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Music, dimensions and play: composing for autonomous laptop musicians and improvising humans

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Abstract

This article discusses three compositions for autonomous laptops performing with improvising musicians. The laptops were programmed with software environments that make narrow-band ‘decisions’ regarding performative soundscapes. They also made ‘decisions’ about visual materials that were presented as onscreen scores for the human improviser to consider. The unfolding aural and visual streams were both functional and creative, and highlighted the here-and-now of indeterminate composition, whilst carefully embedding the aesthetics of the composer within the core of the programming. As such, these laptops were considered as collaborating performers and collaborating composers. The opening section highlights the connecting principles within this collection of works, before discussing each in isolation. This is placed within the context of late twentieth-century and early twenty-first-century composition, whilst offering a framework, for the reading of these, based on Deleuze and Guattari’s rhizome philosophy. *Three Last Letters* is then used as a case study of the concept of *wholeness* within the computer-generated soundscapes and the algorithmic programming. Section 3 draws together several theories surrounding the mental seeing evoked by sound into *dimensionality*: a playground for inventive HCI-music improvisation. The values and principles with which the humans and computers interact is developed using creative play theory, followed by some personal responses of the musicians. Finally, an evaluation is offered on the effect on the audience and their perceptual modes when experiencing

live and fluid compositions of this nature. The article is concluded with a poetics of experience from the composer’s perspective.

Keywords: HCI, creative play, improvisation with computers, soundscape, experimental composition

1 Introduction to the works

The three works discussed here were composed using similar principles. Each were created using found materials (visual and sounding) and were constructed in such a way as to allow these materials to be ‘free’—in the Cagean (Cage 1968) sense—from linear structuration and fixed interrelated meaning. Each composition concentrated on a time and place, and presented a combination of field recordings, live music and electroacoustic miniatures towards a non-cochlear engagement with the music (Kim-Cohan 2010). Furthermore, each deals with a human–computer interaction (HCI) modality focusing on playful engagement with autonomous laptop performers (discussed in detail in Section 3).

From the composer’s perspective, the aim of these compositions was to provide a vehicle with which the individual mind could journey along channels of memory and imagination, with the ongoing assemblage of sound mediating this

fluidity of thought. This is from the perspective of both the audience and the performers who, in a sense, are taken on a journey through their playful engagement with the laptops.

This compositional approach has certain advantages to the performer and audience which will be discussed later; however, from the composer's perspective there are two main areas of innovation. Firstly, it offers a conceptual approach that considers the *wholeness* of a compositional idea to be packaged and realised in a meaningful way; this is discussed in detail in Section 2. Secondly, it presents the performers with a technologically mediated interactivity in order that they complete the 'open-work' (Eco 1959) using playful means, and focussed within a considered arena (Emmerson 1999).

The author of this article is also the composer; therefore, discussing these works from *inside* the point of creation, as does this article, has its limitations when attempting to present a rounded and analytical perspective. However, this *in vivo* experience does have some advantages when attempting to articulate and codify new modalities of composition, especially when dealing with human-computer interaction. The latter is the true purpose of this article; as such it:

- (1) highlights a conceptual framework with which to approach the mixed media composition of forensic ontologies of found materials and the more abstract materials created by an ensemble of improvising musicians;
- (2) frames this discourse within a compositional paradigm created from autonomous computer-generated scores, disembodied voices and a generated soundscape created from source recognisable environmental sounds;
- (3) offers exemplary reference points towards the problem of articulating large temporal scale in improvised composition with computers;
- (4) contributes to the emerging discourse on creative play within human-computer interaction through the analysis of the modalities of interactivity, simultaneously offering a performance-based point of reference for Brigid Costello's (2007) 'pleasure framework'.

1.1 Composition 1 – *The Unchanging Sea* (Vear 2010a) [duration twelve minutes]

This piece was a new-media composition that restaged, repositioned and recontextualised D. W. Griffiths's *The Unchanging Sea* (1910). The piece was composed as a duet for laptop and 'cello. During the performance the human musician is presented with a visual score generated by the laptop using found material relating to the film and fixed in a library; and a soundscape collage created using random process. The musician has the option to auralise a response using her instrument, electronics and/or her voice. This could be done in an abstract or literal way, or sliding between this range at any given point.

The music aimed to poeticise the story that is 'within' the film; the area of the human condition that the film is concerned with: loss, and the loneliness and isolation of loss – even in the presence of the lost one; such as lost love in a relationship. It is important to note that this type of 'parallelism' is an important element in D. W. Griffiths's work. He used it to rupture linearity and generate double narrative: 'the one that is and the one that might be, the one that is real and present and the one that is fictive and hypothetical' (Rohdie 2006, 54). This piece was never performed live, although a full project blog can be found at <http://theunchangingseaopera.blogspot.co.uk/> and audio examples at http://www.ev2.co.uk/vear/unchanging_sea.html.

