinite quantity of poems, with an estimated 200 million years needed to read all the possible combinations [11]. That an Oulipo member created this was no accident - the movement often played with the imaginary of a machinic generation of literature in powerful and unpredictable ways.

Contemporary experiments are moving things a bit further, exploiting the combination of hardware and software to produce printed content that also embeds results from networked processes and thus getting closer to a true form.

Martin Fuchs and Peter Bichsel's book *Written Images* is an example of the first 'baby steps' of such a hybrid post-digital print publishing strategy [12]. Though it's still a traditional book, each copy is individually computer-generated, thus disrupting the fixed 'serial' nature of print. Furthermore, the project was financed through a networked model (using Kickstarter, the very successful 'crowd-funding' platform), speculating on the enthusiasm of its future customers (and in this case, collectors). The book is a comprehensive example of post-digital print, through the combination of several elements: print as a limited-edition object; networked crowd-funding; computer-processed information; hybridisation of print and digital – all residing in a single object – a traditional book. This hybrid is still limited in several respects, however: its process is complete as soon as it is acquired by the reader; there is no further community process or networked activity involved; once purchased, it will forever remain a traditional book on a shelf.

A related experiment has been undertaken by Gregory Chatonsky with the artwork *Capture* [13]. *Capture* is a prolific rock band, generating new songs based on lyrics retrieved from the net and performing live concerts of its own generated music lasting an average of eight hours each. Furthermore the band is very active on social media, often posting new content and comments. But we are talking here about a completely invented band. Several books have been written about them, including a biography, compiled by retrieving pictures and texts from the Internet and carefully (automatically) assembling them and printing them out. These printed biographies are simultaneously ordinary and artistic books, becoming a component of a more complex artwork. They plausibly describe a band and all its activities, while playing with the plausibility of skillful automatic assembly of content.

Another example of an early hybrid is *American Psycho* by Mimi Cabell and Jason Huff [14]. It was created by sending the entirety of Bret Easton Ellis' violent, masochistic and gratuitous novel *American Psycho* through Gmail, one page at a time. They collected the ads that appeared next to each email and used them to annotate the original text, page by page. In printing it as a perfect bound book, they erased the body of Ellis' text and left only chapter titles and constellations of their added footnotes. What remains is *American Psycho*, told through its chapter titles and annotated relational Google ads only. Luc Gross, the publisher, goes even further in predicting a more pervasive future: "Until now, books were the last advertisement-free refuge. We will see how it turns out, but one could think about inline ads, like product placements in movies etc. Those mechanisms could change literary content itself and not only their containers. So that's just one turnover."

Finally, why can't a hybrid art book be a proper catalogue of artworks? Les Liens Invisibles, an Italian collective of net artists have assembled their own, called *Unhappening, not here not now* [15]. It contains pictures and essential descriptions of 100 artworks completely invented but consistently assembled through images, generated titles and short descriptions, including years and techniques for every "artwork". Here a whole genre (the art catalogue or artist monograph) is brought into question, showing how a working machine, properly instructed, can potentially confuse a lot of what we consider "reality". The catalogue, indeed, looks and feels plausible enough, and only those who read it very carefully can have doubts about its authenticity.

Conclusions.

Categorising these publications under a single conceptual umbrella is quite difficult and even if they are not yet as dynamic as the processes they incorporate, it's not trivial to define any of them as either a 'print publication' or a 'digital publication' (or a print publication with some digital enhancements). They are the result of guided processes and are printed as a very original (if not unique) static repository, more akin to an archive of calculated elements (produced in limited or even single copies), than to a classic book, so confirming their particular status. The dynamic nature of publishing can be less and less extensively defined in terms of the classically produced static printed page. And this computational characteristic may well lead to new types of publications, embedded at the proper level. It can help hybrid publications function as both: able to maintain their own role as publications as well as eventually being able to be the most updated static picture of a phenomenon in a single or a few copies, like a tangible limited edition. And since there is still plenty of room for exploration in developing these kind of processes, it's quite likely that computational elements will extensively produce new typologies of printed artifact, and in turn, new attitudes and publishing structures. Under those terms it will be possible for the final definitive digitalization of print to produce very original and still partially unpredictable results.

References and Notes

1. Sony Data Discman file://localhost/<http/::en.wikipedia.org:wiki:Data_Discman>,accessed 1 July 2013.

2. Alessandro Ludovico, Post-digital Print - The Mutation Of Publishing Since 1894

(Eindhoven, The Netherlands: Onomatopee, 2012).

3. James Bridle (2009), <http://booktwo.org/notebook/vanity-press-plus-the-tweetbook/>, accessed 1 July 2013.

4. Michael Wolf (2010), <http://photomichaelwolf.com/#asoue/14>, accessed 1 July 2013.

5. Sean Raspet (2013), <http://thehighlights.org/wp/captcha>, accessed 1 July 2013.

6. Kenneth Goldsmith (2013), <http://printingtheinternet.tumblr.com/>, accessed 1 July 2013.

7. Connor Kirschbaum, "Swartz indicted for JSTOR theft. Digital activist gained access through MIT network drops" *The Tech* (2011), <http://tech.mit.edu/V131/N30/swartz.html>, accessed 1 July 2013.

8. Paul Soulellis, "Search, compile, publish." (2013), <http://soulellis.com/2013/05/search-compile-publish/>, accessed 1 July 2013.

9. Mike Shatzkin, "Atomization: publishing as a function rather than an industry" (2013), <http://www.idealog.com/blog/atomization-publishing-as-a-function-rather-than-an-industry/>, accessed 1 July 2013.

10. Florian Cramer, "Concepts, Notations, Software, Art" (2002), <http://www.netzliteratur.net/cramer/concepts_notations_software_art.html>, accessed 1 July 2013.

11. Raymond Queneau (1961), <http://en.wikipedia.org/wiki/Hundred_Thousand_Billion_Poems>, accessed 1 July 2013.

12. Martin Fuchs, Peter Bichsel (2011), <http://writtenimages.net/>, accessed 1 July 2013.

13. Gregory Chatonsky (2009), <http://chatonsky.net/project/capture/>, accessed 1 July 2013.

14. Mimi Cabell, Jason Huff (2010), <http://www.mimicabell.com/gmail.html>, accessed 1 July 2013.

15. Les Liens Invisibles (2013), <http://www.atypo.org/it/work/unhappening-not-here-not-now/>, accessed 1 July 2013.

ASPECTS OF THE ART/SCIENCE EQUATION – MEDIA ART MEETS HIGH ENERGY PHYSICS

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Abstract

In this paper the argument is made that formal and methodological relationships exist between media art and particle physics. This argument is supported by examples from artist-in-residence projects undertaken by Chris Henschke at the Australian Synchrotron. Through the development of collaborative experiments using a hands-on and emergent methodology, correlations were found between the two disciplines, and material was developed for the production of artworks. The development of, and responses to the works are discussed, and, in conclusion, a plea is made to artists working with scientific research to be more critically aware and engaged.

Keywords: media art, particle physics, Australian Synchrotron, CERN

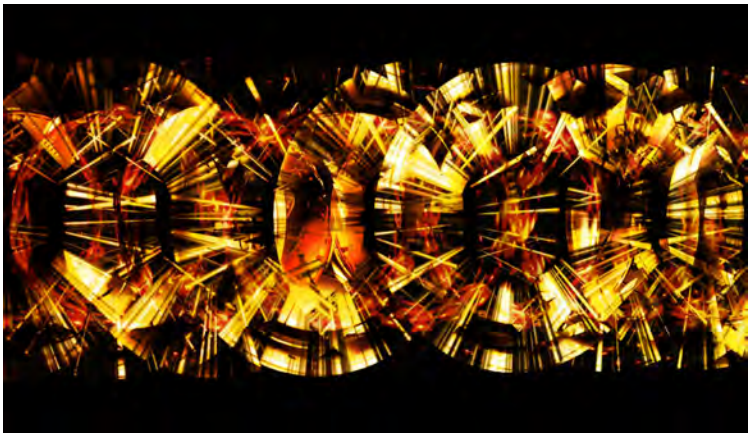

Fig. 1. Infra-red experiment (untitled detail) © Chris Henschke

Introduction

Art and science seem to be very different disciplines, but are they really so unalike? What happens when art comes into contact with science in settings such as the Australian Synchrotron and CERN, the European Organization for Nuclear Research? What results when these worlds collide?

The Australian Synchrotron is a device two hundred metres in circumference that accelerates electrons to ninety-nine percent of the speed of light; it is also the community of scientists, engineers and other personnel who harness the energy emitted from the device with which they conduct experiments. This is done in accordance with the empirical method, a rigorously structured process of developing theories based upon observations of natural phenomena. Scientists undertake experiments to test their theories against the phenomena in question, and, through adjusting both the theory and the experiment, arrive at a clear and precise fit of theory to observation. This method seems to be at odds with the practice of art, which is popularly perceived as being driven by subjective, inward-looking, and irrationally inspired individuals [1]. Such clichéd generalizations tend to describe a superficial disparity between these 'Two Cultures' [2]. However, I argue that connections exist between the disciplines of media art and experimental physics, and these can be revealed through art / science residencies and projects. I will use my residency experiences to support this argument, and although largely limited to personal projects and outcomes, the experiences gained during these activities provide insights into the art / science equation.

Historical and philosophical factors

The influential physicist and philosopher Karl Popper states that scientific discoveries are born from processes of stimulation and the release of inspiration, which itself is not a scientific or logical process. Popper argues that every discovery contains 'an irrational element or a creative intuition', which the scientist then 'critically judges, alters, or rejects' in accordance with the epistemological framework of falsifiability [3]. Additional non-scientific forces also influence the development of scientific "paradigms", including historical, economic and political factors, as well as the intuitions and passions of the researchers [4]. Such factors are also present in the development of art movements; the art critic Ernest Gombrich pointing out that the 'idea of pure observation has proved a mirage in science no less than in art' [5].

However, unlike the properties the physical sciences deal with, art does not need to objectively define or illustrate specifics. Instead, to use an analogy proposed by philosopher Barbara Maria Stafford, art can be seen as a mirror held up to reflect aspects of the world, which 'collects and brings within its circumference all that lies scattered about us and re-launches it in sharper or cloudier form' [6]. The mirror of art does not perfectly reflect reality, nor does it intend to. It is more like a fun-house mirror, yet its distortions are sometimes constructed with a precision akin to the exactitude found in science. Such image incongruences employed in the visual arts have led to a mistrust of it within the sciences, and even in wider culture. Stafford writes that 'cultural bias, convinced of the superiority of written or propositional language… devalues sensory affective and kinetic forms of communication precisely because they often baffle verbal resolution' [7]. And yet, although it may seem paradoxical, in science the visualization and 'witnessing of a phenomenon … is essential to its acceptance in the body of natural knowledge' [8]. This has been the case since the time of Faraday, who made drawings to develop his revolutionary understanding of electromagnetism and used public demonstrations to increase people's understanding of his theories.

The conflicts around the role of images in science are found even in the heart of modern physics. The pillars of twentieth century physics, Einstein and Heisenberg, fundamentally disagreed over the interpretation of the same quantum mechanical experiments, to the point where Heisenberg stated that he found Einstein's visualizations 'disgusting' [9]. In contemporary physics, images are routinely used to assist in the analysis of even the most abstract properties (although contention over interpretation still exists). Digital visualization tools are widely used to represent data in physics, and many equivalent tools are used in digital art.

Residency at the Australian Synchrotron, 2007

The factors described above provided me with initial points of connection to the scientists I worked with at the Australian Synchrotron. I undertook two artist residencies, in 2007 and 2010, respectively through the Arts Victoria and the Australia Council 'Synapse' program, both of which were mediated through the Aus-

tralian Network for Art and Technology. From discussions with various scientists and engineers at the complex, who all worked in ultra-specialized fields, each of which may take a lifetime to fully understand, I began to realize that the synchrotron is a device of such complexity that it is ultimately unknowable. That is, it is impossible for any one person to completely understand all of its scientific and technological dimensions, even among those who build such devices. This state is described by philosopher Jurgen Habermas' term “neue-unubersichlichkeit” – that is, a state of total unsurveyability in the modern world [17]. Habermas posits that this creates a pessimism towards complex technology and its increasing ‘probability of dysfunctional secondary effects’, stating ‘forthright “helplessness” more and more replaces attempts to find orientation determined by and directed toward the future. It may be that the situation is objectively obscure’ [18]. However, given art’s its ability to express that which cannot be rationally comprehended, can art manifest, and thus maybe even sublimate, such a state of unsurveyability?

During my residencies I used digital media to develop processes that brought together different aspects of the practices used at the Synchrotron. These processes were loosely based on their methods of undertaking experiments and collecting data and sought to probe the nature of materials and in a sense materiality. The techniques I developed allowed me to bring together formal and conceptual elements of the synchrotron in various combinations, often with unexpected results.

Infra-red Beamline experiment

My first hands-on experiment was with the Infra-Red beamline, which uses the Synchrotron’s infra-red energy to see microscopic and invisible aspects of mainly biological material. By “interfering” with the beam I managed to audio-visually capture and visiblize the infra-red energy. The process I used to manipulate the material was a kind of audio-visual analogy of the ‘Fourier Transform’, a mathematical function the scientists regularly use to analyse energy emissions, which turns spatial visual data into frequency data and vice-versa (see Fig. 1).

Protein Crystallography Beamline experiment

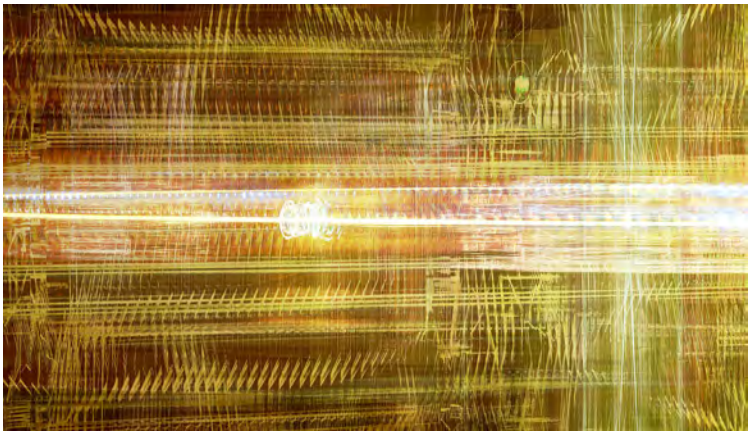

Fig. 2. *The New Sun* (detail) © Chris Henschke

The Protein Crystallography beamline is the highest energy beam at the Synchrotron, and allows scientists to see structures on a molecular scale. I set up and conducted such an experiment, and developed animations made from the data taken from an insulin molecule I scanned in the X-ray beam. I was inspired to unconventionally capture and process the visual data by an eloquent outburst from a usually reserved scientist, who told me that seeing the sample on its micron scale would be like gazing up at an infinite sky of endlessly repeated electron constellations. My result, empirical in a scientifically meaningless way, sought to capture that poetic insight, using the raw images to visually create what I felt it would be like to inhabit such a microcosmic space.

Accelerator experiment

During my – residency I was inspired by the accelerator physicists’ description of the precise combination of magnetic fields and electric forces in the hundreds of magnets that drive the Synchrotron, which they call the “synchrotron tune”. Several accelerator physicists and I developed a way to modulate the beam with sounds. We conducted a “Cicada experiment” – injecting the sound of a cicada into the accelerator at a corresponding frequency. For a moment, both the cicada and synchrotron sang the same tune, but then the synchrotron beam literally crashed. This event gave me a taste of real experimental science, and through the error of dumping the beam, I was able to connect with the scientists both methodologically and socially, via the shared experience of doing an experiment whereby nobody knew what the outcome would be until it was attempted.

Synchrotron portrait

The New Sun (Fig. 2) is a twenty metre translucent print on acrylic panels that paints a ‘synchrotron portrait’, using the synchrotron itself as both the subject of the work and the brush used to paint it. The piece was made by collaging the synchrotron's engineering diagrams with the light captured from the Optical Diagnostics, Infra-Red, Soft X-ray and Protein Crystallography beamlines, overlaid with the visible spectrum of the sun. This work attempts to convey the overwhelmingly complex and yet finely balanced nature of the synchrotron. Commissioned in 2008, and developed with people in the science, engineering, and external relations departments, the work was initially designed to be placed in front of the actual synchrotron, providing an impossible view into the heart of the device. The title of the mural is from an Einsturzende Neubauten song; the chorus of which is “The new sun burns more than it illuminates” [19]. Perhaps such critical elements are too subtle, but if I used more explicit means such as radiation symbols, the more reactionary scientists may not have allowed the work to be put up.

‘Synapse’ residency, 2010

Lightcurve was produced during my 2010 ‘Synapse’ residency at the synchrotron. It was created in collaboration with accelerator physicist Dr Mark Boland, who helped develop unique visualisation tools as well as giving poetic descriptions of the extreme energies within the synchrotron. The piece is an animated visualization of my subjective interpretation of the heart of the synchrotron (see Fig. 3). It formally suggests the structure and nature of the synchrotron beam, and it is ultimately made of the synchrotron light. But it does not seek to illustrate or define exact properties of the synchrotron; it is more an expression of what I

feel the abstract yet ultimately real physics to be. To appropriate a Marxist term, the work is a kind of "concrete abstraction" [13], creating a homogenous yet fragmented vision of a fantastic yet real space of a theoretical yet experimental physics. Through the work I seek to impart an experiential expression of synchrotron space-time, as opposed to an abstract mathematical model. Mathematician and philosopher Henri Bergson states that we intuitively perceive nature in 'an uninterrupted continuity of unforeseeable novelty' [14]. Bergson argues that this perception underpins scientific intelligence, which constructs an abstraction of nature through an artificial atemporality, superimposing states of matter into rigorously organized systems … expressible in static terms [15]. For Bergson, our experience of time and subsequent reduction of it to a calculable form is innate - we are all by nature mathematicians, and science is just a more precise continuation of this capacity [16].

The endless loop of *Lightcurve* also conveys the subjective and personal tension of being in an unknowable realm – moving along a path but realizing you will never get to the destination. In a sense this manifests the unsurveyability of the Synchrotron and the science that propels it.

Lightcurve also contains an element critical of the science in use - through the intense colors and unpleasant sound, it tries to capture the deadly intensity of the synchrotron's ionizing radiation (which the external relations department disarmingly call "light").

Large Hadron Collider experience, 2009

Through my ongoing collaborations with the scientists at the Australian Synchrotron, I was invited to visit CERN in 2009. I took a tour of the twenty-seven kilometre underground accelerator and several of the collision detectors, including the Large Hadron Collider Beauty experiment (LHCb), which examines symmetry breaking in beauty quarks, magnetic monopoles and antimatter. I created a series of *Asymmetry* animations in response to this, and also tried to manifest the overwhelming feeling of being in there, and the spatiotemporally disturbing effects the experiment has on the physical locality. I made the works using photographic and sound recordings I took on site, which I animated using time-displacement algorithms controlled by the audio [20]. This piece is a demonstration of my working process: the animation is one variation of many, where I have adjusted the control variables as a way to audio-visually crystallize concepts forming in my mind. I did not find the *Asymmetry* animations to be as successful as *Lightcurve*, in that they did not convey the emotive essence of the experience, whereas *Lightcurve* has a more compelling and mesmerizing quality – a conclusion I came to from personal appraisal and responses from people (including scientists) who have seen the works in exhibitions and screenings.

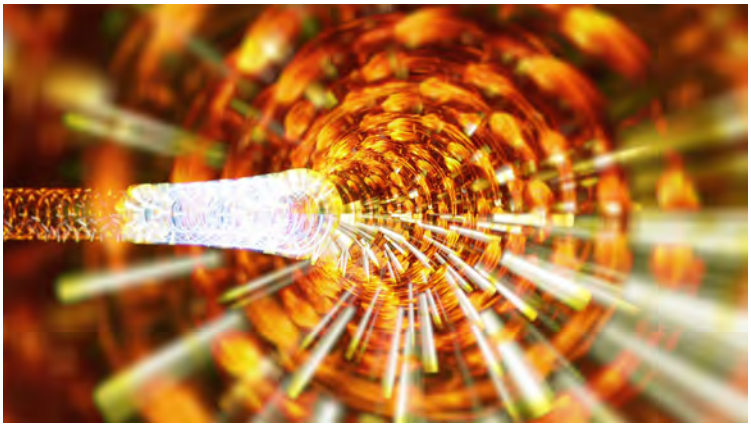

Fig. 3. *Lightcurve* (still from animation) © Chris Henschke

After the CERN experience

Based on such examples, my working method can be summed up as: defining and isolating factors; controlling conditions; manipulating variables and properties; analyzing the effects; and using the results to develop and focus the theory or idea. This can also describe the processes used at a particle accelerator, and indicates methodological correlations do exist between media art and experimental physics.

