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Mapping the dynamic life of lines in a multimodal
compositional practice

Daniel Portelli

A thesis submitted to the University of Huddersfield in partial fulfilment of the
requirements of the degree of Doctor of Philosophy

September 2016

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Abstract

This thesis tracks my journey through eight creative works which employ a broad range of methodologies to map the dynamic life of lines and that focus on concepts of ephemerality, gestural tracing, grains and swarms of sound, and temporal independence. My original contribution to knowledge in composition is led by my personal relationship to sound as mediated through physical gesture in performance. Drawing upon the work of anthropologist Tim Ingold, I have worked with video as a medium for my own sketch processes and as a scoring platform. Video is used to capture and document qualities of motion that bring choreographic and multimodal thinking into my music, propagating divergent approaches to structuring and determining parameters. Through this I have developed ways of thinking compositionally through the visual medium and worked with micro and macro qualities in timbre and movement to achieve effects that I term 'dynamic stasis'. Central to my thinking is an expanded concept of the line as gestalts of sound, video, bodily and mechanical movement, with form arising from a meshwork of such lines. The line as represented in video and musical action contributes to the tendencies and behaviours of precisely notated sound and physical movements in my music, that are reflected in irregular divisions of time and frequent fluctuations of sound characteristics. My discussion of the visual and choreographic perspectives of my notation and multimodal ways of thinking about composition is contextualised with examples from composers such as Jennifer Walshe, Simon Steen-Andersen and Stefan Prins, and the video scoring systems of Cat Hope.

Keywords: map-making, ephemeral, trace, gesture, multimodal, video sketch process, dynamic stasis, grains and swarms.

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Portfolio List

The portfolio consists of seven original compositions (some with multimedia components) and one interactive video installation.

1. **Undulations** (2014)

for two soprano saxophones - 6'09"

Premiere: 3 November 2014, Tokyo University Players, Asian Music Festival, ACL Young Composer's Competition, Minato Mirai Hall, Yokohama, Japan.

2. **Mapping Australia** (2014)

for piano, electronics with video score - 7' [and video]

Premiere: 30 August 2014, Tamara Anna Cislowska (piano)

Playing with Fire Event, Performance Space, Western Sydney University, Australia.

Second Performance: 4 November 2014, Gabriella Smart (piano)

Soundstream's Emerging Composers Forum, Elder Conservatorium of Music, University of Adelaide, Australia.

3. **Memory Tape** (2015)

for 'cello, trombone, and recorded media - 11'

Premiere: 5 February 2015, Stephen Menotti (trombone), Ellen Fallowfield ('cello) St Pauls Hall at Huddersfield, UK.

4. **Copy-Make** (2015)

Interactive video installation, documentation video – 6'16"

Premiere: 13-25 February 2015, Composition Beyond Music, Impuls Music Academy, Graz, Austria.

5. **Animal** (2015)

for violin, 'cello, percussion, keyboard, and choir with video score - 10' [and video]

Premiere: 16 April 2015, Warwick Stengårds (conductor), Elizabeth Layton (violin), Simon Cobcroft ('cello), Gabriella Smart (piano), Andrew Penrose (percussion), and the Adelaide Philharmonic Choir

Anne & Gordon Samstag Museum, University of South Australia, Australia.

6. **Hyperbodies** (2015)

for computer controlled piano - 10'29"

Premiere: 25 October 2015

Phipps Hall at the University of Huddersfield, UK.

7. **Lines of Fragmentation** (2015)

for trumpet, trombone, and two percussionists - 6'03"

Premiere: 17 February 2016, ESMUC Ensemble

L'Auditori in Barcelona, Spain.

8. **A Sense of Space** (2015/16)

for flute, guitar, and soprano with percussion - 10'

Premiere: 5 March 2016, Alba Bru Carci (flute), Diego Castro Magaš (guitar), Peyee Chen (soprano/percussion)

St. Paul's Hall, University of Huddersfield, UK.

Total duration of the seven compositions and the installation documentation is 66'57"

See appendix on page 91 for the full list of digital media files supplied for each work.