1.2 Composition 2 – *The Cape Jeremy Affair* (Vear 2010b) [duration twenty minutes]

The Cape Jeremy Affair was an experimental music theatre composition for two improvising musicians and two laptop computers. It was based on a text: a 1969 sledge report from the British Antarctic Survey that described an arduous, and ultimately aborted, rescue attempt by four dog teams from Stonington Island to Fossil Bluff, where several geophysicists had sought shelter following a plane crash (McArthur 1969). The thirty-day trip started as a routine dog sledging expedition conducting a geophysical survey along the way.



Figure 1. *The Cape Jeremy Affair* live at York Theatre Royal.

However, it ended up being a survival exercise, with four men and twenty-seven huskies adrift on an ice floe. This composition was not as a piece of music *about* the report—as in a retranslation from story to music—nor was it *with* the report—as in a libretto—but something that was more *in-between*. In this sense, the music was created from within the report; that is to say, the imaginary dimension that the report generates when read, or was in the mind of the author when written.

This piece was conceived to be performed in a traditional theatre environment; for example, Figure 1 shows the premiere performance at York Theatre Royal (2010). Two improvising musicians were seated on stage in front of two laptops. Each of these laptops generated a visual score from found materials (text, music, image), and a soundscape generated from field recordings, voice and electroacoustic manipulations. The soundscape library contained:

- A recording of the original text recited by Alis-tair McArthur (the original author);
- Field recordings from places mentioned in the text;
- Field recordings of sounds mentioned in the text;
- Electroacoustic miniatures created in response to the text or were treatments of the above field recordings;
- Silence.

And a visual score for the musician to follow generated from a fixed library of:

- Scans of the original pages from the report;
- The first five pages from *Sinfonia Antartica* by R. Vaughan Williams (study score);¹
- Black screen.

I described this piece as a ‘play’ for musicians, inasmuch as each musician has a responsibility to a narrative exposition—however abstract this may be—and approached the performance embracing definitions of the word play (noun or verb), discussed below in Section 3. The role of the musician was to contribute to a sense of place—in this case, the reality within the written report—auralising a response through improvisation using their voice or their instrument.

The role of the computer is both functional (score generator) and performative; as such, this piece should be considered a quartet. The laptops were completely autonomous and were not networked; as such, the proportions of random events within the algorithms in each version of the software score had to accommodate the presence of the other, and the potential contributions of the human musicians. The software development happened over many months and was tested for many hours to ensure that a sense of the *wholeness* of the composition was embedded within the functional DNA of the software score. The devising process with the musicians happened over the same period to ensure that the improvising strategies (human) and the generative responses (machine) worked in polyphony (discussed in Section 4). It was at this time that these autonomous scores became thought of as virtual musicians, as there was a certain degree of ‘artificial intelligence’ embedded within each, albeit very narrow-band decision-making. Interestingly, the musicality of the machines was mentioned many times by the humans. (Audio examples can be found at <http://www.ev2.co.uk/vear/cja.html>; R&D blog can be found at <http://capejeremyaffair.blogspot.co.uk/>.)

1.3 Composition 3 – *Three Last Letters* (Vear 2012) [duration forty minutes]

Three Last Letters is a play for musicians scored for three voices, three musicians, three networked

laptops and diffused soundscape. The composition was commissioned by the Vale of Glamorgan Festival, and premiered by the Open Work Ensemble at Barry Arts Depot in May 2012. The compositional aim was to imagine the last moments in the mind of Scott before he died in the tent, alone. It was created using facts and suppositions surrounding these last moments and included an ontological library of found materials:

- Text from the final entries in Scott’s diary;²
- The final letters home from Scott, Bowers and Wilson;
- Antarctic field recordings;
- Music materials (specifically *We love the place, O God*, and *Sea Slumber Song* by Elgar);
- Other sound and music that take the minds of the audience to this lonely place.

This ontological library was embedded within an autonomous computer software environment that generated a visual score—one for each human performer—which provided the impetus for an improvised realisation. Each laptop communicated with the others through a network, using the shared data to evaluate the composition of each visual score. Additionally, each laptop contributed to the unfolding aural soundscape, generated from the audio elements within the library, from which recognisable sounds merge or emerge.

The musicians were arranged into trios of voice (human), instrument (human) and laptop (machine), with each human accessing their own score through an independent screen. The Max/MSP 5 based software score (discussed in detail in Section 2.2) was developed from the *Cape Jeremy Affair* environment, but was augmented to allow separate visual generation processes for each of the human musicians within each trio (voice and instrument). As such, each individual human musician was presented with their own bespoke generative score using the common fragments found within the shared libraries.