Such experiments undertaken at CERN bring quantum and cosmic physics together, thus potentially becoming a primer for the ultimate doomsday scenario, the "quantum disaster", where an accidental human-made black hole swallows the world [21]. Cultural theorist Paul Virilio points out the inexorable connection between technology and disaster. 'To invent the train is to invent the derailment' proclaims Virilio [22]. He also suggests that through contemporary science 'we are inaugurating an unparalleled accident, an accident of reality, the accident of space and time' [23]. These are some of the issues facing artists working in such settings, who must avoid being the unquestioning handmaiden of science on the one hand, and being overly sensationalist and reactionary, and invoking sci-fi movie style disaster scenarios such as the one described above, on the other. There is also a danger for the artist's creativity, that of being overwhelmed by the enormity of science, becoming too didactic, and losing one's expressive freedom and voice.

Outcomes and Discussion

Although the methods I use may seem anathema to science, the technique of collage does play a role even in the most precise of disciplines. The physicist David Bohm champions the "mental collage" method of connecting seemingly disparate phenomena or ideas in scientific research. He described this as being a 'poetic equating of very different things [in which there is] a kind of tension or vibration in the mind, a high state of energy' [10]. Physicist-cum-anarchist philosopher Paul Feyerabend pushes his methodology much further, advocating the use of non-scientific methods in scientific practice. This approach is summed up by his radical empirical principle of 'Anything goes' [11]. Paired with Joseph Beuys' edict that 'Art [is] the science of freedom' [12], I developed an emergent process, starting with fundamental properties examined in both art and physics, such as light and sound, space and time, matter and energy. From such relations, I developed my own "visual experiments", which were kind of distorted mirrors reflecting formal aspects and processes of synchrotron science. Demonstrating the results of these experiments to the scientists drew a wide spectrum of responses, ranging from ridicule to a sense revelation. This communicated a lot about how these scientists perceive their world.Their responses shaped my initial image-capturing experiments, informing such pieces as *The New Sun,* in the sense that

it portrays my response to the scientists' description of the device, and *Lightcurve,* in that it seeks to express the endless journey that scientific researchers undertake.

In conclusion, I call upon artists working in this area to be more critically aware of the science they're working with [24]. In Beuys' words, artists must use the 'energy of freedom' [25] with a degree of responsibility. Practicing in such contexts gives artists unique insights, and allows artists to question scientific research through partaking in it. Whilst not trying to be scientists outright, which 'smacks of the dilettante' [26], artists should engage with scientists on an informed and critical level. Such in-situ and collaborative projects give scientists different views of their research and working methods. It also increases their understanding and appreciation of artistic processes, as I have found from my synchrotron experiences. These kinds of projects produced in such settings are fundamentally art, they are not meant to provide new scientific knowledge, although they may provide inspiration to scientists.

As the emerging discipline of art / science practice develops, artists can and should advance an appraisal of science that does not necessarily take a pessimistic stance. Rather, their approach should encompass science's profound and positive discoveries, as well its abuses or unintentional ill-effects. In addition to critical elements, art / science collaboration also reveals a shared spirit of curiosity and inquiry. And it releases a fundamental force, akin to Bohm's "mind energy". This is then what occurs when these worlds collide – energy is released, the energy of ideas, tensions and possibilities. Such energy initiates dialogues and reveals both differences and commonalities between the two disciplines, and this can propel both disciplines collectively into new areas of research, discovery and creation.

References and Notes

1. Christopher Frayling, *Research in Art and Design* (London, U.K.: Royal College of Art Research Papers, Volume 1, No. 1, 1993/4).

2. Charles Percy Snow, *The Two Cultures and the Scientific Revolution* (Cambridge, U.K.: Cambridge Press, 1959) p. 13.

3. Karl Popper, "Selections from The Logic of Discovery", in R. Boyd, P. Gasper, & J. Trout eds., *The Philosophy of Science* (Massachusetts, U.S.A.: MIT Press, 1993) p. 195.

4. Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago, U.S.A.: University of Chicago Press, 1970) p. 175.

5. Ernest Gombrich, *Art & Illusion: a Study in the Psychology of Pictorial Representation* (Phaidon, 6th edition, 2002) p. 271.

6. Barbara Maria Stafford, *Echo Objects, the cognitive work of images* (Chicago, U.S.A.: University of Chicago Press, 2007) p. 126.

7. Barbara Maria Stafford, *Good Looking: Essays on the Virtue of Images* (Massachusetts, U.S.A.: MIT Press, 1996) pp. 22-23.

8. D. Gooding, "'Magnetic Curves' and the Magnetic Field: Experimentation and Representation in the History of a Theory", in D. Gooding, T. Pinch, and S. Schaffer eds., *The Uses of an Experiment*, (Cambridge, U.K.: Cambridge University Press, 1989) p. 183.

9. David Bohm & David Peat, *Science, Order & Creativity* (London, U.K.: Routledge, 1987) p. 85.

10. Bohm & Peat [9] p. 33.

11. Paul Feyerabend, *Against Method* (New Jersey, U.S.A.: Humanities Press, 1975) p. 38.

12. Joseph Beuys, *What is Art – conversations with Joseph Beuys* (Clairview Books 2004) p. 10.

13. Lukasz Stanek, "Space as Concrete Abstraction, Hegel, Marx and urbanism in Henri Lefebvre", in Kanishka Goonewardena, ed., *Space, Difference, Everyday Life: Reading Henri Lefebvre* (Routledge, 2008) p. 63.

14. Henri Bergson, *The Creative Mind* (Westport, U.S.A.: Greenwood, 1946) p. 39.

15. Bergson [14] p. 37.

16. Michael Vaughan, 'Introduction: Henri Bergson's "Creative Evolution"', *SubStance* (Vol. 36, No. 3, Issue 114, 2007) p. 13.

17. Jürgen Habermas, *The new obscurity: the crisis of the welfare state and the exhaustion of utopian energies* Phillip Jacobs, trans. (Philosophy & Social Criticism, Sage, 1986)

18. Jürgen Habermas, *The new obscurity: the crisis of the welfare state and the exhaustion of utopian energies* Phillip Jacobs, trans. (Philosophy & Social Criticism, Sage, 1986) p. 2.

19. Einstürzende Neubauten, *Zeichnungen Des Patienten O.T.*, (Some Bizzare Records, 1983).

20. The experience left me shaking I was so affected, and the ipod in my pocket was also affected somehow by the big magnet I was near and was almost entirely erased. By a twit of fate only the 'Melvins' survived – their music is indeed CERN-proof!

21. John Henley, *Will the world end on Wednesday?* <http://www.guardian.co.uk/science/2008/sep/08/particlephysics.physics>, accessed 1 May 2013.

22. Paul Virilio, *Unknown Quantity*, (London, U.K.: Thames & Hudson, 2002) p. 24.

23. Virilio [21] p. 87.

24. It is not just scientists with whom one must critically engage – I have encountered artists and curators who disturbed me with their dismissive and reactionary attitudes: they did not care about the science even when their work was supposedly dealing with scientific concepts. When I pointed out diagrams showing the effects of gravity around black holes to an artist involved with an exhibition at the Australian Synchrotron, he obtusely responded 'That does nothing for me'. Such willful ignorance does little to help the emerging area of art that works with science.

25. Beuys [12].

26. Sarat Maharaj, in Miyake Akiko & Hans U. Obrist, eds., *Bridge the Gap?* (Neu-Isenburg, Germany: Verlag der Buchhandlung, 2001) p. 112.

Portmanteau Worlds: Hosting Multiple Worldviews in Virtual Environments

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Abstract

Intending to persuade (or sell), conventional architectural representation often hides conflicting opinions, discourages participation and culls possible futures. Dissatisfied with this situation, I consider an approach that aims to emphasize co-presence of multiple voices, disclose power relationships, demonstrate lines of resistance and present existing or possible places as politically charged networks of enacted relationships. Motivated by the capabilities of interactive narrative, the paper considers polyphonic potentials of virtual environments. In spite of their interactive characteristics, virtual environments can impose preconceived worldviews as forcefully as any others. However, generative capabilities of computational media can also support construction of multiple interpretations that emerge simultaneously.

Keywords

Virtual environments, interactive narrative, serious games, architectural representation, interactive camerawork, expressive processing.

Portmanteau Analogy

In this paper, I propose that virtual environments can resemble portmanteau words. Originally defined by Humpty Dumpty, portmanteaux blend sounds and meanings of two or more distinct words.

lithe + *slimy* = *slithy*
flimsy + *miserable* = *mimsy*

Humpty Dumpty was inspired by portmanteau bags used to pack together clothes and other diverse items when traveling. Similarly, virtual environments can combine multiple representations and meanings into new and useful hybrids, or *portmanteau worlds*.

Background and Motivations

This paper is motivated by the desire to resist the flattening of multiplicities in architectural-design thinking and to complicate familiar, but misleading, binary relationships, such as those that exist between humans and nature, buildings and sites or architects and clients. This resistance arises from an acknowledgment that architectural phenomena such as places and performances are assemblages of relationships that extend beyond their apparent limits.

By way of background, this paper uses the concept of assemblages in reference to the reconsiderations of ontologies and epistemologies of society, nature and technology. Interpretations suggested by Latour [1] and De Landa [2] are particularly relevant, but further broad literature exists and synonymous terms include assemblies, rhizomes, collectives, groups, actor-networks and activity systems. In the context of the current discourse on such concepts, this paper is motivated by the need to experiment with the practical implications of efforts to rethink foundational ontologies, for example through the projects of "new materialism", "speculative realism" or "object-oriented ontologies" [3, 4]. A further discussion of concepts used in this paper can be found in my earlier work on places as performances [5].

Such general motivations can be pursued in various ways. This paper focuses on virtual environments used to represent architectural designs and considers whether and how they can sustain heterogeneous assemblages with multiple meanings.

Approach

The form of resistance to flattening and unification with which this paper is concerned involves the slowing down of attention, thinking and learning [6]. This approach has some affinity with the "slow" movement. There are several manifestations of this movement that are relevant to my approach: 1) "slow food", which seeks to promote autonomy, fluidity and complexity representative of the underlying spatially differentiated norms, practices and ecologies [7]; 2) "slow technology", which entails a desire to cater for long term, situated co-habitation with technology and a reflective attitude towards its use [8, 9]; 3) "slow knowledge", which is acquired through gradual cultural maturation and shaped to fit particular ecological and cultural contexts [10]; and 4) "slow design", which, along with co-design, social design and metadesign, acts as an expression of design activism that aims to move beyond eco-efficiency and engage with non-monetary societal metabolisms [11]. According to the slow movement, a drawback of fastness can be attributed to the fact that it discourages diversity [12]. Usability and efficiency that also pursue faster speeds have the same disadvantage. By contrast, the sacrifice of speed can encourage economical practices, thoughtfulness and an openness to difference.

In the case of virtual environments, it is common to presume that they attain their powers through specific illusions made possible by fast computation. For example, one such illusion is immersion, or the state of being deeply involved [13]. Immersion is a powerful effect in interactive media as well as in more passive forms, such as TV or books. For the purposes of my argument, immersive virtual environments can be characterized as fast because they hide the mechanics of simulations used to achieve the illusion of immersion. Indeed, it is common to emphasize the fastness of such worlds by saying that they operate in "real time". The pursuit of other illusions such as that of 1) presence, or an impression of being in a place other than where one's body is physically present; and 2) agency, or the ability to modify one's virtual surroundings, is also a common sign of the fast virtual environments.

By contrast, virtual environments that expose the processes through which their worlds are constructed at the expense of such illusions, can be characterized as slow.

Ryan demonstrates that literary criticism has long been skeptical of immersion and "the alleged incompatibility of the experience [of immersion] with the exercise of critical faculties" [14]. She also observes that interactivity has been over-promoted "as an instrument of liberation from some of the most notorious *bêtes noires* of postmodern thought: linear logic, logocentrism, arborescent hierarchical structures, and repressive forms of power" [15]. The approach discussed in this paper shares an interest in narrative with her "immersible interactivity" project. Ideas parallel to my approach can also be found in Frasca's desire to apply methods of the Boal's theater of the oppressed to games [16, 17]. This paper shares with Boal's work the conceptual background that sees knowledge as constructed rather than transmitted and, therefore, the process of construction or learning by doing as the appropriate tactics of communication.

In fast virtual environments, simulations can be based on conclusions derived from hidden and value-laden reasoning. By contrast, slower engagements can elicit the situated values of relevant stakeholders. The slow virtual environments can achieve this by facilitating experiential encounters with aspects of life-worlds, by amplifying the presence of things and relationships, by encouraging reflection and by motivating cultural exchange.

Test Case

The test case for this approach is Virtual Braunstone, a virtual environment of a Health and Community Center in the Braunstone Estate near Leicester, UK. The Virtual Braunstone is an outcome of a research project which sought to develop a three-dimensional, virtual, navigable environment, to be operated on a standard personal computer with a screen, speakers, keyboard and mouse. In collaboration with others, I was responsible for the strategic planning of the project's research program as well as for the design and technical implementation of the virtual environment. In addition, I participated in consultations with relevant stakeholders and was co-responsible for the collection and analysis of the feedback.

The detailed description of the technical implementation of Virtual Braunstone is beyond the scope of this paper. Briefly, the project uses Virtools as its development platform. It is structured in a modular way to support flexible recombination, experimentation with multiple scenarios and collaborative development. System-level programming supports dynamic loading and initialization of externally-created content such as videos, sounds, texts or 3D models. Object-level scripts can be associated with loaded or procedurally created content manually or automatically. Interface elements receive standardized messages that can be sent by all types of objects or in response to various measured conditions. As a result, additional actors or narrative sequences can be introduced quickly and the environment can suggest interpretations surprising even to its authors.

With these technical capabilities in mind, the analysis below is an exercise in thinking about virtual environments as multiplicious, contingent and self-reconfiguring assemblages.

Places of Many Stories

This focus on the assembled character of environments is appropriate because the co-presence of multiple possible interpretations has been evident from the project's beginning. Virtual Braunstone had to tell a story about the Braunstone Health and Community Centre as a site of innovation, but the challenge of such a presentation is far from trivial. What does Braunstone Health and Community Center do? Why, how and for whom? Many simultaneous stories can serve as suitable answers. As always, different stakeholders experience and describe things differently.

Fig. 1. Opening Sequence, shot 3. [fade in from black] The camera turns to the right and zooms to find Tina, the protagonist, with a pram, moving towards the entrance of the health center. The shot traces the path to the entrance, shows the location of parking, emphasizes the distinction between the walkways and the road, illustrates the scale of the building and relates it to the surroundings.

Fig. 2. Opening Sequence, shot 5. [fade in from black] This static camera shows the entrance lobby and the view into the reception area. Tina, now without the pram but with a baby in her hands, passes through the frame. [cut]

Fig. 3. Opening Sequence, shot 10. A wide shot of the reception area with Tina in the center. The menu appears on the right of the screen. From now on, the user is in control.

During the initial conversations with the research team, the National Health Service and the architects tell a story that justifies the existence of the project. They describe a particularly troubled area of Leicester. Unemployment has been high among residents over several generations. Crime, teenage pregnancy and vandalism are common. Public facilities are missing or basic. Indeed, the New Labour Government has formally identified Braunstone "as a 'neighbourhood' of multiple disadvantage, in 1998/99" [18]. Some say (can they be serious?) that the locals have deliberately burnt down the previous health center.

According to these stakeholders, the new center is badly needed, can be substantially better than the previous center and is likely to be more acceptable to the community. This is a story about civil servants excelling at their duties.

Addressing those concerned with the provision of medical buildings, the National Health Service also claims that the center is unusual because it combines community and health services in one facility. The building will include medical suites, indoor and outdoor public areas, a café, a police outlet, rooms for social workers and a pharmacy. This story can be labeled as that of organizational innovation.

The identity of the Center is further complicated by the conflicting stories describing the wishes and needs of its users. For example, architects think that to gain acceptance, the center has to be welcoming to the local community. Consequently, during their consultations with the neighborhood, the architects describe their design as open. At the same time, the medical professionals want security. None of them seem to live locally and most desire a sealed perimeter with controlled access. In response, the architects attempt to separate incompatible visitors and provide safety without making the building feel like a fortress. Consequently, the stories they tell doctors describe pregnant teenagers moving through separate corridors from their alcoholic fathers and emphasize that the system of parking is inaccessible to the visitors.

Further stories add other meanings. UK planning regulations and established practices tend to produce deep and dark buildings. With the relevant professionals in mind, architects create a story of

Fig. 4. Opening Sequence, shot 12. As the user is navigating Tina towards the Receptionist, the camera switches to a reverse shot showing the approaching avatar and the reception area from his perspective.

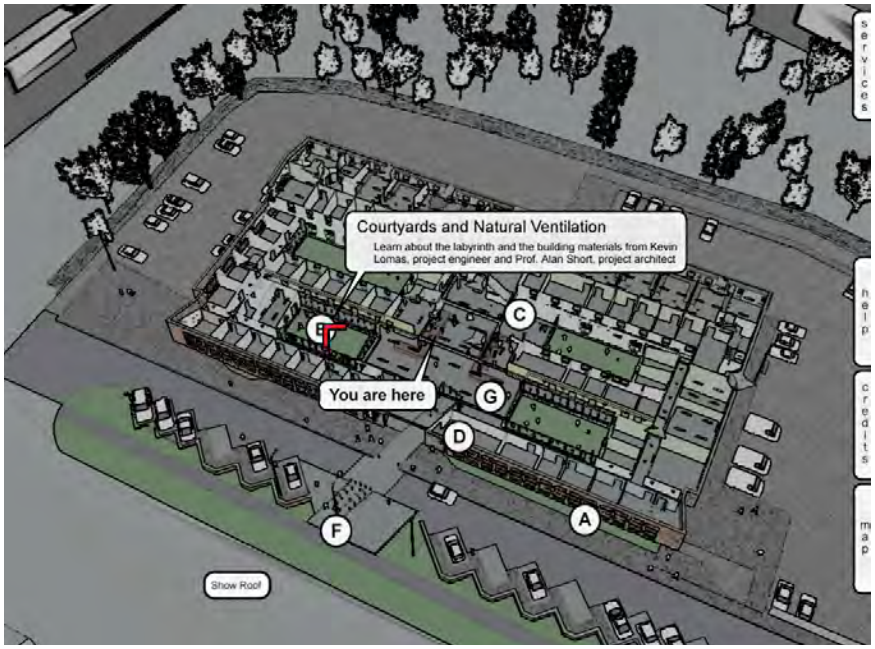

Fig. 5. Interface Elements. Pressing the Space key displays the cursor. Rolling the cursor over the letter markings brings up the titles of the missions. Interface buttons on the right brings up further interface-elements. In this case, the selected sequence is Courtyards and Natural Ventilation.

Fig. 6. Courtyard sequence, shot 2. When the user selects a mission in the aerial view, the camera flies back into the building and the conversation between the receptionist and Tina resumes. The receptionist explains the route to the destination.

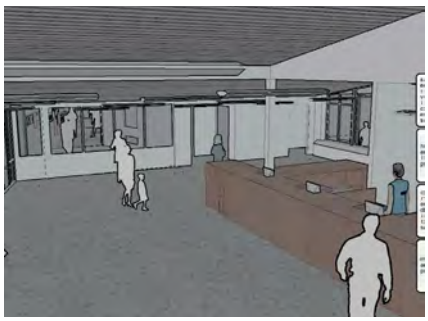

Fig. 7. Courtyard sequence, shot 4. Following the instructions of the receptionist, the user steers Tina towards the courtyard. The camera pans to follow her movement.