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Introduction

Articulating dynamic forms of stasis has been the focus of my creative works both in this portfolio and previous works, allied to an exploration of the textures and qualities of materials. I am concerned in particular with forms in flux, and how this can manifest in the structural properties and qualities of sound of my compositions. My contribution to knowledge in this PhD thesis centers on the use of video as a tool that has allowed me to work directly with capturing these dynamic qualities, and through this develop relationships between musical thinking and visual, spatial and temporal phenomena. My Master's portfolio (2010-2012) was a preliminary study on flux-forms: water and light, explored in three audio-visual works: *water. wave. form.* (2010), *Antibiosis* (2011), and *The Ghost Cave* (2012). The Master's thesis outlined a particular correlative thinking style with these forms and applied them directly to attributes in the music. This was done by repurposing Michel Chion's temporal concepts of film: sync points, temporal vectors (directions in time), sonic scansion (punctuations in time) and synchresis (the added value of two entities) (Chion, 2009), along with observations of natural phenomena from a Chinese Daoist perspective, for instance, 'a waterfall can imply a sense of stasis, through the idea that it remains relatively constant from the time it is observed, with its changing undulating form' (Portelli, 2012). Parts of my current music can be described in a similar way as there are simultaneous qualities of stasis and variability of movement, or a dynamic stasis. Balance, a fundamental concept of Daoism, continues to interest me when represented as a non-hierarchical timbral organisation where each sound character or instrument contributes in a fairly even way throughout a piece.

A key turning point in my search for a more nuanced language with which to articulate my practice was when I attended a workshop and lecture by the anthropologist Prof. Tim Ingold

at Leeds University in March 2014. Of particular interest to me is Ingold's anthropology of lines and line-making and during the conference, I noticed how his use of the word 'line' seemed similar to my use of 'water' as both could take on any shape, and have an omnipresence: something that can apply to many things. The difference is that water is an external physical material that I used to build a set of conceptual ideas that I applied to my musical ideas, and a line is something which can exist both concretely and be manipulated as symbolic representation in the score. Thus line as concept exists in a concrete way in the score, rather than the concept and object being separate. I later realised that my previous engagement with water, and now with lines, grains, and swarms, is what Ingold would call a "relationship of correspondence" (Ingold, 2014, 7'20"). I can apply this dialogic understanding to my compositional process meaning that there is an ongoing process of inquiry and learning carried out through handling materials in a collaborative relationship with a musical instrument, a performer, and through the varied visual and haptic-gestural elements that are part of the score writing process. The process of creating a work for me is about being receptive to unstable instrumental qualities, then responding to this in the course of writing a piece. This is a process of 'thinking through making' (Ingold, 2013, p. 6), where I map a discovered journey through the flux of materials. This allows me to move beyond my previous assumptions and compositional habits and follow where my curiosities take me—creating a meshwork of interest. I am inspired by Ingold's articulation of creativity as the practice-based acquisition of skills or as a 'knowing through doing'. My video-process works, scores, installation pieces, robotic piano work, and ensemble pieces, are a reflection of this praxis based knowledge that prioritises ways of knowing from the inside. I allow the works to become part of who I am, learn with them, and form a connection with the materials that inform the works themselves (Ingold, 2007, pp. 1-2). In the workshop Ingold highlighted my suggested use of temporal-vectors as a shared language between time-based artforms of dance, film and music. This refers to the spatiality and trajectories of time-based

events, such as: a dancer moving from the left to right of stage, or pitch moving from low to high. These artforms share vectorial qualities of time with direction and this can be articulated further through terms such as: stasis and dynamic movement; fragmentation and recursion; materials that have a velocity and can move as swarming densities. I found Ingold's explanations and examples of line gestures (lines made through physical movement), useful as a concrete way of thinking across artforms. He explains this through the act of drawing which is movement that:

...leaves a lasting trace [...] and the duration, the rhythm, the varying tempo, the pauses and attenuations, the pitch and amplitude, are both inspired by, and carry forth, our affective lives. And most importantly, what they describe is ongoing movement rather than a connection between one point and another... (Ingold, 2013, p. 140).