In performance the audience sat in the round in near darkness, facing the centre of the circle where the musicians performed. The three instrumentalists sat in a triangle facing out with their vocalists standing above them. They were lit with a tight-

focused blood-red lantern from above, evoking the famous Antarctic Pyramid Tent and the ghostly presence of the other. Surround sound speakers encircled the audience, at times immersing them in the immensity of white sonic space, or shrinking their perception towards the claustrophobic sense-of-being in that tent.

Through a concentrated process of devising (discussed in Section 3.1), the live performers developed strategies in which they interacted in polyphony with this environmental soundscape, transforming it into a continuously shifting image created from word, expression, rhythm, tonality, texture, spatiality and the representational simula-cra of the found materials. The mix of the live ensemble (fragments of melodies, held chords, spoken text, word play), the disembodied voice of ‘Scott’, the ghost sextet, processed and treated recordings and a soundscape created from the found sound library were diffused live by the composer (discussed in Section 2.1). The experience was vivid, phenomenal and touching, offering a variety of possible interrelationships generated by the open work process. This process, the system of embedding compositional processes within the algorithms of autonomous software environments and projected soundscape for improvised realisation, proved a successful solution to the problem of articulating a larger temporal scale in improvised composition with computers.

2 Historical context

The notion of *wholeness* underpinning the creation of the ontological libraries and the embedded algorithmical processes within these three pieces mirrors a type of twentieth-century indeterminate composition advocated in works such as Morton Feldman’s *Intermission 6* (1953) for 1 or 2 pianists, and Earle Brown’s *Calder Piece* (1966) for four percussionists and mobile sculpture. These two examples present the entire sounding materials (melodic, harmonic, textual, durational) as a constellation of carefully considered events that can begin on ‘any sound and proceed to any other’ (Feldman 1953). The inter-relationships between each event were also carefully con-

sidered, and embed compositional–philosophical properties much like Deleuze and Guattari’s rhizome (Deleuze and Guattari 1980) in as much as they:

- are connected *heterogenetically*: any point of the rhizome can be—and must be—connected to anything else at any given time in any given concept of time;
- are considered a *substantive* and ontological *one*;
- have *asignifying* processes if ruptured: a melody may be broken, but it can start up again on one of its ‘old lines, or on new lines’;
- are not responsive to any structural model.

Within Feldman’s piece his constellation is presented as individual notational events on a single sheet of paper shared by both pianists (or solo), and as a hanging kinetic sculpture containing mobile symbols in the Brown (1966) piece. These pieces presented the performer with solutions in the performer’s notes on how to navigate a response through them, but do not prescribe a route for them. Furthermore, each event has been carefully considered with relation to itself and time, and to its relationship to the other events, and to time. To borrow Feldman’s (1953) analogy of walking through a forest, these pieces present the whole forest of sounds in a single form, and ask the performer to wander through it in a certain way. Nevertheless, the performer must use her skill, ears and judgement to decide *her* route. As such, the resulting music is only one pathway through the forest, of which there are many (infinite maybe), and yet still conveys a ‘sense of place’ that is unique to that forest.

More recently, works that engage with a range of human–computer interaction have included David Behrman’s live performances for *On the Other Ocean*, Joel Chadabe pioneering work with computer interfaces, Robert Rowe’s live electroacoustic music generations, and Todd Winkler and Roger Dannenberg’s interaction with media art which has led to the field of *visual music* as exemplified by the works of Dennis Miller, Bill Alves, Diego Garro, and Bret Battey.

Similarly, performers have been developing technically mediated environments so that live gesture and natural interaction expand traditional instruments and human capabilities ‘to give extra power and finesse to virtuosic performers’ (Machover, n.d.). A recent example of this is *Sensorglove* by Franziska Baumann (n.d.) that enables her to ‘sculpt live and pre-recorded sounds in space’.

Whilst my compositions discussed here do not deal with the entirety of emerging HCI-music techniques, what is presented here is an approach and strategy for the construction of autonomous software solutions, and devised structures for the improvising human musicians.

2.1 *Three Last Letters* case study

Additional to the computer-accessible libraries and the algorithmic programming, other sound materials that took the imagination of the audience into Scott’s mind augmented the *wholeness* of this piece. They became the basic elements for a pre-compositional process, and were then subjected to a number of treatments, for example using a cross-filtration algorithm to transform the sound of the voices of two small children playing in a park with a field recording of Antarctic Katabatic wind, leading to an illusion of the wind speaking to Scott, as if a distant memory became audible through his fevered consciousness.

The field recordings taken from my three-month composer-in-residency with the British Antarctic Survey (2003–2004) became a fundamental presence within the sound library, with a five-minute solo for diffused Antarctic storm created for the opening section of the piece. This allowed the ‘voice’ of the continent and its environment a strong presence within the experience of the music.