Fig. 9. Courtyard sequence, shots 6, 7, 8. When Tina approaches the door, the camera switches again. The user steers Tina through the door and follows the corridor. The camera remains static. In the next shot, the camera is in the courtyard. It pans left-to-right as the user steers Tina towards the end of the corridor.

Fig. 8. Courtyard sequence, image 5. As Tina passes the corner of the counter, the camera switches to a static shot showing the courtyard in the background and the door, that the receptionist described earlier, to the left.

Fig. 10. Courtyard sequence, shot 9. Tina is in the courtyard. The camera smoothly transits from the third- to the first-person point of view. The user sees a video screen located in the courtyard. Shot 10 (shown). The movie is annotated by a textual tag. In it, the project architect discusses the environmental features of the design. The user is free to move about the courtyard. Rolling over buttons brings up associated textual or visual tags with information about the surroundings.

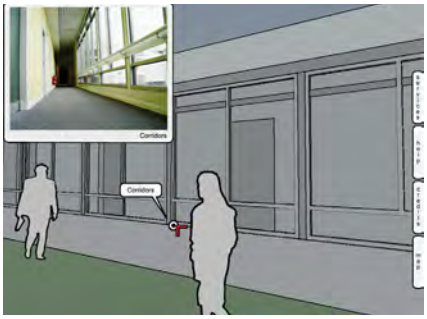

Fig. 11. Courtyard sequence, shot 12. A button triggers a sequence of images showing the detailing and appearance of the corridors.

Fig. 12. Courtyard sequence, shot 13. Having reached the mission's destination, the user returns to the Receptionist and has an option to answer positively or negatively to his questions: "Was the courtyard open? Have you managed to find it?"

the Center's deep-plan structure. It describes landscape courtyards that manage to deliver natural light into most spaces. Wishing to characterize their practice for colleagues and future clients, architects describe the Center's passive ventilation system, developing yet another distinct story. This list of subjective, goal-oriented accounts addressing different audiences and employing different narrative devices can be easily extended.

In response to this radical multiplicity of opinions, purposes and experiences, the design of Virtual Braunstone proposes a narrative structure that can deliver numerous and even conflicting narratives.

From Telling to Acting

These simultaneous and often incompatible narratives cannot be collapsed into one coherent mode of delivery without some loss. Accordingly, Virtual Braunstone avoids generating a master narrative and, instead, seeks to extract meaningful stories from various participants. Human participants can tell interesting stories but these stories are biased by the tellers' understandings and goals. Apart from humans, all places involve multiple types of non-human participants such as animals, natural phenomena or technical artifacts. Typically, such non-human participants cannot tell a story without human help. In both cases, a persuasive way of exploring a situation is through enactment. A performance that involves a variety of stakeholders can combine their multiple narratives with actual experiences. These experiences can be simulated or actual. For example, participants can be asked to navigate through the simulation of building's geometry. Alternatively, doctors and architects can have an actual discussion on the merits of open access in reference to the available virtual locations and views. An integration of conceived and emerging interpretations arising through such hybrid engagements challenges the concept of the "user", presenting both human and non-human participants in terms of actions they perform.

A place like the Braunstone Centre is a complex assemblage of many types of actions. For example, architects and engineers design, construct, promote and make business. Virtual-environment designers learn and retell. Local residents receive treatment, socialize and form expectations. Medical professional cure and worry. The National Health Service personnel organize and institutionalize. Non-human actors also perform. The underground labyrinth ventilates. Brick walls protect.

Some stakeholder actions are harder to simulate than others but even partial simulation can engage participants in the (re)construction of the core notions such as those of the "health center" or "design excellency". It is important to encourage this kind of engagement because the assemblages behind these terms do not have ready constitutions but are sustained through multiple partial performances. This approach has parallels in Latour's sociology of associations, or "slowciology" [19], which suggests that good research accounts perform the social in a way that makes connections explicit and removes the need for explanations.

The following sections discuss how some of such simulations can be supported by computer-sustained operations and are implemented in Virtual Braunstone.

Operations

Given that all of Virtual Braunstone cannot be described within the limits of this paper, the subsequent text focuses on several characteristic operations. The term operation here is informed by Bogost's discussion of "unit operations" [20], or various types of discrete processes that perform transformations on inputs. In this paper, operations are recognizable, repeatable and programmable. They can be initiated by different triggers and their overall outcomes are independent of the mechanisms of their implementation. Relatively autonomous, these operations can be used in different context and combinations, for example, to sustain other stories or to enrich other virtual environments.

Operation 1: Undertaking

To express and simulate a variety of experiences and viewpoints, Virtual Braunstone offers the user a series of journeys. These journeys rely on the concept of missions common to computer games. These missions encourage exploration and enactment by requiring navigation (from fig. 6 to fig. 10), participation in conversations (e.g., fig. 6 and fig. 12), study and selection of narrative themes (fig. 5) and other activities.

Each mission has a distinct topic, relates to a particular location and plots a unique path through the environment. The prototype implementation of Virtual Braunstone includes seven missions: Design Challenges, Courtyards and Natural Ventilation, Environmental Features, A Community Facility, Project Realization and Management and Neighborhood. These themes were selected to reflect the multiplicity of concerns that pertain to the Braunstone Health and Community Center. Each mission mobilizes a distinct cast consisting of 1) human speakers variously involved with the project (fig. 10); 2) photographic evidence collected on site during construction (fig. 11); 3) visualizations and simulations of technical issues, natural processes and construction procedures (not shown); 4) navigable three-dimensional geometry (all figs.); and 5) the movies of pre-rendered, animated two- and three-dimensional digital models (not shown).

Operation 2: Editing

In Virtual Braunstone, navigation is supported by parametrically controlled cinematic camerawork [21, 22] that utilizes action-driven editing (figs. 6 to 8), rhythm-aware shot transitions (figs. 1 and 2) and multiple forms of projection (orthogonal, perspectival and axonometric). These combinatorial capacities of interactive media reach beyond the montage in cinema by associating particular representational choices not only with narrative logic but also with particular locations. By navigating the

avatar through these locations, people who explore the virtual environment can compare the narratives offered by the designers with their own experiences.

Operation 3: Tagging

In addition to other discursive operations, Virtual Braunstone utilizes various forms of tagging (fig. 10). These tags can be textual and visual, unitary or serial, arbitrary or opportunistic. As they are location- and time-specific, they can also be triggered by narrative events. Tags can name, question, compare and highlight many types of actors and operations. They can express processes of construction or the functional behavior of building components. They can group, foreground and explain, such as when they employ a set of photographs to describe the ventilation system (fig. 10, behind the speaker) in varying degrees of completeness. They can guide the navigation and frame the behavior of the people encountering the virtual environment.

Operation 4: Rendering

Virtual Braunstone utilizes cartoon-style rendering (all figs.) as a flexible setting that allows the accommodation of multiple types of visual content. The National Health Service planned to finish the physical building before the completion of Virtual Braunstone. With this in mind, Virtual Braunstone is designed not to compete with the high fidelity of the physical site. Instead, it extends the simplicity of cartoon-style presentation with a broad variety of photographic and simulated imagery produced during different stages of construction (figs. 10 and 11). In addition, the cartoon-style representation of the architectural and natural elements allows flexible and economical inclusion of other non-photorealistic representations. For example, Virtual Braunstone incorporates outline representations of people, cars and trees (fig. 1 and fig. 2); shaded representations of main characters (fig. 2 and fig. 4); and diagrammatic pre-rendered animation (not shown).

Examples

The following text provides two examples of possible sequences of experiences within Virtual Braunstone.

Example 1: The Entry

The first example is the sequence that structures the process of entering into Virtual Braunstone (from fig. 1 to fig. 4; with some of the distinct cinematic shots omitted for brevity). This sequence introduces the non-photorealistic visual style, openly announces the artifice of the virtual-environment representation and establishes the cinematic conventions used in support of interactive missions. These conventions permit cross-fades and cuts to suggest instant relocations or time jumps as well as reverse shots to portray dialogues and relate characters' actions to the surroundings. The sequence follows the main protagonist, a partially controllable avatar of a mother with a young child. Thus, from the very beginning, Virtual Braunstone asks its visitors to consider the experiences and relationships of a participant whose needs and behaviors are different from theirs. Directing and observing actions of another person, especially in public settings, encourages reflection and discussion that could not be triggered by a neutral entity, for example by a generic human avatar or an invisible virtual camera.

Example 2: A Mission

The second example is the sequence that continues from the moment of mission selection to a destination serving as the mission's goal (from fig. 5 to fig. 12; with some shots omitted). The sequence demonstrates how cinematic editing is used to describe the character of architecture. The utilization of multiple cameras provides a variety of views. Typical first-person virtual cameras have unvarying fields-of-view and follow floors at fixed heights. By contrast, cinematic camerawork can take cameras to locations typical to building visitors (e.g., figs. 8, 10 and 11) as well as to vantage points inaccessible to, unappreciated by or unknown to them (e.g., fig. 5 and fig. 7). In turn, views from such locations can highlight significant characteristics of places, for example visual permeability, one of the center's claims to innovation (figs. 9 and 11).

In Virtual Braunstone, missions lead to destinations that host context-specific multimedia content. The Courtyard sequence of this example gives access to a series of movies discussing architectural, environmental and technical aspects of the design. In this example, the movies allow architects and engineers to explain the passive ventilation system with its courtyard air intakes and the underground labyrinth. They speak in clips, which were shot during construction or in the digitally animated environments. These movies employ further cinematic devices. For example, they assemble complex montage sequences, integrate animation and present physical simulations. Following the narrative, the movies transport the speakers between temporal and geometric locations and construct associations between events, data, interpretations and geometry.

Discussion

Human engagement provoked by virtual environments can change dramatically depending on the context of access. This is the case because virtual environments do not belong to a fixed location and their configurations have to be arranged and actively maintained in every concrete situation [23]. This is particularly applicable in the case of Virtual Braunstone. Even if its software resides on a CD, this CD has to be run on a particular computer, in a particular location and by particular people. It is typically installed during temporally bounded and structured events such as symposia or workshops. During events of this kind, the virtual environment becomes embedded into extended encounters that involve further narrative operations, such as explanations and discussions. Therefore, it becomes possible and useful to think about the experience of virtual environments as a process that involves a running software application but that gains its meaning in relationship to other interlinked performances.

Were stories of Virtual Braunstone, situated in the way discussed above, successful in their attempt to reflect the character of the Braunstone Health and Community Center? In conversations with the research team as well as in its internal symposia, National Health Service personnel have described the Virtual Braunstone project as a success. They have also acted as if it was useful by willingly integrating Virtual Braunstone into national and international events, such as design panels or seminars on sustainable urban development. In spite of these encouraging signs, this paper cannot evaluate the faithfulness of Virtual Braunstone as a representation because my understanding of how virtual environments operate is incompatible with the transmission model of communication that such a criterion presumes. Models that focus on transmission cannot exhibit or put together relevant assemblages because they tend to emphasize predetermined, hermetic and propagandistic narrative goals. Incompatibly with such models, important situated and social effects do

not exist "out there" but emerge through collective enactments. This is similar to conceptualizations in which the world itself has to be produced, for example in what Harman terms "the carpentry of things" [24]. In these cases, "representation" is a misleading term. It is better to talk about the staging of relevant performances or the restaging of past encounters.

Returning to the portmanteau analogy, one cannot extract from a physical suitcase something that someone has not packed. However, literary portmanteaus, when successful, are able to create and name new realities. To continue with Humpty Dumpty:

gallop + triumph = galumph
chuckle + snort = chortle

Can similarly new, alternative realities result from encounters with and within virtual environments?

Situated deployments of the Virtual Braunstone case-study illustrated that meanings in virtual environments are created not by passive receivers, but by members of interest groups who employ multiple types of knowledge. Such creative engagements can sample larger or other possibility spaces [25, 26] than those accessible through physically realized buildings. This comparative sampling encourages stakeholders to engage in discussions about issues hidden by the master narratives offered by dominant experts or suggested by the unreflective patterns of habitual use.

Are there specific strategies which might allow one to commit to the multiplicities of possible actors, performances and meanings? In Virtual Braunstone, the range of narrators is limited to set, preselected, and – one suspects – preapproved stakeholders. Is this limited and artificial collective misrepresenting? A typical move is to extend the range of creative contributions by inviting participation, for example through social media. There are some strong advantages to such an approach including breadth, spontaneity and self-direction. However, in some cases disadvantages can outweigh benefits and lead to shallow ideas, flatness, self-similarity and technologically constrained expression. Virtual Braunstone attempts to explore and enact via encounters that are numerous, heterogeneous and reconfigurable but also curated.

The central challenge of this curatorial effort is to decide what stories to tell, what encounters to stage, and what conditions to put in place to allow for participants' enacted creativity. Popular media (including interactive environments, such as games) keep telling a limited range of stories, a practice that some describe as long-standing, normal and even inevitable [27, 28]. Murray even suggests that "the formulaic nature of storytelling makes it particularly appropriate for the computer" [29]. By contrast Virtual Braunstone does not repeat canon narratives but instead induces people to act, make decisions and establish relationships.

The experience of assembling Virtual Braunstone suggests some tactics that can encourage the transition from representation as transmission towards political representation. This type of representation can be seen as speaking on behalf of stakeholders, as gathering entities into collectives and as directing these collectives. Devoid of political representation or active reflection, conventional storytelling is romantic; it focuses on humans and their emotions, often presented through standard hero-obstacle-goal structures, as can be seen, for example in Iuppa and Borst's account of serious games [30]. However, stories about places, such as Braunstone, or issues, such as health, are much broader than stories about humans and their emotional struggles. Such techno-social engagements involve multiple extended relationships between human and non-human actors, as can be illustrated by Michel Callon's discussion of scallops [31], Latour's analysis of personal transport systems [32] or Mol's sociology of the Zimbabwe Bush Pump [33]. Collectives of this kind are framed by design and are inescapably negotiatory. How can the diverse actors of such assemblages partake in choosing between possible change vectors?

This paper cannot fully answer this strategic question. However the experience of constructing and deploying Virtual Braunstone suggests that the integration of slow, unit-based and reconfigurable narrative with elements of immersive simulation can expose diverse thought processes and ways to behave. In Virtual Braunstone, one can observe different types of expertise in action; for example when experts by training (architects or engineers) campaign for particular interpretations of the place, or when experts through the length of involvement (local residents) talk about their visions of the past and their hopes for the future. This type of storytelling resembles political representation in places for negotiations, such as direct democracy forums, parliaments or courts. At the same time, such storytelling aims to avoid didactic messages intending to propagandize or Hollywood recipes aiming to entertain. Alongside this type of curated but deliberately multiplicious narrative, Virtual Braunstone implements engagements in first and third person. This move, borrowed from computer games, shifts what can initially be recognized as simulations closer to what can be better understood as participatory performances. These performances do not simply simulate for observation and analysis but also make those encountering Virtual Braunstone act out or resist the opinions and arrangements of the experts.

The discussion of virtual environments as devices for the staging of places in architecture, urban design, heritage and beyond is of interest because these fields are yet to engage with the meaning-making strategies developed in the fields of games or interactive art. Relevant literature includes Murray on the possible character of stories in a distinct "digital medium" [34], Jenkins on "narrative architecture" and the ludologist/narratologist debate [35], Ryan on computer games as narrative [36] or Bogost [37] and Wardrip-Fruin [38] on process-dependent expressive characteristics of games.

Narrative sophistication is also uncommon in other "serious" virtual environments. For example, it is illustrative that narrative does not constitute a significant theme in Anderson et al.'s [39] thorough overview of the state of the art in serious games. Instead, the examples they found have didactic characteristics associated with the transmission model where experts teach lay people. These experts do use immersive environments or animated avatars, but employ such devices for tactical reasons that are subservient to their goals and pre-conceived notions. Clearly, game-like virtual environments of this kind can be very useful in spite of these limitations. However, this paper contends that the integration of multiple and heterogeneous points of view can help virtual environments be more persuasive and interrogative.

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References and Notes

1. Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2005).

2. Manuel De Landa, *A New Philosophy of Society: Assemblage Theory and Social Complexity* (London: Continuum, 2006).

3. Diana H. Coole and Samantha Frost, eds, *New Materialisms: Ontology, Agency, and Politics* (Durham, London: Duke University Press, 2010).

4. Levi R. Bryant, Nick Srnicek, and Graham Harman, eds, *The Speculative Turn: Continental Materialism and Realism* (Prahran, VIC, AU: re.press, 2011).

5. Roudavski, Stanislav, *Staging Places as Performances: Creative Strategies for Architecture* (PhD, University of Cambridge, 2008).

6. Bruno Latour, *Politics of Nature: How to Bring the Sciences into Democracy*, trans. by Catherine Porter (Cambridge, MA: Harvard University Press, 2004).

7. Jonathan Murdoch, *Post-Structuralist Geography: A Guide to Relational Space* (London; Thousand Oaks, CA: SAGE, 2006).

8. Lars Hallnäs and Johan Redström, "Slow Technology: Designing for Reflection", *Personal Ubiquitous Computing*, 5, 3, (2001), pp. 201–212.

9. Phoebe Sengers, Kirsten Boehner, Shay David and Joseph 'Jofish' Kaye, "Reflective Design", in *Proceedings of the 4th Decennial Conference on Critical Computing: between Sense and Sensibility*, ed. by Olav W. Bertelsen, Niels Olof Bouvin, Peter G. Krogh and Kynd Morten (Aarhus, Denmark: ACM, 2005), pp. 49–58.

10. David W. Orr, *The Nature of Design: Ecology, Culture, and Human Intention* (New York: Oxford University Press, 2002).

11. Alastair Fuad-Luke, *Design Activism: Beautiful Strangeness for a Sustainable World* (London; Sterling, VA: Earthscan, 2009)

12. Linda Leung and Daisy Tam, "The Art of 'Slow': Taking Time in the Digital Age", in *Digital Experience Design Ideas, Industries, Interaction*, ed. by Linda Leung (Bristol: Intellect Books, 2008), pp. 49–56.

13. Janet H. Murray, *Hamlet on the Holodeck: The Future of Narrative in Cyberspace* (Cambridge, MA: MIT Press, 1997).

14. Marie-Laure Ryan, *Narrative As Virtual Reality: Immersion and Interactivity in Literature and Electronic Media* (Baltimore; London: Johns Hopkins University Press, 2001), p. 10.

15. Ryan [14] p. 8.

16. Gonzalo Frasca, "Rethinking Agency and Immersion: Videogames As a Means of Consciousness-Raising", *SIGGRAPH 2001 N-Space Art Gallery* (2001) <http://www.siggraph.org/artde-sign/gallery/S01/essays/0378.pdf>.

17. Augusto Boal, *Theater of the Opressed*, trans. by Charles A. McBride, McBride, Maria-Odilia Leal, and Fryer, Emily (London: Pluto, 2008 [1974]).

18. Kevin Broughton, Nigel Berkeley, and David Jarvis, "Neighbourhood Regeneration in an Era of Austerity? Transferable Lessons from the Case of Braunstone, Leicester", *Journal of Urban Regeneration & Renewal*, 6, 4, (2013), pp. 381-393.

19. Latour [1] pp. 122, 138.

20. Ian Bogost, *Unit Operations: An Approach to Videogame Criticism* (Cambridge, MA: MIT, 2006), pp. 3–19.

21. Stanislav Roudavski and François Penz, "Context Design and Cinematic Mediation in Cuthbert Hall Virtual Environment", in *Virtual Storytelling; Using Virtual Reality Technologies for Storytelling Second International Conference, ICVS 2003*, ed. by Olivier Balet, Gérard Subsol and Patrice Torguet (Heidelberg: Springer, 2003), pp. 112–115.

22. Stanislav Roudavski and François Penz, "Spatial Context of Interactivity", in *Interactive Convergence: Critical Issues in Multimedia*, ed. by Scott P. Schaffer and Melissa L. Price (Oxford: Inter-Disciplinary Press, 2003).

23. Stanislav Roudavski, "Virtual Environments as Techno-Social Performances: Virtual West Cambridge Case-Study", in *CAADRIA2010: New Frontiers, the 15th International Conference on Computer Aided Architectural Design Research in Asia*, ed. by Bharat Dave, Andrew I-kang Li, Ning Gu and Hyoung-June Park (2010), pp. 477–86.