Performance, music notation, audio and video recordings are ways in which music leaves a lasting trace of this kind of 'ongoing movement'. They provide the tools to create and study the ephemerality of sound and gesture. This perspective of music chimes with the work on music and gesture by Gritten, King and Welch (2016), whose viewpoint is "that musical gestures are cross-modal and that gestures include non-sounding physical movements as well as those that produce sound." (Gritten et al., 2016, p. 6). They elaborate on this further by stating:

Musical action is also physical action. This is obvious in cases such as moving the arm to direct a bow across a 'cello string, turning the hand to control the vibrations of a drumhead or inclining the cartilages of the larynx to raise the pitch of a sung note. In addition to producing sound,

however, physical motion can also serve as a means of conceiving and conveying music: motion is linked in turn to visual imagery and other aspects of the conceptualization of music. Auditory, motor, visual and conceptual counterparts may be integrated, generating a unified meaningful action. (Gritten et al., 2016, p. 203).

Comparisons can be made in my works between the mechanics of how the sound is produced, characteristics of the sounds, the trace of gestural information in my scores, and simultaneous movements between any video components and live physical actions. Sound characteristics or qualities in my works are composed by moving between points of difference: smooth-rough, purity-distortion, high and low density, high and low registers, loud and soft, and slow and fast speeds. From these polarities, I devise a musical grammar that moves between these differences, which may be expressed through single instrumental timbral changes or through overall global changes at a formal level.

In searching for correlations across diverse sonic, kinetic, visual, and conceptual materials, I have developed approaches to notation and performance that rely on translations across a variety of sensory modalities. *Animal* utilises multiple cross-modal notational approaches by combining sections of precise staff notation with sections that just involve text instruction, and a customised video scoring system for choir with three different video scoring methods (video prompts for producing foley, scrolling text, and graphic indications). In *Hyperbodies* every key on the piano has been assigned its own tempo. Every key was seen as having a unique sound quality and identity, rather than categorising notes at octave displacement as having an equivalent identity. This piece also extends beyond the capabilities of a human performer, demanding a performance of fast large-scale densities of chromatic notes that

gradually modulate through complex constellations of notes in irregular rhythms across different temporal layers.

Ingold's writing opens up my creative thinking and approach to my compositional practice, especially in relation to the correlative concepts explored in his writing. His work draws connections between cultures and shows how aspects of life such as walking, weaving, observing, storytelling, music notation, drawing, and calligraphy are an interwoven fabric of lines. It inspires me to see everyday aspects of my life, such as walking, as a creative act. This creativity is released through thoughtfully engaging my senses with my environment, and allowing myself to notice the finer details of the moment. A walk is also a process of discovery, a way to understand a place as it currently is, building a new cartography, or new stories from sensorial experiences around a place, thus forming a fresh outlook and ways of thinking. The Ingold workshop discussed gestures of the world, the rhythmic modalities of human life, the motions of clouds and animals, their transformations through time, and transducers of one motion to another (a cellist's hand moving becomes sound and a writer's hand moving converts into marks on paper). These insights inspired me to gaze at the lines and gestures in the world, and to experiment with ways of using the video camera and microphone to capture, amplify, and actively participate in these observed experiences. This type of amplification became part of *Mapping Australia* in a myriad of ways. One method involved placing a microphone on the performer's hand to capture soft micro sounds as it moves over the instruments. Video movements are turned into performed physical movements that are captured by a live stream with the physical movement then turned into sound.

Immediately after experiencing Ingold's workshop, I was inspired to create a video that reflected this way of seeing the world. I also wanted to capture something that represents a

cross-modal experience that could be transferred to my compositional practice. I started by walking through the streets of Huddersfield using a video camera to follow lines on the road at the side of the gutter. In the camera viewfinder, I looked for lines on the ground where the tarmac meets the concrete gutter, white road lines (broken or unbroken) the edge of footpaths and whatever else entered my path. If the line stopped, I would just move the camera to another line in close proximity and continue to follow that.¹ What I discovered from this exercise is that the ‘line’, as perceived visually, is a flexible notion. The line is still able to continue even if its shape, colour and form changes. The ways in which lines track and cross other lines to create interweaving dynamic relationships, which Paul Klee described as a ‘taking a line for a walk’ and making a ‘complementary line’ (Klee, 1972, p. 16) came alive to me in a new way. This experience of exploring the movement of lines and surfaces found along the gutters and tarmac roads of the Huddersfield urban landscape was transferred into my work *Memory Tape* in which the two instrumental lines of ‘cello and trombone weave in and out of each other’s presence. The use of video thus became the primary ‘corresponding’ tool for the development of my multimodal compositional practice. It was used as a means to sketch ideas (as described above) and as a mediating element for building vocabularies between sonic and physical gestures that are elaborated in diverse ways in my portfolio. My original contribution in this PhD lies in the ways in which I have developed personalised approaches to using the video medium to articulate my musical ideas, as an embodied practice with an experiential process of becoming in the creation of a work. This approach finds its way into how the performer’s movement in *Mapping Australia* looks like someone in the process of constructing, making or mapping, in this case a complex sonic gestural landscape, and how the object of a reel-to-reel tape machine in *Memory Tape* symbolically represents both the ephemerality of memory and a sound world