Another, metaphysical presence within the *wholeness* of this soundscape was the creation of a pre-recorded ‘ghost’ string trio. These raw recordings were then subjected to a series of treatments and simple electroacoustic compositional processes (such as sampling, looping, reverse, layering) in order to augment the materials in such a way as to enhance their dramaturgical func-

tion. These were then rendered into 6.2 specialisations allowing a range of images from distant to close, immense to claustrophobic. This pre-recorded element used all female musicians improvising with generative laptop scores based on hymns sung at the memorial service for Scott. In a poetic sense, the collective ‘voice’ of the wives and mothers of our dead explorers ruptured the reality of the music through time and place, both historic (the music) and present (the performance).

The Antarctic field recordings, the ghost string trio and these Kyma treatments became the materials for a fixed soundscape composition. These in turn were organised to illustrate a progression towards death, and then mixed/diffused live in response to the ongoing music from the human and machine musicians.

2.2 Overview of the algorithms

The autonomous software environments at the centre of each work discussed in this article followed in the tradition of the Feldman (1953) and Brown (1966) pieces mentioned above. They allowed the composer to create a sound-world, consider the inter-relationships between each event and the boundaries of human engagement, but were open to the possibility of any of these events occurring at any given time and within any sequential/polyphonic inter-relationships. However, unlike the free roaming of Feldman, or the kinetic choreography of Brown, the algorithmic processes offered an additional, generative route for the performers. Whilst this bespoke Ariadne-like thread through the materials does offer some form of the here-and-now of indeterminacy, it also permits the performers to roam freely in any direction at any given point away from this thread, discovering new areas of interest and possibilities not even considered by the composer. This mirrors the free-wheeling continuum of thought, and the *heterogenic* philosophy of Deleuze and Guattari’s (1980) rhizome.

Figure 2 charts the flow of logic with the algorithmic processes and the sophisticated network

linking each process. This network facilitated a sharing of information across the local-host processes of each machine–voice–instrument trio, and with those in the other laptops. As such, each laptop process was actively monitored through this network, which acted as a conductor for these virtual performers and organised them, asking if they would like to collaborate at certain times. This meant that there were occasions when a human pair within a trio (voice and instrument) might be sharing the same page on the screen, or two neighbouring laptops were communicating information about materials and coordinating a polyphonic approach. This, say, might lead to four of the six human performers reading the same page of the Elgar score, thus adding cohesion to a potentially free-for-all system. However, a layer of autonomy was included that centred on the zoom logic. This enabled each onscreen score to focus on a different part of the same page, producing both *substantive* and *heterogeneous* rhizomic links.

Further information is available at <https://vimeo.com/55203930> (audio extract from premiere performance) and <https://vimeo.com/86457007> (guided tour video through Max/MSP programming).

3 Wholeness as dimensionality

In order to maximise the potential of improvising musicians working within this human–computer interaction it was essential to develop the conceptual construct of *dimensionality*, within which their music was positioned. *Dimensionality* brought together several existing theories into a metaphysical playground that (a) the improvising musicians would find familiar, and (b) offered an open-ended platform for creative invention between the human musicians and the autonomous laptop performers.

The primary theory informing this concept can be read in the forward to Michel Chion’s (1994) book *Audio-Vision*. Here, Walter Murch discusses how the mental process of ‘[f]using image in a film produces a “dimensionality” that the mind projects back onto the image ... the result is we actually see