24. Graham Harman, *Guerrilla Metaphysics: Phenomenology and the Carpentry of Things* (Chicago: Open Court, 2005).

25. Candy, Stuart, *The Future of Everyday Life: Politics and the Design of Experiential Scenarios* (PhD, University of Hawai'i at Mānoa, 2010).

26. Heape, Christopher Robert Ashton, *The Design Space: The Design Process as the Construction, Exploration and Expansion of a Conceptual Space* (PhD, Mads Clausen Institute, University of Southern Denmark, 2007).

27. Joesph Campbell, *The Hero With a Thousand Faces*, (Princeton, NJ; Oxford: Princeton University Press, 2004).

28. Vladimir Propp, *Morphology of the Folktale*, trans. by Laurence Scott, 2nd edn (Austin; London: University of Texas Press, 1968 [1928]).

29. Murray [13] p. 187.

30. Nicholas V. Iuppa and Terry Borst, *Story and Simulations for Serious Games: Tales from the Trenches* (Oxford: Focal, 2007), pp. 35-37.

31. Michel Callon, 'Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of Saint Brieuc Bay', in *Power, Action and Belief: A New Sociology of Knowledge?*, ed. by John Law (London: Routledge & Kegan Paul, 1986), pp. 196-233.

32. Bruno Latour, *Aramis: Or the Love of Technology*, trans. by Catherine Porter (Cambridge, MA; London: Harvard University Press, 1996[1993]).

33. Marianne K. de Laet, and Annemarie Mol (2000). 'The Zimbabwe Bush Pump: Mechanics of a Fluid Technology', *Social Studies of Science*, 30, 2, (2000) pp. 225–263.

34. Murray [13].

35. Henry Jenkins, "Game Design as Narrative Architecture", in *First Person: New Media as Story, Performance, and Game*, ed. by Noah Wardrip-Fruin and Pat Harrigan (Cambridge, MA: MIT Press, 2004).

36. Marie-Laure Ryan, *Avatars of Story* (Minneapolis: University of Minnesota Press, 2006).

37. Ian Bogost, *Persuasive Games: The Expressive Power of Videogames* (Cambridge, MA: MIT Press, 2007).

38. Noah Wardrip-Fruin, *Expressive Processing: Digital Fictions, Computer Games, and Software Studies* (Cambridge, MA: MIT Press, 2009).

39. Eike Falk Anderson, et al., "Developing Serious Games for Cultural Heritage: A State-of-the-Art Review", *Virtual Reality*, 14, 4 (2010), pp. 255–275.

THE SITUATIONAL LIBRARY

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Abstract

This paper introduces the ongoing series of itinerant participatory artworks called the Situational Library. Through the construction of a publicly accessible and open-source archive of physical and digital books, the Situational Library attempts to create a heightened sense of the exchange of something other, or external, which accompanies the exchange of the book itself.

Keywords: book, library, situational, electronic book, archive, participatory art

"The Idea of the book is the Idea that there is no end to this very Idea, and that it contains nothing less than its own proliferation, its multiplication, its dispersion, and always, at some moment and in some respect or another, there is the silent or eloquent advice from the book that is an invitation to throw it away, to abandon it."

– Jean-Luc Nancy

The quote is from Jean-Luc Nancy's *Sur le commerce des pensees : Du livre et de la librairie* and was appended to the texts associated with my first Situational Libraries in 2012 [1]. The Situational Library project is an ongoing and itinerant series of participatory artworks. These works more or less appropriate and subvert the dynamic of a community book swap in order to address general notions of the book and the archive in light of the radically transformative forces currently affecting the complex pathways of the book's ideation, production and distribution.

With this paper I will introduce some of the basic concepts underlying the Situational Library, which I present as a model for a self-organizing, self-running archive with the potential to create a heightened awareness of a shared place and space through which there may be an exchange of energies, along with the exchange of the book itself, material or otherwise. Another underlying motivation in writing this paper is to permit other interested parties to build upon and develop their own Situational Libraries. For those who read with this purpose in mind, I include detailed plans, images and code at the main website hosting the project, where a version of this text will also be made available [2].

Before we discuss the Situational Library itself, a note on what I am talking about when I talk about a 'participatory artwork.' I refer to Claire Bishop's excellent critical volume *Artificial Hells* in which she distinguishes participatory art as connoting the involvement of many people and which she opposes to 'interactive art' which traditionally involves a one-on-one relationship [3]. I would add that, further to involving and encouraging the activity of any number of participants, my Situational Libraries also permit an equal distribution of their potential for intervention. Every participant is equally able to shape the archive, or conversely no single participant, including myself, has any more or differing powers to change the state of the archive. Anyone connecting to the network may upload, download and delete files or categories, rename them, or whatever else is required to shape the archive. Once the work is set into motion it must, more or less, find its own final state without my intervention.

Finally, a note on the project's title, which borrows from the Situationist International (SI) movement founded in 1957 which lasted 15 years. The use of the term "Situational" in the project's title is intended to evoke some of the same primary concerns as addressed by the SI, specifically acknowledging the need to counteract the alienating effects of the "spectacle" produced by late-capitalist society through the conscious construction of "situations" for the purpose of heightening and uncovering authentic feelings and relationships. Guy Debord's *La Société du spectacle* ('The Society of the Spectacle'), published without copyright in 1967, is always among the first books I share in the Situational Library [4].

Fig. 1. "Swap, Drop and Roll" – The Situational Library, Perth Institute of Contemporary Art, 2012 (installation view). (© Andy Simionato.)

The Situational Library 1.0

In its most elementary form, The Situational Library is a free exchange of books in a publicly accessible space and place. The first iteration of the Situational Library "Swap, Drop and Roll," occurred at the Perth Institute of Contemporary Art (PICA), over two months beginning November, 2012. In this inaugural event several thousand de-accessioned books, donated by the State Library of Western Australia, were placed on and around a wooden platform in the center of one of the main rooms of the Institute. Alongside these an improvised table was placed, and secured to this table were some custom made rubber-stamps which the public were encouraged to use on the books in the room. The stamps read "This book belongs to the Situational Library", along with the project's symbol and a web address.

This Situational Library attracted many visitors, often through repeat visits, some donating their own unwanted books to the archive. The front of house and technical staff of the Institute were requested to allow the public to perform any and all activities within the Institute's standard legal and safety parameters. Activities that were encouraged included the reorganizing and sorting of the piles of books, archiving (such as stamping the books), and of course adding any books to, or removing them from, the archive. This last point was not given any more weight than the other

possibilities. In short, it was not overtly framed as a book give-away or 'free-for-all'. Over the course of the installation the piles of books transformed in size, location around the room, and shape depending on the net activity of the day's visiting public, the front-of-house volunteers and the institute's technical and cleaning staff. Depending on which day one visited, the stacks of books could be found lining the walls, scattered across the floors (this often occurred after school group visits), arranged by size, or subject, or colour, or other harder to define criteria. By the end of the installation, the remaining books were removed and the Library was considered closed.

Habent Sua Fata Libelli

On the occasion of the International Symposium of Electronic Art (ISEA2013), a new Situational Library was created in the foyer of the New Law Building on the University of Sydney campus for the duration of the Symposium. This was followed by another installation of the Situational Library in the courtyard of the College of Fine Arts (COFA) in the University of NSW for the closing events of ISEA2013 hosted by the College.

As an evolution of the original model of the Situational Library, these new installations included the provision for the free exchange of the electronic surrogates of the book – the electronic book or e-book – and indeed almost any other form of digital file the visitor wished to share in the archive. The only limitation placed on the type of file exchanged was that it needed to be less than 10MB. Any further limitations (often in the form of restrictions of file type) to the sharing were due to the user's devices and their operating systems.

In the simplest terms this digital version of the Situational Library is a local open-access wireless network generated by a custom programmed computer that allows the visitors within the range of the network to join, upload, download and shape the archive. This network is not dependent on any other system or network, nor is it accessible through other networks, for example the Internet. The network's signal becomes inaccessible beyond a radius of approximately 10 meters, forcing participants to remain within close quarters.

Besides a user accidently noticing the free (unlocked) network appearing on his device's list of available networks, the project required strategies to raise awareness of its presence. The methods for raising this awareness for an otherwise 'invisible' library were three-fold. First, a number of physical books were freely distributed, all of which were stamped with the Situational Library stamp (the same used at the PICA event). Second, a display-stand of printed bookmarks with instructions on how to access the network was placed in a prominent position in the foyer of the New Law Building, and third, a number of large format posters were glued onto the walls of the space. In addition to these direct methods, another poster design was employed containing a more cryptic message with the Latin words *Habent Sua Fata Libelli* and a Quick Response (QR) code which once scanned by smart devices, directed users to the project's online information.

Fig. 2. The Situational Library stamp. (© Andy Simionato.)

Habent Sua Fata Libelli is an abbreviation of the Latin phrase *Pro captu lectoris habent sua fata* libelli, meaning (literally) "According to the capabilities of the reader, books have their destiny" [5]. Walter Benjamin adopts this shortened form in his essay on book collectors *Unpacking My Library*, and in Umberto Eco's novel *The Name of the Rose* the phrase is interpreted as "Books share their fates with their readers" [6]. The posters printed with the Latin phrase were pasted around the site of the Situational Library and were very likely illegible to anyone seeing them who did not read Latin, or at least, anyone who was not already familiar with the quote, yet the QR code (a square machine-readable sign), placed prominently below the Latin sentence, offered their devices an easy path to interpretation. Language appears redundant, at least temporarily, and the 'reading' has been deferred to the machine.

So what will become of the *social uses* of the book if it loses its hegemonic dominance as a principle carrier of information?

1. Books are for Use
2. Every Reader his Book
3. Every Book Its Reader
4. Save the Time of the Reader
5. A Library is a Growing Organism

Ranganathan's five laws of library science (above) presented in 1928 and embraced by librarians around the world ever since, have found echoes in various scholarly texts for decades [7]. Yet the growing divergence between traditional models of the book and the places we build to house them has tested these 'laws', for "...it happens that the name of this place, Bibliothèque, gives its name to a place which, as it already does, will more and more in the future have to collect together (in order to make them available to users) texts, documents, and archives that are further and further away from both the support that is paper and the book form" [8].

Ranganathan's 'laws', seldom criticized and often cited, may soon be straining to hold true as the boundaries of the book are contested in electronic space. The mass digitization of books by projects such as Google Library (to name one among the many, more or less altruistic endeavors to build massive online repositories of books) and their deference of reading to the machine, affect the fate of the book, the archive and the library that holds them [9].

Perhaps Ranganathan's laws, and more importantly, our own assumptions of the library, may need to account for this new form of reading by the machine. Will it be sufficient to reconsider Ranganathan's 'Reader' to embrace both human and machine agency? Indeed, the underlying premise of this mass-digitization indicates that the electronic-book will be consumed primarily by machines (did we ever imagine otherwise?) for the very purposes of OCR and digital archiving, raising further questions about the human uses of what remains of the book [10].

Let us return, then, to the Situational Library, which I have described as an open, evolving, and publicly driven repository unconnected to any external network, specifically (and significantly) inaccessible through the Internet such that it obliges participants to be physically present to share digital files; close enough that they become aware of each other and their activities. I consider this exchange of 'energy' (the word is not ideal, but it's all I have for now to connote these situational interactivities) as becoming a primary function of the book, regardless of its form. Increasingly, but I suspect from its originality in some way, this is what the book is *for*.

I propose that with each exchange of the book, there is the potential for the exchange of something other, external to the book; of an energy inextricably connected to, but situated outside, the book itself.

The Situational Library is an attempt to make visible, if only for an instant, the exchange of such energies by those that share books. Every exchange of the book is potentially a library, and every library a situation.

Fig. 3. The Situational Library at ISEA2013, New Law Building, University of Sydney, 2013 (installation detail). (© Andy Simionato.)

References and Notes

1. J-L. Nancy, *On the Commerce of thinking: Of Books and Bookstores*, D. Wills, trans. (New York, U.S.A.: Fordham University Press, 2008) p.41.

2. The Situational Library (2012), <http://www.situationallibrary.com >, accessed 8 July 2013.

3. Claire Bishop, *Artificial Hells: Participatory Art and the Politics of Spectatorship* (London, U.K.: Verso, 2012).

4. Guy Debord, *Society of the Spectacle* (Detroit, U.S.A.: Black & Red, 1983).

5. Verse 1286 of *De litteris, De syllabis, De Metris* by Terentianus Maurus.

6. Walter Benjamin, "Unpacking My Library," in Walter Benjamin, *Illuminations* (New York, U.S.A.: Schocken Books, 1968).

Umberto Eco, *The Name of the Rose*. (London: Secker & Warburg, 1983).

7. B.K. Sen, "Ranganathan's five laws," *Annals of Library and Information Studies* **Vol.55**, (June 2008) pp. 87-90.

8. J. Derrida, *Paper Machine*. *Cultural Memory in the Present*. (Stanford, Calif.: Stanford University Press, 2005) p.7.

9. Google Book Library Project (2013), < http://www.google.com.au/googlebooks/library/index.html>, accessed 8 July 2013.

10. Google has carefully reworded their original hyperbolic claims of creating a digital archive of every book in the world to the more humble statement of providing a searchable 'card catalog'. In practice however, the project remains a mass-rendering of books into machine-readable data.

Pixelated View: Investigating the Pixel in Light of Substantial Motion

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Abstract

This paper considers creative approaches engaging the body of digital video in relation to the outside world, drawing on Persian Islamic philosopher Mulla Sadra's (1571–1641) theory of "al-harakat al-jawhariyya" (Substantial Motion). For Sadra, the world is constantly changing in its substance. Substance is not fixed, as other philosophies suggest; rather, it is an act of existence, a process. Resisting fixity, this process emphasizes time and motion. Sadra's theory, alongside Deleuze's approach toward the point of view of non-human subjects, suggests new possibilities for the moving image.

Keywords: Pixel, time, motion,Moving image, Persian-Islamic Philosophy, Mulla Sadra, Substantial Motion, Gilles Deleuze.

Prologue

Sometimes, when a person runs, the camera floats; resisting common human perception, it gives a disjointed glimpse of the subject (Fig.1). As the camera moves, the underlying pixels, which construct the image, struggle to keep up with change and movement outside the frame, and gives a 'pixelated view' of the event. Pixels, which have their own motion and time, and differ from our overall perception of the image, emerge on the surface. Constantly shifting between recognisable and unrecognisable forms, they unsettle the viewer's perception. The inside and the outside of the frame clash, and the exposed pixels suggest different forms of time and motion [1].

Introduction

Classical Persian Islamic philosopher Mulla Sadra Shirazi (1571–1641) developed a sophisticated theory of reality,

Fig. 1. YouTube video, Iran, 2009.

including a relationship between temporal beings and the infinite realm of the Divine. His theory of 'substantial motion' (al-harakat al-jawhariyya) posits movement and transformation within substance. It implies that every entity experiences the universe, and is in constant motion toward perfection – a motion that is not limited to material and temporal aspects of being but, rather, is linked to the invisible realm of the Divine.

The moving image, like a living entity, also has its own perceiving body –yet it functions differently from human bodies. Extending Sadra's theory, pixels can also be seen as experiencing and changing. Considering the body of the digital image in the light of substantial motion, this paper proposes to explore new ways of seeing from a non-human point of view, in relation to the video-frame and the world. The pixels' connections, then, provide forms of change, time and motion. A pixel-centric video is able to transform viewers by freeing them from their fixed point-of-view.

Non-Human Point of View

A film is an act of seeing that makes itself seen, an act of hearing that makes itself heard, an act of physical and reflective movement that makes itself reflexively felt and understood [2].

Like a living entity, a moving image has its own body that perceives the world. This moving image body expresses the world it experiences to viewers in an organised manner: as Vivian Sobchak suggests, the camera uses modes of "embodied existence"; seeing and hearing [3]. Yet the significant difference between the camera's mode of perception and conventional human perception is often overlooked. Gilles Deleuze, too, suggests that the camera's perception enables us to perceive differently. Unlike human perception, the camera has no "centre of anchoring" and no "horizon". This lack of reference creates an alienation from normal perception, enabling us to see what we don't see with the naked eye, such as pixilation in digital video [4]. Deleuze argues that the camera has neither interest nor need; it just perceives, giving rise to a different kind of perception. There can be many points of view – not only the human one [5].

For any profound change to be achieved, a new way of seeing is essential. The camera's non-human point of view can introduce and enhance new ways of seeing. Pixels, like individuals, exist as the smallest units of the overall collective of pixels in a frame. They form the underlying structure of the digital image (a fact that High Definition (HD) videos conceal in favour of a 'realistic image'). If, as Deleuze's reading of Bergson suggests, there are not only many points of view other than the human, but also eyes "in things, in luminous images in themselves" [6]; and if these many points-of-view can unfold the universe; then we may ask what a pixel captures, and what the changing universe is from a pixel's point of view. This privileging of a non-human point of view forms a meeting point between the thoughts of Sadra and Deleuze, and the condition of the pixel [7].

Substantial Motion

Sadra's theory of Substantial Motion (*al-harakat al-jawhariyya*) can help us understand pixels and digital videos. In this theory, a gradual, invisible transformation takes place in the inner structure of entities. Sadra calls Substantial Motion "the flow of being", which is not "a motion affecting substances with extrinsic modifications but a transformative motion that affects their substantiality itself" [8]. Accordingly, the world is constantly changing in its substance (*jawhar*), and existence is ontologically in motion [9]. 'To be' is to be in motion, and movement shows the eternal world as continually unfolding.

In its historical context, Sadra's notion of a changing universe challenged the substantialist view that dominated Greek and Islamic philosophy. Aristotle (384–322 BC) and Ibn Sina (c.980–1037), for instance, argued that an entity cannot change substantially without losing its singularity and unity as a whole. The term 'substance' relates to the Greek "*ousia*, which means 'being'", and to the "Latin *substantia"*, meaning "something that stands under or grounds things" [10]. Substance, as constituting matter primarily, is not subject to change; as *ousia* it cannot be more or less, because "it has no opposite, and intensity requires opposition and contrariness" [11]. Movement and time are considered external to matter. The experience of change results from our perception, which creates unity and movement from disjointed parts and events.

However, for Sadra, 'substance' is not primordial to being [12], but is itself "a process of becoming and unfolding of being" [13]. That is to say, all substance must undergo modification, because it is subject to being. Sadra equates 'being' with God or 'the act of being', and defines a 'substance' as an "independent existent which is existent by its essence and ipseity; it is necessary for itself without being attached to any other thing" [14]. In its being, substance links to God as the most perfect, in an internal motion that causes an external motion and a change in attributes, expressing God's "independent existence" [15]. Substance (*jawhar*) is constituted of both divine being (invisible/ immaterial) and matter (visible/ material). Thus, existing entities, with their intertwining aspects of existence and matter, dwell in the sensible world *and* in an immaterial/ invisible world that links to divine stability and simplicity [16].

For Sadra, God is the simplest being, with no attributes or properties. Yet in processes of becoming, entities constantly manifest within his simplicity. In Sadra's view, "[t]he most manifest is also the most difficult to perceive" [17]. The more apparent to senses a thing is, therefore, the less simple and also less real: the sensible world is the least real. Entities continue to exist in the sensible world because the Divine constantly intervenes through substances. Each entity is intangibly attached to the Divine, as though by an umbilical cord. Substances, as links to the unmoving Divine manifest in God's act of being, are the simplest aspects of entities [18]. Their position, in between the two worlds, provides connection and transmission of Divine codes to beings. But they also conceal the Divine.

The constant exchange between two diverse worlds is the origin of both internal *and* external changes of substance as manifestations of God's invisible act of being. For Sadra, "everything in existence is a proof and a sign of what is in the invisible. [The divine Name] 'Self-Subsisting' corresponds to substance" [19]. Since movement or transformation within the material context is caused by internal motion, and each individual entity consists of both material and immaterial aspects, materiality can reveal the invisible. In the constant transformation of the universe, the ultimate goal is to reach the unchanging Divine that dwells inside each being [20]. The more simple a being becomes, the more real and more perfect.