¹ See accompanying footage called: “Line-Walking Southgate 6 March 2014” taken on the 6 March 2014 along the road of A62 Southgate in Huddersfield, West Yorkshire, HD1 6HQ, UK.

of soft flexible textures, which is then transposed into the soft undulating sonorities of a 'cello and trombone. Again, correlative thinking is present in the way concepts of memory as ephemeral time are realised in both metaphorical and concrete ways.

I can situate my work within a broader historical context traced through compositions such as John Cage's *Water Walk* (1959) through to the absurdist instrumental theatre pieces of composer Mauricio Kagel, such as *Atem* (1969) for 1 wind player and *Dressur* (1977) for 3 percussionists. In *Atem*, the theatrical instructions require a performer to take the role of a retired musician who "has been going through the same routine for years, namely keeping his instrument in top condition by painstakingly cleaning it" (Kagel, 1969/70). *Dressur* and *Atem* both contain instrumental-based actions alongside theatrical action, and music performance within a theatrical context (Mason, 2014, p. 38). In *Atem* this occurs with the instruction to mute the bell "inside a player's buttoned jacket, or into his trousers" (Kagel, 1969/70). In *Dressur*, one example of this happens towards the end of the piece, where player 3 is instructed to wear a pair of "wooden shoes, one on the hands to be clapped together, and one on the feet." (Mason, 2014, p. 40). It is clear that Kagel's compositional goal is towards a multimodal experience, challenging conventions by asking performers to step outside of the frame of standard performance practice. Kagel highlights this point by claiming to create a: "re-humanization of music-making" (Heile, 2006, p. 38), and further defines his intentions by stating: "What I want is to bring the audience back to an enjoyment of music with all senses." (Heile, 2006, p. 38). In similar fashion, a theatrical context is set up in my piece *Memory Tape* when the performer is asked to: "Establish a purposeful presence, wait for the audience's attention, walk over and turn on the tape machine, wait 10 seconds then play." This implies the tape machine prop has something to do with what the performers are playing, and focuses the audience's attention to the tape machine sounds coming out of the speakers spread out across the space. Musical action and theatrical action

are present in the instruction to “blow across the end of the straight mute like a glass bottle” (bar 82), as well as the vocalisation through the trombone and outside of it. Theatrical gesture and sonic results are brought together in moments such as where the trombone is dipped into a bucket of the water like a watergong (bars 85-90) transforming the performative identity of the instrument beyond its usual frame of reference.

Kagel also produced a video score out of his film *Lugwig van* (1970), which consists of staged footage inside Beethoven’s music studio, and the performers play musical fragments in the sequence as they appear on screen. Some score fragments are missing clefs, key signatures, and tempo, with different degrees of clarity from the camera’s lens, and some fragments are upside down (Stavlas, 2012, p. 90). The piece functions differently to the video score in *Mapping Australia*, which is more about the transference of a line of movement on screen to a location on the piano’s surface. However, both pieces have similar ideas of flipping, inverting and stretching musical fragments through visual representation. They also both contain elements of quotations: my piece does this with original music from the documentary, and Kagel does this with Beethoven’s scores, but to different ends. Kagel’s quotation brings up issues of the perception and reception of Beethoven as a historical figure, his commercialisation, and the misuse of his persona for political and nationalistic means (Stavlas, 2012, p. 13). The video score is indeterminate, using parts of musical staff notation, and placing responsibility on the performer to interpret what they are seeing. Whereas the quotation as applied to my work is to use video material (not staff notation) in a musical situation that is more deterministic, to satire about the greed of mining companies in conjunction with 1960s Australian (non-Indigenous) cartography practices. The quotation as applied to my work can only be understood if there was prior information about the documentary, but the meaning that can be derived from these processes is a distillation with moments of unresolved tones with resonance (that is in contrast with the

driving lyrical propulsion as heard in the original music). In Kagel's score there is a displacement, meaning that the music is placed in a different musical context with changes to the original notation, with characteristics like the rhythmic proportions and pitch intervals still remaining.