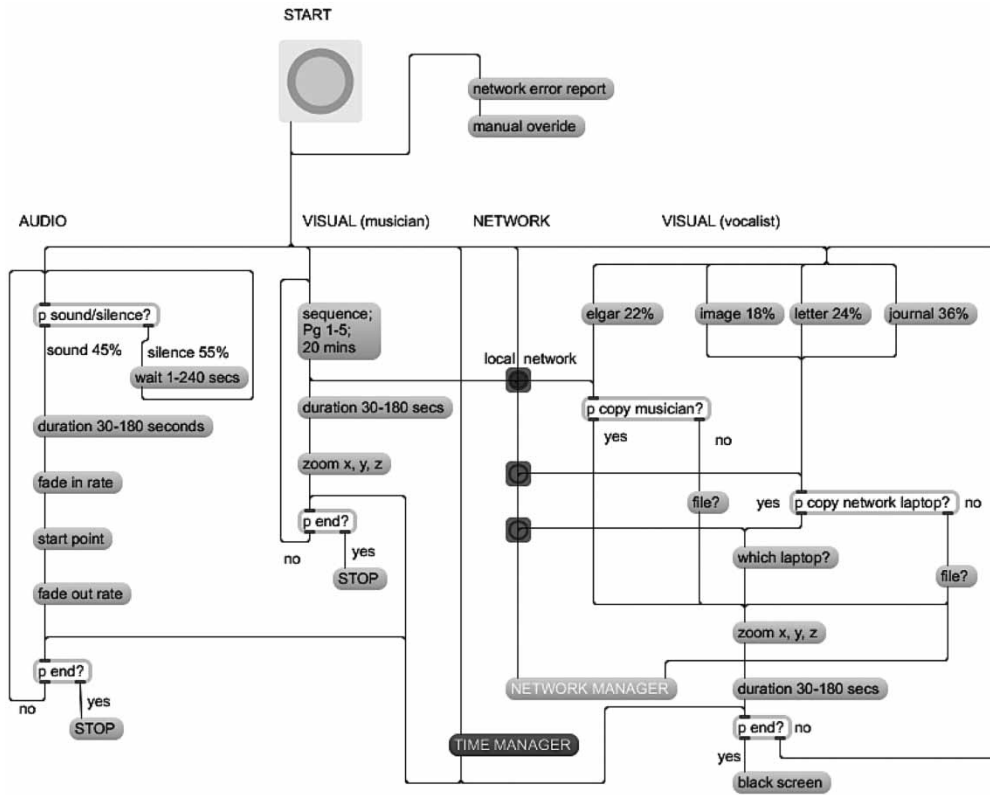


Figure 2. *Three Last Letters* software score: logic flow diagram.

something on the screen that exists only in our mind’ (Murch in Chion 1994, xxii). He develops a notion of perceptual dialogue between seeing and listening as a ‘conceptual resonance’:

The sound makes us see the image differently, and then this new image makes us hear the sound differently, which in turn makes us see something else in the image, which makes us hear different things in the sound, and so on (Murch in Chion 1994, xxii).

Dimensionality is informed further by Simon Emmerson’s article ‘Aural Landscape: Musical Space’ that proposes that sound ‘can evoke a sense of being and place which may be strongly related to our visual sense.’ Emmerson develops this by describing how the ‘auditory system has evolved to seek the reasons for the soundfield it encounters . . . sound has the power

to create its own visual response in humans—a sense of place, of aural landscape’ (Emmerson 1999, 135).

Because of this, it was of paramount importance that the *wholeness* of each composition—each library of found materials, the software programming algorithms and the improvising musicians—contributed to the creation of each aural landscape, a sense of place that each mind could project back onto the sounds they heard. Thus, the focus for the composer, machine and musician was to contribute to an experience that affects each individual so as they *see-hear* something that only existed in their mind. This *see-hear* dimension was considered to be the performance stage: the place where the music was played out, and within. As such, the following strategy for the human–computer–*dimension* interaction was created.

3.1 The HCI-dimensional playground

The paper score offered a practical guide to the type of improvisation required for an open interpretation to these compositions. However, from an HCI perspective the onscreen visual scores and the generative soundscapes offered the musician's visual and sounding stimuli beyond that which can only be expressed in traditional or graphic notation (see Figures 3, 4 and 5 as examples). This challenged the musician to make a solution through their ongoing contribution to the music, and invent a response that acts in the spirit of the piece and is meaningful to them. By that I mean that it could form part of their ongoing interpretation of the narrative, or is interpreted as an opportunity to sever a rhizomic pathway, either abruptly as in a cut edit or cross-dissolve, or to redirect their focus of collaboration onto the aural and ignore the visual materials. It is important to note that the visual and aural scores are not tyrannical, they were not presented as musical dogma, insomuch as they must be obeyed, they are merely incitation's to improvise and make music.

In addition to these practical rules of engagement they were given the following note:

The role of the musician is to work in collaboration with all the elements to create a sense of the place within the letters. The evolving composition will be a negotiation between the ears and the eyes with the intellect and the imagination. The overall effect should be one of the sensorial not the cognitive. There will be a sensitive line between artistic intent and perceived success as such the realisation of this piece should be developed through a series of devised rehearsals.

The devising process centred on an open approach that aimed to develop each musicians' embodiment within the HCI dimension and based on notions of play.

3.2 HCI context and Costello's 'pleasure framework'

Brigid Costello proposed a 'pleasure framework' for understanding human-computer interaction particularly in both computer games and interac-

Figure 3. *Three Last Letters* score screenshot 1.

As this may p
 be my last letter to
 I am sorry it is such
 short scribble. I ha
 written little since
 left the Pole but it

Figure 4. *Three Last Letters* score screenshot 2.

clean run out of
 el after a long
 ry short fuel and
 and headwinds.
 has beaten us though we got

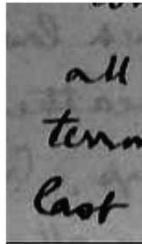


Figure 5. *Three Last Letters* score screenshot 3.

tive art. This framework was developed as a fusion of the ideas of six theorists—Karl Groos, Roger Callois, Mihaly Csikszentmihalyi, Michael Apter, Pierre Gameau and Marc LeBlanc—all of whom approach ‘play and pleasure from different perspectives’ (Costello 2007, 370). Within this framework Costello defines thirteen categories as:

Creation is the pleasure participants get from having the power to create something while interacting with a work. It is also the pleasure participants get from being able to express themselves creatively.