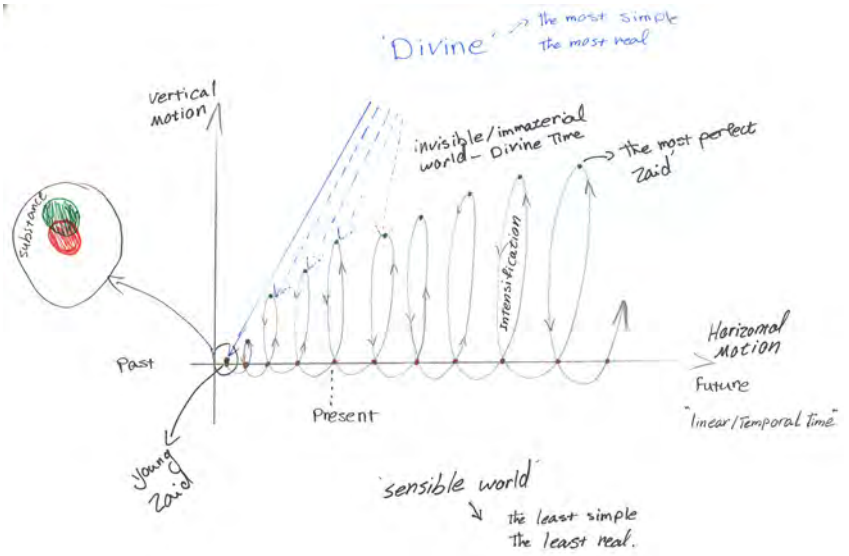
The species entails the fixity of particulars, whereas concrete singularity liberates them, by inflecting a movement that traverses them and modifies them in the direction of a greater potency of acting and knowing [21].

Sadra's model of motion considers the intensification of being via its material origin (Fig. 2). For this, the change of matter is important, even though the goal is to transcend it. While God's constant command to exist, and his togetherness with being, impel a substance to move in itself, the change of matter in the sensible world propels the inner motion toward spiritual perfection, too. The change of matter is "horizontal motion" in the material world (for example, a child/ young "Zaid" growing old [22]), whereas the movement toward Divine perfection is "vertical motion". Any horizontal motion goes back to a vertical motion (from the sensible world to the higher world) that is linked to the Divine. In Sadra's terms, simplicity and individuation result from changing substance, and from its contact with both sensible and insensible worlds (see Fig. 2) [23].

Similar to Sadra's concept of intensification, Henri Bergson and other process philosophers (such as Alfred North Whitehead) suggest that the more we perceive and experience the world, the more we individuate. Bergson's diagram of the "recollection image" (Fig. 3) [24], suggests that potential for creating anew lies in the gap between the perception image and the movement image – the longer the interval, the more one perceives. This gap, Deleuze notes, brings one closer to an "essential singularity" [25]. For Sadra, too, singularity is graded in intensity and perfection, and moves toward a "greater potency".

For Sadra, time is a coordinate of being [26]. It is neither linear nor temporal (as in past, present and future), nor is it external to matter. Unlike the major philosophers in the tradition following Aristotle and Ibn Sina, Sadra allows for "temporal time", but only in accordance with each particular entity. The only "present" is Divine time, of which "temporal time" is a fragment; accordingly,

Fig. 2. Diagram showing substance and Substantial Motion in Sadra's terms (© Azadeh Emadi)



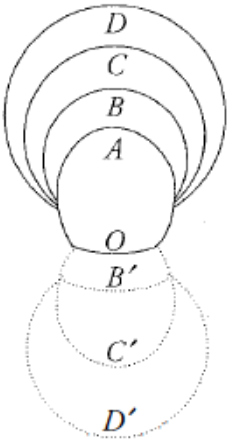


Fig. 3. Bergson's diagram of "Recollection Image" in Deleuze's Cinema 2

there is no actual beginning or end, as the experience of events as 'before' and 'after' results from our perception of linear time [27]. In each moment, something dies and is born. However, the new is not completely new, because the becoming at the level of substance is ongoing; "Zaid" remains "Zaid", even though he passes through different events [28]. The butterfly both is and is not the caterpillar. This, the unchanging aspect of substance, is part of Divine time. Time affects each entity differently, since it is linked to the qualities of being. Each entity, as a process, is part of the unique movement of the universe. The entire universe and its units individuate in each instance, shaping and reshaping. Becoming - that is, God's act of being - unifies infinitely changing entities into a stable whole in time [29].

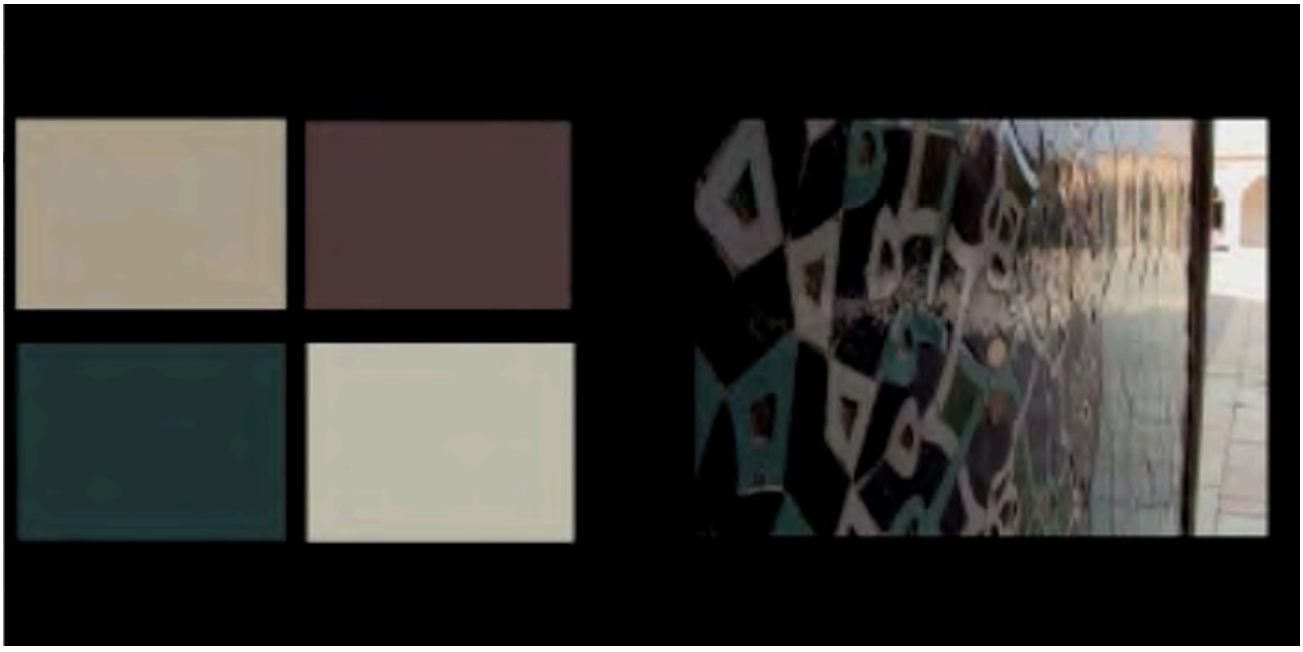
In a similar way, insofar as motion and change are deemed not external factors but inherent to being, Deleuze (following Bergson) does not regard movement as separate and independent from matter, arguing that "each change or becoming has its own duration" [30]. He posits the universe as a flow of movement, articulating itself in distinct ways [31]. Time depends neither on the event nor on matter. It is not a container in which events take place, and which then becomes a measure of movement [32]. However, Deleuze's change is essentially a material form of becoming (a horizontal motion, in Sadra's terms), whereas, for Sadra, change is not limited to material, but also involves the divine aspect of substance, *jawhar*.

Digital video as a Metaphor for Sadra's Universe

Digital video closely approximates Sadra's philosophy, in that it suggests becoming at the level of pixels, and via motion that remains invisible. The notion of Substantial Motion runs counter to established views of film as undisrupted, illusionistic movement created by an even and horizontal passage of frames and units of time. Further, while the frames in analogue film act as borders of consecutive images, in digital film the frame is a platform to structure pixels. A pixel (a small unit of illumination, and the most simple entity inside the frame) mediates an exchange between the inside of the frame and the outside world. Appearing and disappearing pixels allude to the continuous movement of the frame as a whole. When our perception of changing frames (collected pixels) is interrupted, our experience of movement is troubled. This interruption encourages ambiguity and a movement from a representational to a sensational experience of the image. If pixels collectively refuse to appear and disappear, then, using Deleuze's term, an expanded "interval" between the movement image and the perceived image becomes a new point of becoming [33]. The transformation of pixels inside the frame is due to an initial contact, provided by the camera's body, with the world outside of the digital. Although independent from each other, pixels influence one another in our perception of movement through their collective changes. Resembling Sadra's 'substances', each pixel has its own connection to the outside of the screen. Still and stationary, the pixel yet affords an experience of motion.

The constitution of a moving image resembles Sadra's moving universe, where simple entities known as substances have their own time and motion as part of a bigger motion of the universe. In an analogy to the relationship between temporal and divine, the video image exists in "temporal" time, while the pixel relates to the "divine", or a non-temporal source of transformation. In analogue film, time is mostly experienced as instances between frames. By contrast, our perception of time in digital video results from different times within the same frame: each pixel on a screen undergoes certain internal changes. The rate of change depends on the digital (I/O) codes that link the frame to some outside subject matter. We become aware of change at the level of pixels when the motion between adjacent pixels inside a frame varies. Our experience of motion as a whole is different from that of motion at the level of pixels. In digital video, movement is not from point A to point B, but from the potentiality of point A to the actuality of that very same point A, in a new instant. Using an analogy from physics, this is a

Fig. 4. Still from the video Lightened Tiles, 2013 (© Azadeh Emadi)



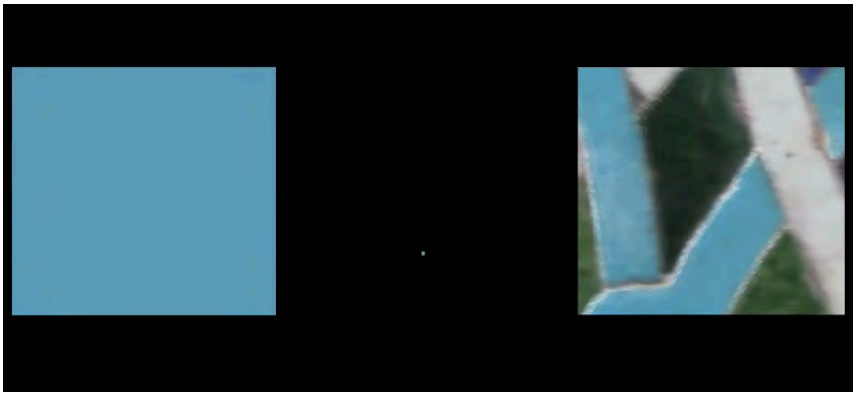


Fig. 5. Still from the video Through a Dot, 2013 (© Azadeh Emadi)

similar motion to boiling water; a contained movement that transforms particles from within.

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The aspects of Sadra's philosophy discussed above, which informed my thinking on digital video and the pixel's becoming as an entity, influenced the production of two videos, *Through a Dot* and *Lighted Tiles*. *Lighted Tiles* (Fig.4) demonstrates that our perception of continuous movement as a whole is formed by a collection of events that take place inside the frame and between pixels. Four pixels, taken from different parts of the video on the right, show diverse kinds of motion within the existing frame. Each pixel undergoes different changes depending on changes outside the frame. Their rate of change, too, differs from the time and motion that is perceived in the frame as a whole. Nevertheless, their collective changes produce a perception of unified movement.

Through a Dot (Fig. 5), by contrast, observes the becoming of a single pixel [34]. The video consists of three images of the pixel; the right-hand image shows the video frame as a whole, in which no individual pixels can be perceived; the middle image shows a single pixel masked out from the right image; and the left image exposes internal changes of the pixel on a large scale. In this image, potentiality constantly transforms into an actuality in the same pixel, and back to a new potentiality, linking to a movement initially informed by an event external to the frame. A pixel is all – past, present and future. It is the duration as a whole, *and* the present [35].

To Conclude

The universe is "flowing matter" [36], an ever-changing relationship between parts and wholes. Each unit, as Sadra suggested, is a continuously changing event, connected to both horizontal and vertical motion. All units, individually and as a collective whole, shape and reshape each other, in each instance due to their Substantial Motion. Pixels taken from an image, and then returned to it, can bring about new points of view and experiences; each point can unfold new aspects of human perception, and open up new ways of seeing. Digital video, in the light of Substantial Motion, and the pixel as a link to both material and immaterial realms, can provide new potentials for understanding and generating contemporary digital media works that energise the relationship between minimal parts (pixels, in the case of digital media) and the whole (screen, audience and beyond). A pixel-centric video can liberate viewers from a fixed point of view. Moving beyond the surface of the image can reveal the imperceptible, and connect us to other experiences, time and motion.

Acknowledgments

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References and Notes

1. This video was filmed by ordinary people, during the demonstrations following the elections in Iran in 2008. Anonymous (2009), < http://www.youtube.com/results?nfpr=1&search_query=Iran+after+election+2009 >, Accessed 20 April 2010.

2. Vivian Sobchack, *The Address of the Eye: A Phenomenology of Film Experience* (Princeton, New Jersey: Princeton University Press, 1991. p. 3).

3. Sobchack [2] pp. 3-8.

4. Gilles Deleuze, *Cinema 1; The movement – image*, Tomlinson and Habberjam, trans. (Minneapolis: The University of Minnesota Press, 1986, p. 58).

5. Deleuze [4] pp. 56-66.

6. Deleuze [4] p. 60.

7. Laura U. Marks, *Enfoldment and Infinity; An Islamic Genealogy of New Media Art* (Cambridge, U.S.A.: MIT Press, 2010). This book provides a precedent for bringing together Islamic philosophy and Deleuze to think about digital media; especially chapter 7, 'Baghdad, 1000: Origin of the Pixel'.

8. Christian Jambet, *The act of being: the philosophy of revelation in Mulla Sadra*, Fort, trans. (Brooklyn, New York: Zone Books, 2006. p. 96).

9. Sajjad Rizvi, *Mulla Sadra and Metaphysics; Modulation of being* (London, U.K.: Routledge, 2009).

10. Howard Robinson, 'Substance', *The Stanford Encyclopedia of Philosophy* (Summer 2013 Edition), Edward N. Zalta (ed.), URL = http://plato.stanford.edu/archives/sum2013/entries/substance/, Accessed 9 March 2011.

11. Rizvi [8] p. 111.

12. Sadra's definition of substance, which is a minor tradition, is influenced by the Platonic view.

13. Rizvi [8] p. 131.

14. Mulla Sadra Shirazi, *On the Hermeneutics of the Light Verse of the Qur'an (Tafsir Ayat al-Nilr)*, L.P. Peerwani, Trans. (London, U.K.: lCAS Press, 2004, p. 50).

15. Sadra Shirazi [13].

16. Rizvi [8] pp. 90-95.

17. Jambet [7] p. 160.

18. Jambet [7].

19. Sadra Shirazi [13] p. 100.

20. Muhammad Kamal, *Mulla Sadra's Transcendent Philosophy* (London, U.K.: Ashgate, 2006).

21. Jambet [7] p. 96.

22. 'Zaid' is a name Islamic philosophers often used to designate an individual.

23. Please see Jambet [7] and Rizvi [8].

24. Gilles Deleuze, *Cinema 2: The time-image*, H.Tomlinson & R. Galeta, Trans. (Minneapolis: The University of Minnesota Press, 1989, p. 289).

25. “[I]t will be seen that the progress of attention results in creating anew not only the object perceived, but also the ever widening systems with which it may be bound up; so that in the measure in which the circles B, C, D represent a higher expansion of memory, their reflection attains in B', C', D' deeper strata of reality”. Deleuze [22] pp. 44-47.

26. Rizvi [8].

27. Ibrahim Kalin, ‘Between Physics and Metaphysics: Mulla Sadra on Nature and Motion,’ *Islam & Science Vol 1*. Center for Islam & Science (2003) <http://www.highbeam.com>.

28. There are paralles with Deleuze’s view on changing objects: “[I]nstead of an addition of distinct objects on the same plane, we see the object remaining the same, but passing through different planes”. Deleuze [22] p. 44.

29. Rizvi [8].

30. Cliff Stagoll, ‘Becoming’. In A. Parr Ed., *The Deleuze Dictionary* (Edinburgh: Edinburgh University Press, 2005, pp. 21-23).

31. Deleuze [4] pp. 56-60.

32. Deleuze [22] p. 34.

33. Deleuze [4] pp. 33-55.

34. The idea for this video arose from a discussion with Laura Marks about a drawing of a changing pixel.

35. Similar to Sadra, Deleuze, following Bergson, pursues a discussion on the image constantly divided between past and present. Deleuze [22].

36. Using Bergson’s term.

RECONSIDERING EXPERIENTIAL KNOWLEDGE IN THE RELATION OF ART AND SCIENCE PRACTICES

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Abstract

As practice-theory orientations the arts and sciences have often *seemed* juxtaposed. We are interested in how a new generation of artist-scientists think, operate and communicate. We argue that it is crucial to find new forms and formats for engagement and communication in communities of interdisciplinary research and practice. In this paper, we investigate the discursive and communicative relation between different disciplines, in social and experiential events (conferences, festivals, and the like). For this purpose, we will build upon the experiences and observations from various 'Remix' situations in which art-scientists meet in conference and festival settings.

Keywords: technology, collaborative, practice, action, situations, communication, theory, art, knowledge sharing

Introduction

Art, technology and media practice are domains that should inspire and provoke through revisionary and self-reflexive methods. A media may in fact be the very concretization of thought. These communities of practice are well poised to provide new ways of mediating and situating more formal means of knowledge production and dissemination. The relation of art and technology has been central to many long-standing debates within contexts of art education, university teaching, and human-centered, lab-based research. This relationship also plays an important role in situating practice as central to the aesthetics of an art form, by highlighting process and collaboration throughout its development.

"One speaking mouth, with many ears, and half as many writing hands - there you have to all appearances, the external academic apparatus; the university engine of culture set in motion" [1].

The above critique of academic event formats is as relevant today as it was when Nietzsche penned it. In this tradition, positively critiquing the appropriateness of formal representations and disseminations available to art/science and art-and-technology practitioners, this paper discusses the background and foreground of the live, experiential knowledge event. It does so through brief historical and theoretical discussion, related to our experiences conducting sessions at the Re-New Festival in Copenhagen. Also, a situating of the participatory and structural dimensions of these kinds of events is suggested.

The protocols of sharing and communicating practice and thought seem to perennially cement themselves as static forms, requiring rethinking and revisiting. The format of the conference, as a collective moment of knowledge sharing, would seem to have its genealogical roots in our first shared residences as places of testimony, necessitating the retelling of what occurs. We can imagine an antediluvian lecture at ancient paintings at Lascaux, the mineral pigments on these cave walls prefiguring the existence of a "Powerpoint deck." The plenary mode of our present day conference presumes also a deep history in the performance of knowledge in the West. Such forms of presentation were purportedly being played with and subsequently codified by Pythagoras in 6th-Century BC: Pythagoras' probationary pupils, the so-called Acousmatics, who had to sit behind a curtain, listening but not able to see, the philosopher-teacher's voice (spawning a word now used to describe a particular art-technology compositional practice of audio-speaker performance). Such forms of passive learning-as-listening have resulted in the unfortunate diminution of learning-as-action, leading to our present unfitting proscriptions for communicating works. But this idealism in the University waxes and wanes throughout history, as Whitehead points out: "at no time have universities been restricted to pure abstract learning... Universities have trained clergy, medical men, lawyers, engineers" [2].

The relationships between communicative events and the exposition of practice in art-and-technology and art/science relations proves ripe ground for the resituation and reformatting of such discursive forms. Firstly, these new forms allow us to reposition a 'techno-aesthetics' (or 'production aesthetics', after Simondon [3]) into the discourse, while providing transitional forms towards hybridized action-research communication and publication. Knowledge sharing formats should appropriately support both the way we think through and use tools. Digital media moves asymptotically towards manifestations of experience in real-time, driving creative practices more and more toward processes and away from objects. Conventional communications (lectures, workshops and panel formats) in conferences have their uses and justification, but proposed herein is a modified format - the remix session - with ambitions to feature participatory, production-aesthetics of art and creative works.