In Kagel's *Synchronstudie* (1969) singers and foley artists provide a live sound track to a film shown on screen (Heile, 2006, p. 56). This is similar to the use of foley in *Animal*, when the performers are asked to vocalise the sound they think a video would be making with the sound turned off. Kagel's work aims to integrate media, theatre, and instrumental performance, and by doing so, emphasises the importance of the corporal whether through making sound, performing actions, interpreting media, or acting. There is often a power dynamic in Kagel's music such as in *Match* (1964) where there is a competition between two 'cellists adjudicated by a percussionist, and *Finale* (1989) where the conductor collapses and 'dies' at the end of the piece. The work challenges the performers involved, and the audience, to shift their perception of the relation between—requiring a flexibility of thinking. It connects abstract sound with a relatable visual or theatrical idea, and necessitates a receptiveness and in-depth engagement with multi-sensory information.

There is a diverse body of discourse within 20th Century visual arts practice regarding the 'line' that can be related to my musical thinking. In, *On Line: Drawing through the Twentieth Century*, Butler & Zegher (2010) outline the historical differences between artists in relation to their line making practices. The discipline of drawing in a historical context is a useful starting point which is broadly defined as: "the formation of a line by moving some tracing tool from point to point on a surface." (Butler & Zegher, 2010, p. 23). Furthermore:

Seen as an open-ended activity, drawing is characterised by a line that is always unfolding, always becoming. And in the drawing's stages of becoming—mark becoming line, line becoming contour, contour becoming image—the first mark not only structures the blank page as an open field but also defines it temporally, as the drawing's marks follow one another in time. (Butler & Zegher, 2010, p. 23).

This element of drawing as temporal contouring is also present in my work in the way I, work with translations between a musician's movements in space and my sonic architecture. Line-making forms the key concept of how I elaborate my use of video as an unfolding process of discovery in space and time. The two realms of body gesture and video are intertwined, with the video being a way to represent what a continuous line of bodily movement might look like. Staff notated lines connect with this as well, such as when one gestural attribute transitions from one state or location to another (for example a bowing transition from ord. to s.p.). The outcome of this interplay between gestures and their visual representation is the creation of a series of abstract and non-figurative marks that I compare with the works of visual artist Vasily Kandinsky, notably: *Watercolor No. 14* (1913) and *Untitled* (1915).

Figure 1: Kandinsky's *Watercolor No. 14* (1913)



(MoMA, 1995)

In these works, lines and planes are the focus, and what stands out to me is the shape and contour of these lines, their intersections and overlapping elements, the blurry distinction between a line and a plane, the roughness, clarity, jagged and smoothness of the lines, the polyphony of multiple lines and their directions, the thickness, the darkness, the lightness, and their colour. This opens up questions such as: when does a line become a plane? when is a plane a line? what are the spaces between the lines? and are the shades of colour a plane or a line? The spatial layout is also an even balance of colour and density, and no single area seems to have greater importance than another. This is also a defining characteristic of my music where I aim to create fields in which no featured sections or themes stand out.

Kandinsky's work also deals with the line becoming movements of the body and the body becoming lines on paper (Butler & Zegher, 2010, p. 148), illustrated in the works: *Ligne courbe librement ondulée (Curved line undulating freely)* (1925) & *Ligne (Line)* (1925). While the focus of my music and its analysis deals with the body, it is more about reducing lines of movement down to abstract lines. These lines become a representation of my music, which I feel resembles the visual approach of Kandinsky.

Klee (closely associated with Kandinsky) was also deeply concerned with the process by which a point becomes a line, a line becomes a plane, and a plane becomes a body. (Butler & Zegher, 2010, p. 38). This was a trend explored in the early part of the 20th century, through the creative exchange between drawing and dance, which:

seems generally to have taken two forms: either an attempt to mimic the body's movement, creating a mark as a record of the observed, or a kind of mark-making that sought to move beyond the page to a space of suspension and animation. (Butler & Zegher, 2010, p. 148).