Exploration is the pleasure participants get from exploring a situation. Because interactive artworks present participants with unfamiliar situations, all will involve some degree of exploration.

Discovery is the pleasure participants get from making a discovery or working something out. For example, participants may be unsure about the relationship between their actions and a sound that a work emits and may then feel pleasure when they realize that a specific action can control that sound

Difficulty is the pleasure participants get from having to develop a skill or to exercise skill in order to do something. An activity can often be more fun if it is not too easy.

Competition is the pleasure participants get from trying to achieve a defined goal. This could be a goal that is defined by them or it might be one that is defined by the work. Completing the goal could involve working with or against another human participant, a perceived entity within the work, or the system of the work itself.

Danger is the pleasure of participants feeling scared, in danger, or as if they are taking a risk. Captivation is the pleasure of participants feeling mesmerized or spellbound by something or of feeling like another entity has control over them. For example, the sound or vision of a work might captivate participants for a while, making them unconscious of their other surroundings.

Sensation is the pleasure participants get from the feeling of any physical action the work evokes, e.g. touch, body movements, hearing, vocalising etc.

Sympathy is the pleasure of sharing emotional or physical feelings with something.

Simulation is the pleasure of perceiving a copy or representation of something from real life.

Fantasy is the pleasure of perceiving a fantastical creation of the imagination.

Camaraderie is the pleasure of developing a sense of friendship, fellowship or intimacy with someone. This could be with another human participant or with a perceived entity within the work.

Subversion is the pleasure of breaking rules or of seeing others break them (Costello 2007, 370–371).

3.3 Creative play

From Costello's 'pleasure framework' above, and my personal *in vivo* experience of improvised music practice, I developed a devising process in which the musicians engaged with the computers, their soundworlds and the visual scores, through notions of *creative play*. Throughout this process the musicians were asked to engage with the following values and principles based on selected definitions of the word 'play' (adapted from the Apple dictionary). The aim was to develop a sense of their character within this *dimension* whilst entering into the 'spirit' of the play:

- (1) To engage in the music for enjoyment and recreation rather than a solemn act (see below);
- (2) To participate together; to work in polyphony with another musician (human or computer);
- (3) To represent a character within the dimension; using the voice to expand on the diegetic narrative;
- (4) To perform non-diegetic music to accompany the ongoing narrative;
- (5) To move 'lightly and quickly, so as to appear and disappear; flicker'; interjecting music motifs that work with others for short periods of time;
- (6) To exhaust a musical text or vocal line 'before reeling it in';
- (7) A space in, or through, which a mechanism can or does move; fiddle or tamper with other's motifs';
- (8) A state of 'being active, operative, or effective';
- (9) 'Scope or freedom to act or operate';
- (10) 'Light and constantly changing movement'.

Furthermore, three TED lectures informed the development of this *creative play* engagement and devising process. Presented as part of the Serious Play conference 2008 Paula Scher looked back at a life in design and pinpoints the moment when she started really having fun;³ designer Tim Brown talked about the powerful relationship between creative thinking and play;⁴

Dr Stuart Brown discussed how humour, games, roughhousing, flirtation and fantasy are more than just fun.⁵

One of the overarching concepts that linked these three lectures was that play does not necessarily mean non-serious. Paula Scher talked about her career embodying two definitions for play: serious play (her example: poker) and solemn play (her example: jogging). She defined her experience of serious play as: 'Spontaneously, intuitively, accidentally or incidentally. . . . But mostly, it's achieved through all those kind of crazy parts of human behaviour that don't really make any sense.' With this in mind, the focus for the improvising musicians was 'invention, change or rebellion', not, as Scher suggests, perfection.

Dr Stewart Brown focused on the signal systems that groups employ to gain a sense of safety within play, saying if 'purpose is more important than the act of doing it, it's probably not play'. To facilitate openness to the possibilities when devising within HCI, and considering *dimensionality*, it became important that the musicians found confidence in their play, and not to edit or circumvent risk.

For this to happen—as Tim Brown observes regarding kids at play—they needed to feel secure in their *dimensional* playground, to know the boundaries of the *wholeness* of each composition, to recognise the signals of play (with the live performers and the computer media), to understand the rules of engagement and the agreed values/permissions. 'Play is not anarchy. Play has rules, especially when it's group play.' Through this, the players (these musicians) developed a sense of shared security and enjoyed the devising process. Brown concluded that adults can be serious, professional *and* playful, that it is not an 'either/or, it's an and. You can be serious and play.'