Case: REMIX sessions [4]

At the Interactive Media Arts Conference (IMAC) 2012, four "Remix" sessions were scheduled with two to three artists, with one 'action-chair' in each session. Theses sessions were experimenting with different layers of conventionality in the relation between art and technology. They were intended to create an experimental situation where the coming together of art and science occur on two levels:

1) First, the framing and goals of the Remix sessions create a process and dialogue grounded in 'non-conventional' formats and examine the workshop-as-art-work. The format creates, ideally, a different and not-predefined situation that reveals and accentuates relations between matters concerning art and science that were not visible before.

2) Secondly, the Remix sessions create a platform in which the body may play—accentuated, embodied and sensuous situations are more likely to occur. Here, the body becomes implicated in knowledge acquired from beyond the social and technical 'scenario' in a direct interaction with artistic practice.

Thus, the intention of the Remix sessions is to achieve / focus on:

1. Proximity to the work – practice
2. Reformatting of formats / non-conventional formats
3. The (techno-)aesthetics of production
4. Sensuous situations

During the remix sessions both the chairs and the artist-participants are asked to reflect on their 'roles' and develop a sense of how things are made and knowledge generated *from the work*. The following was announced to the 'action-chairs' - and, in the same instant, communicated to the artist-practitioners involved:

"Your role is to run the track according to practitioner and artists' ideas and practice, and to facilitate the involvement of the audience into the process. Any format may be pursued, and you are

not required to stay in the physical space of the auditorium! It might also be possible, perhaps, to have more than one process running at the same time...

But, most importantly, it should all happen according to the artists' own ideas and wishes, of course. It is the artistic practice that takes center-stage" [5].

Remix sessions are acted out in a variety of ways. We have chosen two examples, Remix sessions 2 and 4, which can also help clarify both the strengths and some of the limitations involved in an experiment like this, in order to point out the challenges for future Remix sessions.

Ervax for 2 - Anders Monrad

The first example we want to highlight is the session involving the Danish composer, Anders Monrad who presented his piece, *Ervax for 2*, in Remix session 2 with Jamie Allen as action-chair. *Ervax for 2* is a composer tool disguised, and fully functioning as a computergame. The session was realized as a dialogue between Anders Monrad and Jamie Allen and was centered upon the development of *Ervax*, which was on exhibit at the re-new festival. In an email after the festival, Anders Monrad stated that, whereas the general outcome of the dialogue was interesting, there was a problem concerning the intention and the goal of the remix session, which was not very clear [6]. Also, the proximity of the actual work (only 10ft away) was never used actively in the Remix session.

Here, the importance of and work involved in preparing people for new formats becomes apparent - you have to make people feel it is their own format, not something forced upon them. In creating new formats much of the effort goes into de-normalising people's (conventional) expectations as well - it does not just 'happen'. Also, what plays an important role here is the nature of the artistic practice - and how he/she is conscious about involving the audience. Are they in front of, or behind, the curtain?

***Echo Moire* - Matteo Mangoni**

The second example, from the Remix session 4, accentuates this question even further albeit in a different direction with which we want to conclude this paper. At the session, Matteo Marangoni had robots moving about, "playing" the room as an instrument. Essentially, *Echo Moire* consists of two 'listening robots' that are able to navigate a space based on the acoustics of that space.

The Remix session 4 developed from a 'speaking session' into a 'sounding and hearing' trip through the spaces of the site (Aalborg University Copenhagen campus), revealing the different architectural and functional rooms as spaces of bodily-based sound-cognition. This Remix session, then, was much more sensuously orientated (than Remix session II), to a point where it became almost an art-event in itself. The debate-element did not play as important a role as in the session with Anders Monrad however, measured by the character of audience-participation, which was much more focused, it would appear that this was perhaps the most successful remix-session.

There is a distinct transformation of the way the relation of art and science practices is being communicated in Remix session 4, whereas in Remix session 2 that communication is mainly intellectual and about ideas (excluding the actual work only a few feet away in the same space).

Social Knowledge Sharing Events

The Remix sessions prove an interesting way of investigating the complexity of transferring knowledge about art-science and art and technology relations. In the important essay "On Techno-Aesthetics," Gilbert Simondon writes: "Aesthetics is not only, nor first and foremost, the sensation of the 'consumer' of the work of art. It is also, and more originally so, the set of sensations, more or less rich, of the artists themselves: it's about a certain contact with matter that is being transformed through work. One experiences something aesthetic when one is doing a soldering or driving in a long screw" [7]. It is this complex sensation of practice involved in the art-science relation that the Remix-sessions attempt to render visible. They become, in other words, social knowledge sharing events.

Knowledge sharing events vary in form, and the conference and panel presentation are characteristic of a rooting of academia in the natural sciences (e.g.: The presentation of 'results'). Though conferences are rather structured, the study showed that knowledge sharing happens at different levels:

"Two forms of knowledge sharing were analyzed: formal, guided, planned knowledge sharing in lectures or discussions, and informal knowledge exchange during social events." [8]

Other such events happen more spontaneously — over a meal between colleagues in an informal conversation, others are planned events involving hundreds of participants that follow accepted rituals.

Reychav and Te'eni have conducted research which indicates that knowledge sharing in the formal setting is more intensive than in the informal setting. However, in the informal setting participants can relate their knowledge sharing more to their own situation in relation to job enhancement and initiations of meetings. There are other formats of knowledge sharing, which are less structured and formal. One is the unconference: "Unconferences are gatherings of people united by a passion, where the content and structure of the day is driven by the participants" [9]. In contrast to conventional conferences, the unconference is unstructured, does not have objectives and relies completely on what the participants put into the event.

The Remix sessions described herein clearly show that some kind of clear structure around these types of events is essential. Obviously people need to share knowledge in a structured manner in order to communicate: "[P]eople's need to congregate and confer is one of the things that defines our humanity and, for a multitude of reasons, meetings and gatherings of people have taken place since the nearly days of civilization" [10].

Conferences are one type of knowledge sharing events where people with certain interest come together to discuss a topic or share results in a field. According to Gustavsen and Engelstad: "A conference is a composite of dialogue and work experience where the primary objective is to encourage participants to acquire information through democratic dialogue and participation, in accordance with such notions as activity, equality, and collective practicality" [11]. In this quote, conferences and festivals are defined as overall formal work related events that have objectives and require certain types of behaviors. The most common format is that participants sign up, pay a fee, and often they submit a paper which follows certain guidelines in terms of content, structure, formatting and references. Each paper is given a time in the program for a presentation. Other aspects of these forms include keynotes speeches, dinners and coffee breaks. All of these elements are indicative of conferences are ritualistic formats.

A Spectrum of Knowledge Sharing Formats

By drawing on the Remix sessions and placing this investigation in the context of recent research within the field of these kinds of events, we can begin to draw a spectrum of the types of formats knowledge sharing events have. This is illustrated in Figure 1. The "participation axis" relates to how much participants are involved in contribution to the sharing of their knowledge. A lecture in which participants are merely listening and cannot ask questions is non-participatory. Conversely, examples of 'Happening' type events, such as Joseph Beuys' 'action'-workshops [12], are examples of a highly participatory event that allow participants to share their knowledge in practice. Beuys had a group of people wordlessly coaxed into the construction of the cage-like structure (in which a Coyote lives) that serves as part of his action-installation *"I Like America, and America Likes Me"*. The workshop functions inside an action-as-artwork situation, showing a possible conference-format in which is highlighted the actual experience of the participants, in an attempt to bring about social transformation and individual insight. The "structure axis" relates to the forms that we need to understand what is expected from us. These vary from the ritualistic forms in which guidelines prescribe how to participate, to the spontaneous forms in which participants must find their own way.

Various strands of media studies and reformatted practices within art and academia are relevant to and drive the desire to create new ways of understanding and relating practices of inquiry and expression engaged with technology. As a community of communications media users, art-science and art-and-technology practitioners are appropriate interlocutors for a "comparative media study" of academic forms. N. Katherine Hayles' assertion that literary studies have been "lulled into somnolence by five hundred years of print" is no less true of our event-based forms of communications. Again, as with literary studies, where the "new medium of electronic textuality vibrantly asserts its presence," communications technologies and networked-presences create both new thinking and new needs for reformatting the way that that art science practices are related and communicated [13].

Conclusions

The Remix sessions discussed in this paper made it possible to frame an investigation of art-science relations *in practice*. Looking at these sessions in retrospect, and contextualizing them in terms of the ritual of the 'academic 'knowledge-sharing event, we are able to draw some useful conclusions about how our understanding of the complex and real time, process-driven orientation of art-science and art-and-technology practices can be enhanced. Even more importantly, perhaps, is to achieve an understanding of the challenges involved in reconsidering the use of knowledge sharing formats in real art-science relations and designs for another future.

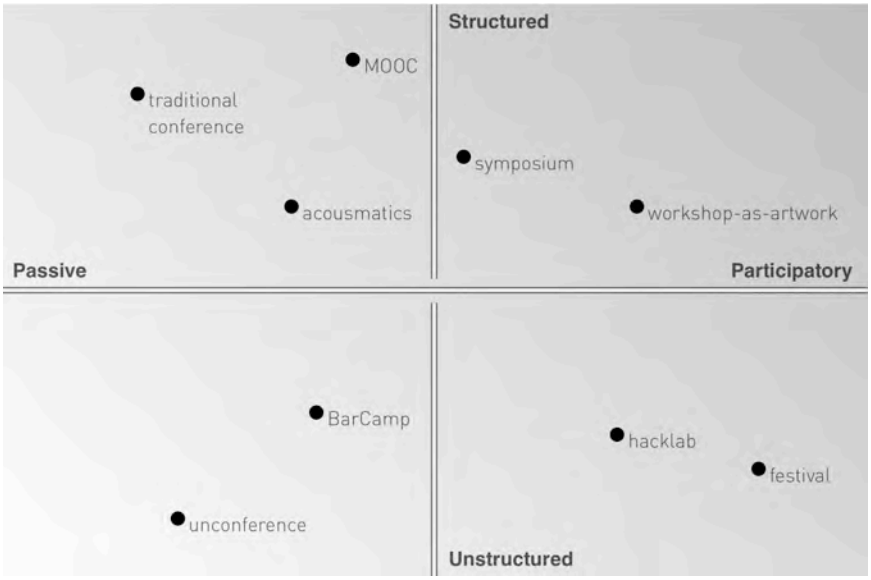

Figure 1 - A matrix representing orientations of social knowledge formats.

References and Notes

1. Nietzsche and The Future of The University Gary Shapiro Journal of Nietzsche Studies No. 1, 'Whose Nietzsche?' (Spring 1991), pp. 15-28. Published by: Penn State University Press

2. Whitehead, Alfred North. "Universities and their function." Bulletin of the American Association of University Professors 14.6 (1928): 448-450.

3. Simondon G., on Techno-Aesthetics translated by Arne De Boever, Parrhesia, 14, 2012, 1-8, p. 3

4. Rogers, T. (2003). Conferences and conventions: a global industry. Oxford: Butterworth-Heinemann.

5. Gustavsen and Engelstad: "Knowledge exchange in the shrines of knowledge: The "how's" and "where's" of knowledge sharing processes" In: Reychav, D Te'eni - Computers & Education, 2009

6. Greenhill, K. and Wiebrands, C. (2008) The unconference: a new model for better professional communication. In: Lianza Conference 2008: Poropitia Outside the Box, 2-5 Nov. 2008, Auckland, N.Z..

7. Beuys, Joseph *I Like America and America Likes Me*, 1974.

8. Hayles, N. Katherine. "Print is flat, code is deep: The importance of media-specific analysis." Poetics Today 25.1 (2004): 67-90.

9. The IMAC - Interactive Media Arts Conference 2012, which took place during the re-new festival of digital arts in Copenhagen, November 16-21 2012.

10. Søndergaard, Morten, Curatorial letter, IMAC2012, Copenhagen 2012.

11. Søndergaard, Morten, E-mail interview with Anders Monrad, April 24, 2013.

WATERWHEEL PATCH: USING MOBILE DEVICE SENSORS FOR LIVE PARTICIPATION IN AN ONLINE NETWORKED ENVIRONMENT

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Abstract
This paper documents our current research into using mobile devices to integrate remote physical movement and sound into the online structure of Waterwheel's Tap, allowing participation away from keyboard and mouse based computers. We asked participants in Australia, Indonesia, Europe and the U.S.A. to explore their local waterways or bodies of water. Taking a cue from research using sensors in dance, we are using mobile devices carried by, or attached to, these participants in order to transmit location and motion sensor data, plus live audio, for use as experimental content, feedback and control sources for elements of the Waterwheel Tap while outdoors.

Keywords: Waterwheel, the Tap, collaborative, environment, movement, data visualisation, sonification, mobile device, sensors, Open Sound Control, OSC

Introduction

Since early 2013, we have been developing and researching inexpensive tools for remote physical performers to perform away from keyboard and mouse based computers, with an online audience gathered on Waterwheel's Tap interface (the Tap) [1]. Our research has focused on the use of inbuilt mobile device movement and location sensors (accelerometer, GPS, gyroscope) to send motion data from participants in remote locations, as both a control mechanism, and as a data source to prototype visualisation and sonification methods. Additional components of our research included: evaluating alternative wireless sensor options (essentially any Open Sound Control, or OSC, data source); identifying potential steps for implementing our prototype concepts directly into the Tap; and developing a vocabulary of physical movement '"scores" (meaning, as in dance improvisation, the parameters, motif or images on which to improvise) suitable for generating particular ranges of data according to the sensors used.

Background

Waterwheel is a collaborative online venue for streaming, mixing and sharing media and ideas about water. Initiated by Suzon Fuks and co-founded with design studio Inkahoots, Waterwheel was launched two years ago, and has a growing community of more than eight hundred users – artists, scientists and activists – from around the world, contributing to and creating events such as webinars, symposia, performances and festivals.

The **wheel** on the homepage consists of the latest uploaded media, which are part of the **media centre**, a growing collection of shared water-related audio, images, video, text, spreadsheets and animations uploaded by users. These media items are available for any presentation on the Tap.

The **Fountains** are past and future events, in real places or on the Tap, chronicled on a global timeline-map.

The **Tap** is a video-conferencing and media display system allowing up to six webcams, drawings and media items. Its particularity is that everything can be moved, rotated, scaled, faded or overlaid via a palette of tools. All changes are viewable instantaneously on a single webpage. Users can invite their own 'crew' to present publicly or in private, while audience members can watch a live event with just one click, and comment in a shared type-chat column.

Somatic Considerations

Our previous experiences of embodied interaction in networked online environments in general, and in the Tap in particular, have been via webcams, monitoring the screen, and the use of the keyboard and mouse.

Stemming from these experiences, and in keeping with the environmental focus of the Waterwheel platform, our current research has the following aims related to movement, awareness, the body, and environment:

- to facilitate immersive physical engagement free of the keyboard and mouse, and of looking at screens,
- to enable interaction with remote collaborators without losing connection to one's own body and environment,
- to explore interfaces that enable participants to be in diverse environments – creeks, waterways, landscapes or cities,
- to be able to explore as broad a range of movements as possible – from micro-movements of the body, to travelling, or traversing across landscapes – achievable through the use of a range of movement data sources, scaled through visualisations and sonifications to be either within perceptual range, or contained within a single screen space, and
- that the interface would enable people with mobility impairments to engage with both the projects and the collaborators.

Technical Considerations

Our research process began in January 2013 by establishing several goals for evaluating prospective mechanisms to explore embodied collaborative interaction / creation on the Tap. In addition to the somatic considerations, we identified several key technical requirements:

- our system should be economically and technically accessible to collaborators and participants in a wide range of locations,
- the system should be able to operate on low-bandwidth connections (2G up),
- it should provide a real-time mechanism to collaboratively create / record / interact with movement, compass and location data from all participants,
- the completed system and site integration should be based on extensible and open communication protocol, so that other participants can easily create new tools, and
- that any hardware required be available on the consumer market.

Working with one inherent limitation of mobile devices – that they can only generate information on a single point of the body – instigated an additional research interest, into how to use that data to generate a value for the instantaneous overall movement 'dynamics' or 'quality' as a control source (rather than working with the precise spatial location of individual joints or skeletal tracking, as is more common when working with traditional motion capture systems and 3D depth camera systems such as Primesense or Kinect).

Somatic and Technical Integration

This latter goal, of looking at a movement's dynamic or quality, informed much of our prototyping work, especially in regards to choosing which sensor data to focus on, specifically: looking at changes in the rate, angle, and acceleration of rotation about the axes, of a participant's movement, rather than sensing their absolute position in space. Fundamentally, we are asking: will sensing the body's change in movement tell us more about the instantaneous state of the body than would a more detailed sensing of the body's absolute state or position in space? Recent scholarship (such as Stamatia Portanova's *Moving Without a Body* [2]) explores whether this abstraction of body may be analogous to early twentieth century philosopher Alfred Whitehead's development of the concepts of process philosophy, in which a process or structure (such as quantum position) is the essential descriptor of an 'object', rather than the physical object itself (which is a momentary manifestation of the structure).

In terms of our actual work: in early experimentation we explored various positions of placement of the mobile devices on the body (shin, ankle, sacrum, hand-held, head, chest), and in later experiments we used primarily the head and torso. Driven by this exploration of the structures of change and related ideas of scale, our physical explorations have come to favour sensor placement on the top of the head (usually attached to a helmet) (Fig. 1) as a reliable, easily set-up means to clearly read large and small-scale changes in motion.

Fig. 1. Volunteer participant ISEA2013 delegate Brisa MP. Photo: Yto Aranda © Yto Aranda and Brisa MP.

We have found that sensor data from mobile devices, thus attached, easily and reliably reads the micro-movements of the head. This kind of motion, as Cunningham found in prior research, when done with focus, and emanating from stillness, brings awareness into one's body. In his essay *Breathing the Walls* [3] Cunningham states:

"When attention to bodily sensation is practiced in day-to-day life, this present moment awareness, or dropping into the moment (…) is also linked to physiological changes. The muscles at the top of my neck relax, the occipital joint becomes more fluid, my breathing relaxes and I'm more aware of it. At the same time, I have access to creativity, playfulness, and a widening sense of possibilities. There is an inner stillness, within which I can sense connection to what is forward and behind, above and below."

The Feldenkrais and Alexander Techniques also aim to loosen the muscles that connect the skull to the spine, and reconfigure patterns-of-connection between head and eye movement, in order to achieve a playful state of physical discovery.

Physical and Software Prototype and Demonstration

System description: The initial prototype system that we developed uses data from the built-in gyroscope, accelerometer (or IMU – Inertial Measurement Unit) and compass of a 3G, or newer, Android mobile device or iPhone. Participants securely mount the mobile devices to a movement centre on their body (sacrum, top of head, or centre of the chest). For prototyping purposes we worked with several commercially distributed apps [4] that transmit sensor data via OSC to a dedicated host IP. The received motion and location data was then processed using a series of high/low-pass filters and complementary filtration [5], implemented in a combination of Max/MSP and Isadora [6] before being used as a source for visualisation, sonification and control.

Three factors drove our decision to use mobile devices rather than custom built sensors:

- with over a billion in use, mobile devices are ubiquitous 'in pocket' technology,
- they are relatively inexpensive and available, and, transmitting limited data over UDP, can work with low-bandwidth internet connections (dial-up, satellite and rural 2G/3G systems), and
- no hardware distribution is required – all of the required 'systems' can be software-based.

Collaborative Data Visualisation and Sonification: For prototype purposes, each participant streamed data from their mobile devices to a central computer using Isadora and Max/MSP to create a variety of live data visualisations; these were then streamed live to the Tap so that in rehearsal, participants could immediately see their motion relative to other collaborators. Building on the work of the prototyping process, we plan to implement an additional 'palette' for the Tap structure: a 'data tab' (Fig. 2) that will allow collaborators to assign data streams to existing Tap tools, stream their own custom visualisations and sonifications (created in Max, Isadora and similar software) to the Tap, and provide tools for collaborative work, transformation and recording of movement data.
This 'data tab' will, in effect, also serve to open the existing Tap structure to interaction with, and control by, any of the tremendous array of interfaces and sensors that utilise the OSC protocol to transmit information. Building on the collaborative and improvisational structure of the existing Tap interface, the 'data tab' would allow participants to:

- combine and manipulate live data of remote participants (motion, compass, location),
- produce collaborative data visualisation,
- record, play back and transform data as part of choreographic, performative or mapping explorations,
- use it as a control source for existing palettes, and
- integrate custom visualisations and sonifications into the Tap via streaming.