4 Performer's response

The musicians working with these composition commented how they had been inspired and challenged, and how refreshing it is to be working in an improvised situation with machines that are 'alive', as opposed to fixed

media tracks, especially sound-based backing that, in their opinion, soon become predictable and learnt which can lead to predefined or fixed responses.⁶

The visual scores similarly presented a fluid source of inspiration. More crucially, with these two elements working together the musician's felt less responsible for the background mental calculation of overarching form. By that I mean they were freed from the responsibility and mental editing of, say, 'has this been going on too long?' 'should I join in with *x*, or accompany *y*?' and 'I should do something different now', as the autonomous software had embedded within its algorithms an overarching organisation, and the composer's intent of form, albeit open within considered boundaries. This allowed the musicians to concentrate on the here-and-now and to focus on the creative invention in the present moment, to make a meaningful judgement about their relationship to the *dimension* and how that contributes further to the *wholeness* of the experience.

4.1 Audience perspective

The open-work processes within the *wholeness* concept offer the audience a chance to hear repeated performances of the same composition but as dramatically different versions. The first private performance of *Cape Jeremy Affair* was performed twice: once in a small studio theatre of York Theatre Royal and then on its main stage. The audience responses were:⁷

Performance 1

I felt cold isolated and totally alone—it was quite scary.

Watching the two of you isolated there, concentrated, it seemed to be you were embodying something existentially to do with the experience.

I think my strongest sense was one of human predicament in the studio version and that is something that is very compelling.

Two almost lonely isolated beings on stage, both with full intense concentration on their own personal task and yet there's a quite and hidden communication between them.

Performance 2

Sounds of dogs in the wind, for a moment, I felt as if I had been transported to the Antarctica. Reciting the position and coordinates made you them in a way or at least a conduit to them lost someplace, a great distance, but together somehow.

You are lost too in the music, so there is this parallel journey being made and the two forms of concentration sit very comfortably inside a visual language that you see.

You were isolated in a place, because of the movement of the thing there was a sense of travel; a sense of constant difficult struggle.

Sense of landscape, and the dangerous natural environment that you are pitted against.

Although, these two performances were dramatically different—first: loud and brassy; second: quiet and introverted—the perceptions of the audience were the same. This suggests that both times they were taken within the *wholeness* of the idea behind the piece. As the Feldman (1953) and the Brown (1966) pieces presented different walks through the same metaphorical forest, this piece—this compositional approach—presented different paths through its *heterogeneous* rhizome.

By foregrounding the autonomous processes of the laptops, the *wholeness* concept, and the playful interaction between human and machine within the programme notes, the audience were under no illusion that there was/is a single author and a singularity of intent behind these different versions. As Eco discusses, they are alerted to their role within an experience that has been 'rationally organised, oriented, and endowed with specifications for proper development' and requires their engagement to complete the music (Eco 1959, 19). This highlights the open-work process and enables the audience to enjoy the uniqueness of the event as it happens here-and-now.

This effect was also highlighted during the post-performance discussion after the premiere of *Three Last Letters*. Members of the audience expressed their experience as being vivid, phenomenal and touching, offering a variety of

possible interrelationships generated by this human–machine collaboration, but all connected. For example, one woman—an experienced climber—explained (passionately) that she felt that she had been taken to the brink of her death. She explained that several of her life experiences had agglomerated with the meaning of the music and her imaginary journey (her *dimensionality*). This led her to a feeling as if she was being ‘sucked into the void of death’.

It is interesting to note that the musicians congratulated the machines on having had a ‘good gig’.

4.2 Perceptual modes

From the composer’s (and author’s) perspective, the interactivity between human and computer was both social and ontological. By that I mean that I attempted to embed (my) human behaviour into the decision-making processes of the machines, to make them appear to behave as I might, so that human musicians may meaningfully collaborate with them in the making of music; in a sense they were performing with an image of *me*. As such, their presence on stage, their membership in the ensemble, their billing on programme notes and the way the human performers respond to them is carefully considered so as they afford the laptops rightful status as a collaborator.

Witnessing this collaboration during live performance offers new perceptual modes for the audience. The notion of ‘presence’ and ‘liveness’ is an ongoing debate within digital performance studies, and holds that media and mediated performers alongside human or corporeal performers asks us to (re)consider the meaning of ‘real’ and how we (the audience) understand the relationship between the seemingly ‘real’ and the reproduced. This discourse is extensive and exciting, and is in constant development as we continue to understand the relationship between machine and human.

However, of interest within the perception of these compositions is the presence of the *other* within the authorship of their experience; that somehow the computers embody a sense of human aesthetics, choice and taste. In this sense the algorithmic processes and autonomous per-

formances of the laptops suggest a feeling of conscious thought beyond the validation and significance awarded it by the human performers. This presence of the *other* and the way it extends our understanding of the music affects our relationship with the performance as a whole.