A final piece of the prototyping research was to investigate work with transforming sound as a feedback source for non-vision centred remote performance.

The Demonstrations

For the presentation at *ISEA2013* [7] we prototyped how movement data from remote participants could be utilised in a real-time online interface through the use of an Isadora patch.

The remote participants were Russell Milledge and Rebecca Youdell of Bonemap (Cairns, Aus), Mary Armentrout and Marcia Scott (San Francisco, USA), and Kate Genevieve and Evelyn Ficarra (Brighton, UK). ISEA delegate Brisa MP from Santiago,

Chile volunteered her participation on the day within the presentation space, and Adhari Donora (Riau, Sumatra, Indonesia) participated in the research on other days.

In keeping with the ideals of Waterwheel, we asked participants to become familiar with, to photograph, and to undertake their physical explorations in proximity to their local creek, waterway or body of water – namely Atika Creek (Cairns), San Francisco Embarcadero (California), Brighton Beach (UK) and the Kampar River (Sumatra).

Telecommunications

We established separate telephone or Skype calls with each remotely participating pair. One member of each pair was tasked with maintaining the call on a mobile device, capturing local sounds, and ensuring their partner could hear the sound of the call. The other was tasked with moving with their mobile device attached to their head or torso, listening to the phone call sound and following the movement "score" of each demo.

Sound as a Means of Feedback

Cross-fading between two sound sources was used as a means of providing sonic feedback to participants about both group and individual movement. Each pair was ascribed a pre-recorded sound loop as 'their' designated sound, and was also transmitting live location sound. The intensity of their motion resulted in a cross-fade between pre-recorded and live sound – with 0 motion correlating to minimum pre-recorded volume / maximum live volume, and vice versa.

The sound that each group received was a combination of all of the groups' live vs. pre-recorded sound mix.

Movement Scores

Each demonstration was characterised by a different movement score on which the remote participants could improvise. The dynamic quality, duration and direction in each score varied, in order to tease out a wide range of data from the sensors, and also to explore different ways of visualising that data. Fine movement sensors such as accelerometers generated data streams rich in detail and nuance. The movement range within each motif was kept minimal, enhancing the possibility for increased embodied awareness, and allowing for participation of people with mobility impairments.

Demo 1: "Compass" was the first movement score, in which the data-sending participants remained in place and rotated their head or torso from one compass setting to another, e.g. from east to west and back again. Timing, range of rotation, speed and repetition of movement was up to their discretion.

Data from the compass was mapped onto a 360-degree panorama of each participant's location (Fig. 3), thus directly tracking the participant's

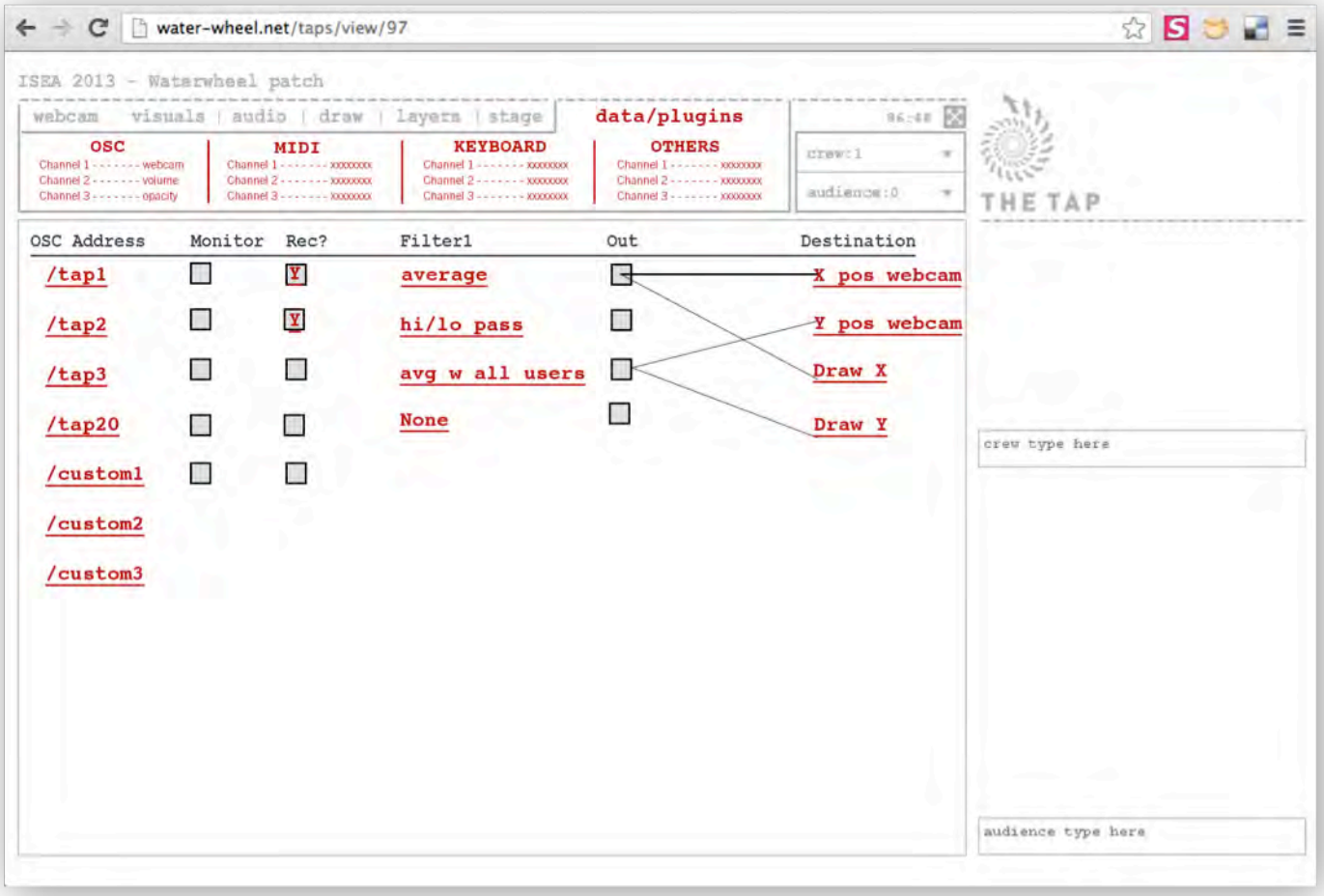


Fig. 2. The proposed "Data tab" showing conceptual arrangement of data inputs. Screengrab © Ian Winters.

orientation in real time. At the same time, the rate of change in each compass reading was calculated to control the balance between the participant's live sound (when still), and 'assigned sound' (when moving).

Demo 2: "Swaying and Stillness" involved minute, gentle side-to-side swaying of the head and torso in any direction, alternating with stillness.

We used gyroscopic data showing change in rotation [8] about the mobile device and participant's body's XYZ axis, which was then mapped onto a simple line drawing visualisation showing the distance between two pairs of XYZ points that are 30 samples apart in time, and then redrawn at a 1 to 5 Hz rate (Fig. 4). This generates a pattern displaying both overall rhythm of the movement, and changes in position.

Demo 3: "Bird" consisted of small, rapid movements in any direction – alternating with "Flowing", which was characterised by smooth continuous movements from one place to another whilst maintaining velocity.

In terms of data, we were exploring the elementary property of accelerometer data, that only change in velocity (i.e. acceleration) is visible, while continuous motion is, in effect, invisible, combined with an incremented '"dead-reckoning" where acceleration in a given direction increments a 3D particle in that direction. (Fig. 5)

Feedback from Remote Participants

Kate Genevieve commented:

"The movements were somatically distinct and interesting for me, and there is something interesting in knowing that the visceral contrasts that I was experiencing were being shared by people in front of the sea in America (...) As a performer I longed to have something that gave me details about where and who the other performers were – perhaps their voices describing where they are would do this well enough, or a webcam at the start."

Rebecca Youdell commented:

"During the rehearsals the focus was on making the transmission of the pairs and the score work, but then at the symposium, the focus switched to making the presentation work for the face to face audience in Sydney, so it became very one way (and) as communication was intermittent and chat not consistent (...) as a pair we felt disconnected from the presentation, but part of the event through transmitting."

This feedback has been valuable in identifying issues to be resolved in any future developments, as outlined in the conclusions below.

Conclusions

The research provided valuable opportunities for, and yielded good progress in, the development of physical scores for interaction using mobile devices, methods of transmitting data from these devices over a variety of networks, prototyping visualisation and sonification of data, trials of connectivity between remote participants via sound feedback, and conceiving the implementation of data feeds into the Tap.

Feedback from the team, the remote participants and *ISEA2013* delegates confirmed interest in these developments. In addition to our already established work with performers in collaborative and networked performance, we found through the conference that a number of people, collecting data related to climate change and environmental issues, are keen to establish a platform that would enable presentation of creative options

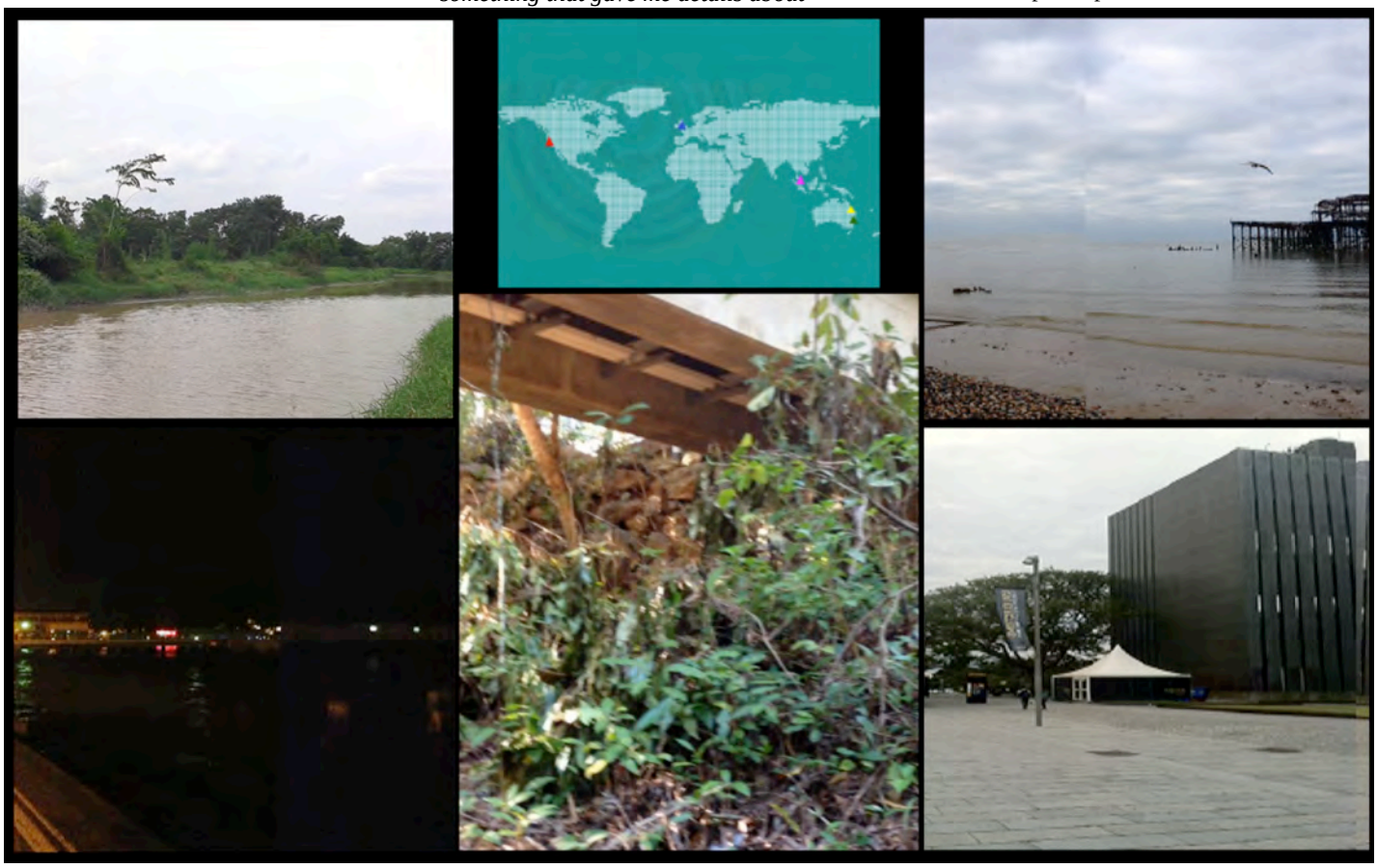


Fig. 3. 'Compass' layout showing from top left (Indonesia, map, Brighton, San Francisco, Cairns, Sydney). Screengrab © Ian Winters.

for this data.

Going forward, we have several areas of additional exploration:

- address technical implementation issues and feedback from participants regarding the lack of connectivity between collaborators,
- develop a specific app (for android and iPhone) that provides pre-configured setup for sending OSC data to the Tap, and testing apps and methods of sending OSC data,
- develop a data library or archive as part of the media centre linked to the Tap – to be implemented in partnership with the Inkahoots programming team, and
- further develop movement and sound scores in order to improve both the feeling of connection between remote participants, and how they contribute to a general artwork.

Synchronous vs. Asynchronous Works:

Another important feature of the research to pursue is in the differences between synchronous and asynchronous data-driven works, and the differing qualities of collaborative engagement.

A number of recent artworks using mobile devices, OSC devices and locative media [9] use an asynchronous connection between data collection and visualisation.

Our research seeks synchronous connections by creatively transforming real-time data in the Tap, and providing performative interactivity between crew and live online audience. Projects using this type of interface can stimulate awareness, exchange and debate about embodiment and environmental issues, and, because of its 'liveness', provide agency to people for interaction.

Ultimately we see the Tap data-feed 'plug-in' as a structure that would enable creative and innovative projects by any user of Waterwheel.

References and Notes

1. Access to the Tap is via <HYPERLINK "http://water-wheel.net"http://water-wheel.net>, accessed Oct 23, 2013.

2. Stamatia Portanova, *Moving Without a Body* (MIT Press, 2013).

3. James Cunningham. "Breathing the Walls", Inflexions 6, "Arakawa and Gins" (January 2013). p. 169 <HYPERLINK "http://www.inflexions.org/n6_cunningham.html"http://www.inflexions.org/n6_cunningham.html>, accessed Oct 23, 2013.

4. The applications that we used were: GyrOSC <HYPERLINK "http://www.bitshapesoftware.com/instruments/gyrosc/"http://www.bitshapesoftware.com/instruments/gyrosc/>, accessed Oct 23, 2013; Control <HYPERLINK "http://github.com/charlieroberts/Control"http://github.com/charlieroberts/Control>, accessed Oct 23, 2013; OSCDroid <HYPERLINK "http://www.1mobile.com/oscdroid-507064.html"http://www.1mobile.com/oscdroid-507064.html>, accessed Oct 23, 2013; and TouchOSC <HYPERLINK "http://hexler.net/software/touchosc"http://hexler.net/software/touchosc>, accessed Oct 23, 2013.

5. Motion data was preprocessed using high/low-pass filters to remove outliers, and simplified Kalman type filtration based on implementations by Jan Pieter <HYPERLINK "http://www.pieter-jan.com/node/11"http://www.pieter-jan.com/node/11>, accessed Oct 23, 2013, and Mital A. Gandhi and Lamine Mili**.** 'Robust Kalman Filter Based on a Generalized Maximum-Likelihood-Type Estimator', IEEE Transactions on Signal Processing, Vol. 58, No. 5, May 2010.

6. Isadora is the graphical programming environment created by Mark Coniglio / Troikatronix See <HYPERLINK "http://troikatronix.com"http://troikatronix.com>, accessed Oct 23, 2013. Max/MSP is a product of Cycling74 software <HYPERLINK "http://cycling74.com"http://cycling74.com>, accessed Oct 23, 2013.

7. Full presentation video documentation is available at <HYPERLINK "http://vimeo.com/68970588"http://vimeo.com/68970588>, accessed Oct 23, 2013.

8. We use "Rotation rate" somewhat loosely as either the calculated composite sensor defined as "rotationRate" in Apple iOS 6 Core Motion framework <HYPERLINK "https://developer.apple.com/library/iOS/navigation/"https://developer.apple.com/library/iOS/navigation/>, accessed Oct 23, 2013, or the similar parameters in the Android "Sensor Manager" class <HYPERLINK "http://developer.android.com/reference/android/hardware/SensorManager.html"http://developer.android.com/reference/android/hardware/SensorManager.html>, accessed Oct 23, 2013.

9. Such as 'Notes for Walking' <HYPERLINK "http://www.creativecultural.com/notesforwalking"http://www.creativecultural.com/notesforwalking>, accessed Oct 23, 2013, utilising preproduced media viewed individually by participants during walks, 'Long Time No See' <HYPERLINK "http://explore.long-time-no-see.org/map"http://explore.long-time-no-see.org/map>, accessed Oct 23, 2013, in which traces of individuals' walks are made visible afterwards, and 'Breathing is Free' <HYPERLINK "http://breathingisfree.net"http://breathingisfree.net>, accessed Oct 23, 2013, a series of visual artworks showing GPS-generated patterns of the artist's runs through cities.

Fig. 4. "Swaying" line drawing score. Screengrab © Ian Winters

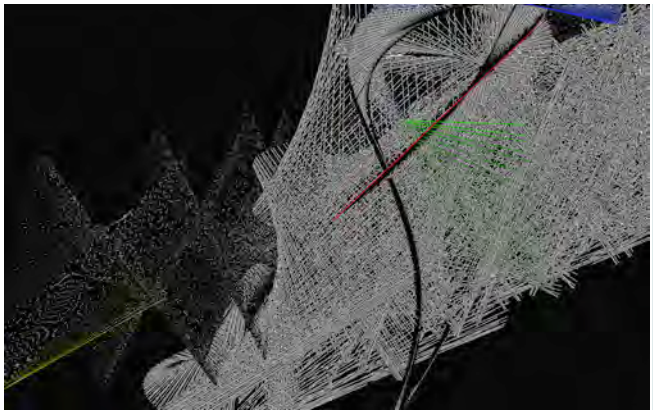
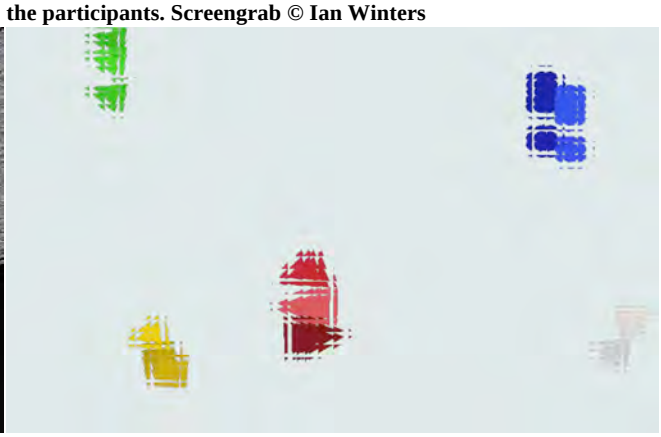


Fig. 5. Each colour of particle is the movement generated by one of the participants. Screengrab © Ian Winters



SPECULATIVE OBJECTS: MATERIALISING SCIENCE FICTION

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Abstract

In this essay I propose the idea of the 'speculative object' as a way of understanding how some artworks and artefacts function in human experience as philosophical tools. I explore the way in which objects materialize science fictional structures, in particular the way they provoke and support speculative thought.

Keywords: Speculative objects, Science fiction, Curatorial practice based research, Awfully Wonderful: Science Fiction in Contemporary Art, Performance Space.

Awfully Wonderful

This paper is based on curatorial practice-based research surrounding the exhibition *Awfully Wonderful: Science Fiction in Contemporary Art*, which took place at Performance Space, Sydney in 2011[1, 2]. This exhibition, which I co-curated with Bec Dean, brought together an eclectic mix of science fictional artworks with scientific and technological objects from the collection of the Powerhouse Museum of Science and Design, Sydney. In this paper I propose the idea of the 'speculative object' as a way of understanding how both the artworks and artefacts included in the exhibition function in human experience as philosophical tools that provoke reflection about scientific and technological change, and the relationship of the present to possible futures and alternate pasts.