In relation to McLuhan’s *The Extensions of Man*, these intermedial relationships ‘amplify, accelerate, supercharge, enlarge, zoom in (or out), redact and bring life into focus’ (Deuze 2012, 24) both the *Wholeness* of the composition, and in the way it alters our own bodily ‘sense ratios or patterns of perception’ (McLuhan 1994, 18). Digging a little deeper, we can understand this process from a phenomenological perspective and the way we either ‘embody a dimension of myself through a machine or in the form of confronting and being involved in a machine’ (Ihde 1994). This deep engagement through our embodiment of the human–machine interaction provides another layer of complexity to the notion of *wholeness*, as each rhizome is now *re-dimensionalised* by the perceptual characteristics of each individual beyond the *see-hear*. It is within this rich mix that thought, imagination, memory and fantasy coalesce with the ‘polyphony of the senses’ and articulates our ‘sense of being in the world’ that, existentially, strengthens our ‘experience of self’ (Pallasmaa 2005, 41). As such, it is the sense of self that is taken to the worlds within each of these compositions, placing *I* at the centre of this experience.

5. Conclusion

The purpose of the autonomous software systems is to open the performers, the composition and the audience to new possibilities. The dialogue between a random list of numbers called upon by the software, the software score and the human performer creates a sense of human–computer collaboration. The computer, through the random process, proposes options that the human may never have considered, and in time the human responds: a dialogue, but not wholly one way. As the musicians began to understand the *play* of time and space, they inhabited it,

getting to grips with the relationship between themselves and the laptop performers. As such, it was increasingly more difficult to discern the disembodied from the live voices, the sounding materials from the live music: they all appeared to be coming from inside a *dimension* set-up by each concept and the performance technology.

Each point in this process had a very clear focus: to take the mind of the listener into an imaginary space bounded by the metaphysical limits of each composition. It was therefore crucial that each stage developed a strategy that (a) achieved this metaphysical aim, and (b) worked in polyphony (meta-polyphony) with the other stages. As such, the libraries of found materials were constructed from a range of carefully considered materials, each of which were *heterogenetically* connected, and formed a substantive *one*. This was fine-tuned through the proceeding development of each composition, so that the boundaries of these libraries created a particular imaginary space and embodied the *wholeness* of what the composition might be.

Secondly, the algorithms controlling the presentation of these library elements were embedded with the composer's aesthetic choices, they operated as if the composer was making choices about, say, on-screen score selection, or the tempo and density of the soundscape and its polyphonic arrangement across several computers, but were free from human choice and imposition of narrative and allowed space for the human musicians to meaningfully engage with the 'spirit of the piece'.

Thirdly, the *wholeness* of the libraries and the software algorithms contributed to a *dimensionality*, an imaginary space that was a catalyst for meaningful and open improvisation. It is worth noting that the casting of these musicians was also a crucial element in the experience.

Finally, the devising process enabled the musicians to inhabit this *dimension* and to openly, freely and playfully invent, create, change or rebel within known limits. All of these, working in harmony allowed the individual listener the opportunity to find their own meaning within each performance—perhaps within each minute—again and again.

5.1 The composer as experienter

From a composer's perspective my overarching experience was one of *fluid* immersion. By that I mean that I subconsciously moved between realms and dimensions within these *other* times and places. For the most part I am unaware of this phenomenon as I am immersed in and enjoying the engagement of experience. However, on those occasion where I 'caught myself' experiencing the experience, I am able to analyse my sense of being using the following phenomenology: through the process of *poetic* thinking my mind produced thought-images which can be said to be a re-presentation of somewhere else *and* the creation of something else.

This *fluidity*, presented to me by my thinking mind, contained images of the present, memory of the past, imagination of the future and the past, and of dream (Pallasmaa 2005). However, of interest is the significance that this flux of thought-image coalesced, merged and united into new concepts and further *poetics* of thought. For example, with reference to *Three Last Letters*, one minute I found that I was present in the concert hall, but I was experiencing the harshness of an Antarctic storm; I then found that I am empathising with a letter written 'to my dearest widow' whilst present in a tent. These were all 'real' experiences—from the perspective of phenomenology—and all individual to me; and all gathered into a singular experience united by *me* and placing the *self* at the centre of this experience (Ihde 2007). In this sense, I was (re)visiting these times and places, and even though I may have been to these locations mentioned in these compositions, it does not stop others bringing forth imaginings and phenomenological experiences of equal vividness.

Notes

- ¹ Permission was granted by Oxford University Press and the Vaughn Williams Trust.
- ² With kind permission of the Scott Polar Research Institute and the families of Scott and Wilson.
- ³ http://www.ted.com/index.php/talks/paula_scher_gets_serious.html (accessed 14 May 2013).
- ⁴ http://www.ted.com/talks/lang/eng/tim_brown_on_creativity_and_play.html (accessed 12 May 2013).

- ⁵ http://www.ted.com/talks/stuart_brown_says_play_is_more_than_fun_it_s_vital.html (accessed 14 May 2013).
- ⁶ Composer's notes and project blogs: <http://theunchangingseaopera.blogspot.co.uk/> and <http://capejeremyaffair.blogspot.co.uk/>.
- ⁷ Project blog: <http://capejeremyaffair.blogspot.co.uk/>.

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