Science fiction is usually thought of as a narrative genre, primarily experienced through film, television or print. Whether we locate its origins in the Enlightenment or in the Industrial Revolution, there is general agreement that science fiction dramatises our deeply ambivalent relationship to the discovery of knowledge about our environment (science), and the means to influence it for our own purposes (technology)[3]. We both fear and revere the immensity of the universe, just as we both desire and revile the augmentation of our own powers through science and technology. Science fiction has surfed the waves of this oscillation, dramatising utopias and dystopias, helping human beings to think through the ontological and ethical implications of new techno-scientific discoveries [4].

Science fiction does this through extrapolation and speculation – that is, it projects from the known into the unknown. It opens up alternative perspectives – whether temporal, spatial, political, interspecies or intergalactic – from which we can see and interrogate our own situation in a new light. In this essay I examine the way in which some objects use or activate this same speculative structure. I ask what happens when science fiction is materialized, when speculative fiction becomes speculative objects (5). To do this I reflect upon a selection of objects from the exhibition *Awfully Wonderful* – both artworks and techno-scientific artefacts - and try to explain the different ways in which they generate or support speculative thought.

Visualisation and viscerality

Investigating contemporary art (alongside other objects and artefacts) as a materialization of the process of speculation also represents a move away from the question of how science fiction *visually represents* scientific and technological objects and themes. But it is not necessarily a move away from the rich visual inheritance of science fiction imagery. Curator and critic Patrick Gyger wrote in the *Awfully Wonderful* catalogue of the historic interplay between visualization and science fiction, and of the particularly strong and lasting influence of the graphic imagery of the science fiction pulp magazines from the mid twentieth century [6]. In an acknowledgment of this inheritance, we commissioned artist Deborah Kelly to make a series of works in response to the collection of science fiction pulps held in the Fisher Library of the University of Sydney.

In her collage-based practice Kelly has frequently worked with the imagery of the B movie. Her work offers a feminist critique of the futuristic excesses of our visual imagination, without suppressing what is compelling and attractive in these images. What we (and what Kelly herself) expected to emerge from this commission, were pop-esque images of alien creatures and women in seductive space outfits. The results however were a much more subtle and transformative response to science fiction's figurative tradition. Figure 1 is one example of a series of 8 collages Kelly produced for *Awfully Wonderful*, collectively titled *Dream of a common language in the disintegrating circuit (with thanks to Donna Harraway)*. They are delicate and exquisite concoctions formed from glamour magazines, erotica, botanical and aquatic imagery. Kelly's artist's statement accompanying the collages connects the fetishized female body of the pulp – in which "lush alien ladies" in "skyscraper heels and skintight spacesuits" teeter into the arms of "reassuringly virile, scientific white men", to a deep history of female transformation and objectification:

> *I see fear of monstrous fecundity projected across human millennia from treacherous man-eating seawitch siren lairs through fearsome fairy- and folktales and onto the impossible physiques of fertile future babes.*

Fig. 1. Deborah Kelly, *Dream of a common language in the disintegrating circuit (with thanks to Donna Harraway)* (2011) (© Deborah Kelley. Photo © Performance Space.)

The speculative structures of Kelly's spliced images move both forward and backwards in time. They point backwards to myths of human transformation into other kinds of creatures, either through magic, or divine intervention. They explore biological possibilities that are both atavistic and futuristic: invoking our evolutionary inheritance from primordial aquatic forms, and the potential transformation of the human to the post-human through bio-technology. Kelly herself describes them as both pre- and post-mammalian.

Kelly's images imaginatively materialise the potential consequences of

contemporary biotechnology, such as genetic modification, biomimicry, and reproductive technologies. Apart from Donna Harraway, Kelly cites Shulamith Firestone as a key influence in these visual experiments. Firestone's extreme and controversial vision of female emancipation entailed the necessity of "wombless" reproduction. To be truly free, she argued, women would have to jettison that reproductive aspect of female biology.

One of our interpretive strategies for the exhibition was to create an audio guide, based on interviews with scientists, that would explore the scientific realities connected with the artworks. In Kelly's case we interviewed Professor Stuart Bunt, the co-founder of SymbioticA research laboratory for Bio-Art. Whilst Firestone's position may seem extreme, Stuart Bunt claimed in the audio guide that "wombless" reproduction is a significant goal in reproductive science, and that current research with calves and mice is relatively close to bringing a live foetus to term outside of the body. In the case of Kelly's works and many other works in the exhibition, what seems like extreme science fiction is actually surprisingly close to science fact, and perhaps more importantly, to scientific developments that are outpacing our capacity for ethical consideration at a societal level.

One of the roles of these speculative objects is to raise these ethical questions that concern our bodies in a bodily or visceral way. Their concrete physical existence demands a physical reaction. How do we feel about these objects, what do they make us want to do? Do we want to go towards them, or do we shy away from them? As such they become tools for embodied reflection on our own attitudes. Kelly herself described her images as visual scenarios, connecting them to influential methods of strategic future planning used in both business and design [7]. Unlike verbal or narrative scenarios, however, they emphasise instinct and ambiguous possibility over explanatory sequences of cause and effect.

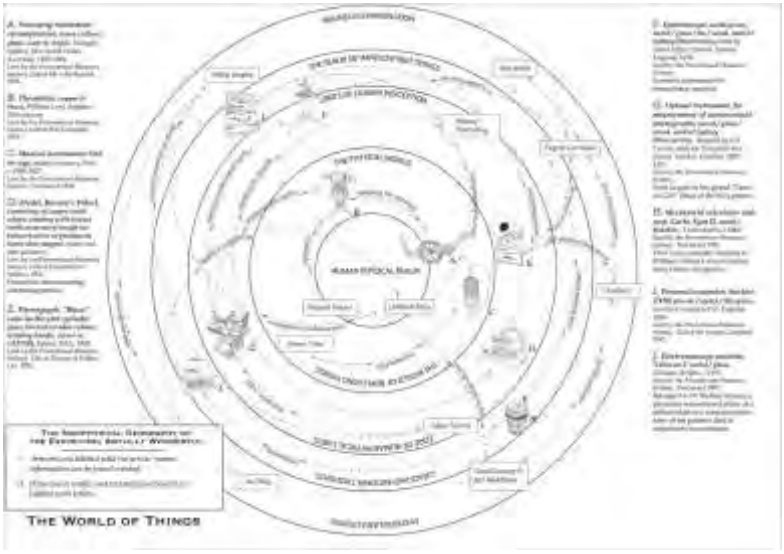
The World of Things

Figure 2 shows another object that deals with the shifting ground of scientific knowledge, medical practice and ethics in regard to the human, and particularly female body. The object on the right is Dr Bodkin Adam's electro-massage machine, c 1930, from the Powerhouse Museum collection. This device was widely believed to cure numerous ailments, including female "hysteria", by the application of vibration. One of the uses of this type of machine was probably as an early portable vibrator. This object, like many of the artefacts in the exhibition, speaks eloquently of the scientific fictions of the past, and the way these beliefs are manifested in technologies and practices that can come to seem out-dated at best, and barbaric at worst. It also tells another, more personal story. Between 40 and 160 of Dr Bodkin Adam's patients died under suspicious circumstances in the 1940s and 50s. He was named in the wills of 132 of them. Recent historians are fairly unanimous in describing him as an unconvicted mass murderer, though many at the time believed him to be euthanasiast.

We commissioned artist Jo Law, whose practice engages with the legacy of the Cabinet of Curiosities and the nature and display of objects, to arrange the scientific and technological artefacts that appeared in the exhibition. She placed Dr Bodkin Adam's massager next to an electromagnetism demonstration device called a Barlow's Wheel, which can also be seen in figure 3. There are numerous resonances and connections between the two objects. Like many of the artefacts displayed, they share material and formal properties such as their polished metal and wooden parts and elaborate cursive inscriptions, which are redolent of "antique" technologies. Law constructed bespoke cabinets for the objects with mirrored bases and sides creating infinite reflections that receded into the distance. This optical effect

Fig. 2. Barlow's Wheel Electromagnetism Demonstration Device (date unknown), Dr Bodkin Adam's Electromassager (c 1930), Collection of the Powerhouse Museum. (Photo © Performance Space)

Fig. 3. Jo Law, The World of Things (2011) (© Jo Law. Photo © Perforamnce Space.)



heightened the experience of the formal and visual echoes that resonated between objects and artworks in the exhibition. It also emphasized, through its repetitive abstraction, the 'objecthood' of the artefacts. Separated from their traditional explanatory contexts (un-labeled and a-historically placed), the objects' relationships to function and period were mysterious. Intriguing, but opaque, they became the focus of aesthetic appreciation and a source of speculation. By begging the question 'what might this object be?' the artefacts invited audiences to engage their knowledge of the history of scientific thought and technological apparatus.

As well as arranging the objects, we also invited Law to create an interpretive map, *The World of Things* (Figure 3.), which charted both the physical and the metaphysical terrain of the exhibition. The map provided details of the official provenance and purpose of all the objects in the show, and also situated them in a speculative taxonomical structure. The map moves outwards in concentric circles from the Human Physical Realm at the centre through two axes: The Physical World, The Limits of Human Perception, The Realm of Imperceptible Things and, finally, Boundless Imagination on one axis, and The World of Non-Living Things, The Edge of Human Physical Limits, Logics and Rational Thoughts and Utopias and Dystopias on the other. Thematic trajectories criss-cross the map, connecting disparate objects. The theme of Technologies of the Body connects Dr Bodkin Adams' massager with Deborah Kelly's collages, and the theme of Electromagnetism connects the massager with the Barlow's Wheel and with The *Cloudbusters* (numbers three and four, see Fig.4) by David Haines and Joyce Hinterding that I will discuss next.

Myth makers and busters

The *Cloudbusters* are re-creations of an outlawed technology created by the controversial American Psychiatrist Wilhelm Reich. Like the electro massager and the Barlow's wheel, *The Cloudbusters* speak of the provisionality of scientific truth, the role of performance and belief in science and medicine, and the power relations between expert, amateur and audience that are concentrated around technological artefacts. Reich's published works, including *The Mass Psychology of Fascism* (1933), and *The Sexual Revolution* (1936), were significant texts in the development of left-wing political and social thought. Reich developed the theory of Orgone Energy, which was both widely influential and also widely condemned as a fraud. Reich described Orgone energy as a life force that connects all the beings in the universe together. He attributed to it powerful properties, including the capacity to cure illnesses and influence the weather. The Cloudbusters, which are intended to seed rain, are part of a suite of machines Reich developed, which were supposed to concentrate Orgone energy in particular ways for particular purposes. The American Food and Drug Administration, a deeply conservative organisation in the 1950s, banned the Orgone machines, burned the books that contained instructions of how to make them, and eventually prosecuted and imprisoned Reich for contravening an injunction preventing the distribution of the machines and associated literature.

Haines and Hinterding, whose collaborative practice often includes the manifestation of unseen forces, have recreated these machines from instructions and remaining documentation of the originals. They are to all intents and purposes functioning Cloudbusters. The speculative capacity of these objects derives in part from their ambiguous status. Are they tools or sculptures? Are they functional or fantastic? In eluding clear categories these objects question fundamentally the role of belief, respectability and politics in relation to science and technology. They raise the question: what are we *allowed* to believe?

As with Kelly's collages, the questions raised by the Cloudbusters resonate powerfully with contemporary debates about progress, science and technological change. The Cloudbusters speak particularly to the politicization of climate change science and the environment. Geo-engineering (the cause of numerous science fiction apocalypses) is becoming an increasingly likely response to climate change. The idea of engineering interventions to change weather patterns was particularly relevant in Kellerberrin in the Western Australian wheat belt, where these works were made in 2008, as Australia was in the grip of a long drought. Like Kelly's collages these objects raise these fraught issues with a provocative and, I would argue, productive ethical ambivalence.

Fig. 4. Haines/Hinterding, Cloudbuster Number Three: Orgone Energy Cloud Engineering Device (The Black Ray) 2008/2011. Cloudbuster Number Four: Orgone Energy Cloud Engineering Device (Starlight Driver 3.1) 2008/ 2011 (© Haines/Hinterding, Photo © Performance Space

Macguffins and story engines

All the objects that I have described in this paper vibrate with numerous stories. They act as fulcrums for the intersecting narratives of scientific history, both personal and global. This capacity to generate stories is a key feature of the speculative object. They operate, in Alfred Hitchcock's term, as "Macguffins" the "mechanical element" (as Hichcock describes it), which propels forward the action of a narrative. The Macguffin has always played an important part in science fiction narratives. Generic science fictional Macguffins include the "BDO" or Big Dumb Object, a thing that inspires awe and wonder through its presence, whilst remaining mysterious (the obelisk in Stanley Kubrick's *2001: A Space Odyssey* is a classic example), and the Novum [8], a fictional innovation that is cognitively plausible, and signals the narrative's inhabitation of a world different from that inhabited by the reader. Some of the objects included in

Awfully Wonderful were physical examples of Macguffins related to famous sci-fi stories – the Curta Calculator and Sinclair personal computer, for example, are the main object-protagonists in William Gibson's novel *Pattern Recognition*. It is notable that both of these objects are associated with rich real-world stories, and Gibson's invocation of them in his novel created a compelling mixture of truth and fiction within the text.

We commissioned artist Simon Yates to materialise, through his signature hand-made wood and paper robots, a particularly famous and provocative science fiction Macguffin – *Futura*, the evil, seductive, female robot from Fritz Lang's *Metropolis* (Fig.5). Supported by helium balloons Yates' fragile and delicate contemporary version of Futura drifted, spectrally around the exhibition. This once powerful and fearful creation was revived in the exhibition as kind of geriatric ghost in the machine. Her haunting presence was a poignant reminder of the way in which the future ages.

Fig. 5. Simon Yates, *Futura* (2011) (© Simon Yates. Photo © Performance Space.)

Anthropocene

Whilst many of the objects and works destabilised our view of the past, others offered destabilising views of the future. Apocalyptic, dystopian and post-human visions are familiar terrain in science fiction narratives, and several of the works materialised this terrain in startlingly physical ways. Hayden Fowler's work *Anthropocene* (Figure 6.), speaks to the possibility of post-human consciousness, and the relationship that such a consciousness might have to human beings. The Anthropocene is the name recently given to the geological time period during which human activity has had a significant impact on the earth's ecosystems. The very act of naming this period implies its finitude, and Fowler's installation allows us to speculate on the possible fate of the human. The work consists of an island covered by grass with a rudimentary cave shelter on top of it. Fowler inhabited the island during the exhibition, wearing a pelt and accompanied, if you looked closely, by three rats.

Fig. 6. Hayden Fowler, *Anthropocene* (2011) (© Hayden Fowler. Photo © Performance Space.)

The installation suggests, at first, a museum diorama of a pre-historic dwelling. It looks like an idealisation of a pre-technological, pre-modern form of existence. When you get closer, however, you can see the complicated technological systems that are maintaining this simple inhabitation. The food Fowler is eating comes from tin cans. CCTV monitors show surveillance views from within his cave, wires trail beneath the exposed wooden structure of the island. There is a complex technological infrastructure that supports this primitive way of life.

The rats, which audiences may catch a glimpse of, suggest a hint of an ecosystem, but also a laboratory experiment. Whether this is a zoological or museum exhibit, or an experiment, it suggests that the human inhabiting the island is the subject of scrutiny, perhaps even the cause of wonder and enjoyment for another consciousness. What is looking *at* this exhibit? Something stands in relation to this human in the same position that we humans stand in relation to cave men, zoo animals or laboratory rats. In terms of speculative projection, this is an incredibly humbling perspective to adopt.

Conclusion: From speculative fiction to speculative objects

Considering the experience of Hayden Fowler's island illuminates one of the key questions raised by the idea of the speculative object as a materialisation of science fiction. Is the experience of looking at, smelling, moving around and contemplating *Anthropocene* different from the experience of psychologically inhabiting a science fiction narrative?

The Marxist literary critic Frederic Jameson argues that the "deepest vocation" of science fiction texts is "over and over again to demonstrate and to dramatise our incapacity to imagine the future." This incapacity is "not owing to any individual failure of imagination but [is] the result of the systemic, cultural and ideological closure of which we are all in one way or another prisoners."(9). Speculative Fiction is, for Jameson, a mirror reflecting our situation but closed off from it, unable to penetrate or shift our reality (10). In *Awfully Wonderful* science fiction made a three dimensional, and experiential entrance into our own world. The exhibition was filled with objects, like *Anthropocene*, that suggested alternate realities, but at the same time inhabited, with concrete physicality, our own. It is not by any means the aim of this essay to argue for the superiority of physical over textual artworks, but it is interesting to note that

the nature of the experience generated by the speculative objects I have described offers a possible counterpoint to the impasse identified by Jameson. The experience of speculation provoked by these objects is visceral and ambiguous. In the interplay of their impossibility, obsolescence and liminality with their tangible existence, these objects act not only as mirrors of our own reality, but also as portals that allow us, if only fleetingly, to move beyond it.

References and Notes

1. *Awfully Wonderful: Science Fiction in Contemporary Art* took place between April 15 and May 14 2011. This paper develops ideas first introduced in my short essay in the exhibition catalogue, entitled: *Speculative Objects And The Total Perspective Vortex*.

2. For a discussion of my particular approach to curatorial practice-based research see Muller, L. (2011), 'Learning From Experience: A Reflective Curatorial Practice' in Candy, L. & Edmonds, E. (eds), *Interacting: Art, Research and the Creative Practitioner*, Libri Publishing, Faringdon, Oxfordshire, U.K, pp. 94-106.

3. See both Anne Cranny Francis (20-24) and Andrew Frost (24-27) in Dean, B. and Muller, L. (Eds) *Awfully Wonderful: Science Fiction in Contemporary Art,* Performance Space, Sydney.

4. My argument here builds on previous work I have done in explaining the aesthetic experience of interactive digital art, which draws on the pragmatist philosopher John Dewey, see Muller, L. (2009) *The Audience Experience of Media Art: A Curatorial Study*, PhD Thesis, University of Technology, Sydney. In *Art as Experience* (1934), Dewey argues that the "work" of art (as verb rather than noun) is to help human beings adapt to the constant changes that we cause and undergo, as humanity cycles through rhythms of challenge, adaptation and growth within our environment. Science fiction, like digital and interactive art, are both concerned particularly with the changes wrought by science and technology.

5. The term "speculative fiction" is used to describe the family of literature that includes both science fiction and fantasy fiction. This essay, and the exhibition it is based on, are concerned particularly with the nature of science fictional speculation that engages with the implications of scientific discovery and technological change.

6. Gyger, Patrick (2011) "In a Strange Land: A Tour Through the Worlds of Science Fiction Art", in Dean, B. and Muller, L. (Eds) *Awfully Wonderful: Science Fiction in Contemporary Art,* Performance Space, Sydney, pp. 27-31.

7. One of the most influential users of future scenarios is the Shell Oil company, who have famously been producing energy related scenarios since the 1970s. Since 2000 the Intergovernmental Panel on Climate Change IPCC's) Emissions Scenarios have been hotly debated, showing speculation on future events as a powerful ideological battleground.

8. Suvin, Darko (1979) *Metamorphoses of Science Fiction: On the Poetics and History of a Literary Genre,* Yale University Press, New Haven and London.

9. Jameson, Frederic (2005) *Archaeologies of the Future – The Desire Called Utopia and Other Science Fictions,* Verso, London pp. 288-289.

10. It is perhaps unsurprising that, as the embers of Marxist revolutionary politics fade, Jameson should claim that it is structurally impossible, within a fictional text to represent an alternative future. Other critics have more recently pointed to the practical and measurable effects of science fiction on individuals and society. I would like to thank the anonymous reviewer of this essay who suggested the following references to support this point:

Lin K, Fu-Hsing T, Hui-Min C, and Liang-Te C (2013). "Effects of a science fiction film on the technological creativity of middle school students" *Eurasia Journal of Mathematics, Science and Technology Education* 9(2):191-2.

Spicer Arwen. (2005). *Towards Sustainable Change: The Legacy of William Morris, George Bernard Shaw, and H. G. Wells in the Ecological Discourse of Contemporary Science Fiction*, PhD Thesis, University of Oregon