This resonates with the discourse of modern dance in the 20th century through the practice of quite diverse choreographers such as Merce Cunningham and William Forsythe:

In dance the whole body, in modern dance every finger, draws lines with a very precise expression. The "modern" dancer moves across the stage in exact lines, which he incorporates as an essential element into the composition of his dance. Apart from which, the dancer's entire body, right down to the fingertips, is at every moment a continuous linear composition. (Butler & Zegher, 2010, p. 154)

Forsythe have even stated that his devised analytical approach to choreography involves moving “from a point to a line to a plane to a volume” and “was able to visualize a geometric space composed of points that were vastly interconnected.” (OpenEndedGroup, 1999).

The interest in working with the ‘line’ is also present in the practice of composers such as Christian Wolff’s whose piece *Lines* (1972) explores a concept of line on a social level of passing musical elements between players. Wolff:

defines lines to be passed between the members of a string quartet, but leaves the duration open. "Thus," he writes, the "viola lets her sound go when she wishes, at which point the violin must pick it up immediately, holds it as desired, lets it go for the cello to pick up, and so forth." It is equivalent in some ways to a ball that is in one player's possession and must be passed to the next. Both the throw and the catch have to be executed carefully if the sound is not to fall (or fall silent). (Gottschalk, 2016, pp.204-205).

By contrast Pierre Boulez uses the term heterophony to describe the function of lines in his music. Boulez defines heterophony as the “superposition on a primary structure of a modified aspect of the same structure...” (Goldman, 2011, p. 104). Similarly to Paul Klee’s concept of a complementary line, Boulez’s pitch and texture has an original line of movement and trajectory that has a surrounding swarm of lines that move, and weave alongside it. Boulez describes it as: “a man walking his dog while his dog walks circles around him: the two resulting trajectories are interwoven in the manner of heterophonic lines.” (Goldman, 2011, p. 104).

A more poetic understanding of a line in music is seen through the perspective of composer Jon Rose, who travels Australia bowing fence wire. Fence wire is like a line drawn over a landscape, and by bowing it in a performance, the line not only becomes an audible tool of rich harmonics, but also a political act about what these fences represent, as something that divides things, or, as stated by Rose:

Fences mark the boundaries of cultures and political systems... Why on earth are they there? Who put them there? How long did it take?... the so-called dingo fence of Australia, will eventually succumb to nature despite the efforts of those who painstakingly and regularly repair it. The geography will survive the history.” (Rose, 2016).

Rose’s fence line is a sonic exploration of the land, a type of aural and physical mapping, and a way of navigating through the landscape. This brings into focus the line as a physical act of walking and mapping the world, as discussed in the book by O’Rourke (2013) *Walking and Mapping: Artists as Cartographers*. In contrast to Kandinsky’s lines drawn on paper, the line can also move off the page and involve physically moving and traversing terrain—termed ‘psychogeography’.

Many dance- and line-based works of art since the 1980s involve a notion of line as political—a deployment of line in the space of the political and social. Through the mapping of both abstract and everyday lines, stories are told and social space is narrated and inscribed. (Butler & Zegher, 2010, p. 182).

My walking piece, starts with a set of instructions about how to navigate a terrain, and then is implemented onto a location with further details worked out later during its execution. Artist Richard Long has a similar process, stating that all of his projects begin with an idea, such as his first piece of walking art, *A Line Made by Walking* (1967). Captured in a photo, Long walked up and down on a field of grass leaving an imprint on the ground making a visible line. (O'Rourke, 2013, p. 59).

Composer La Monte Young proposes another method, specifying to “Draw a straight line and follow it” in *Composition No. 10* (1960):

The line here is both map and path. The directive, he says, although impossible to carry out literally (it provides no end), has guided his life and work ever since. In another performance, he spent a whole evening drawing a line. What interested him in this process is that a line is “one of the more sparse, singular expressions of oneness.” The line held particular interest “because it was continuous—it existed in time. A line is a potential of existing time. In graphs and scores one designates time as one dimension, Nonetheless, the actual drawing of the line did involve a singular event. (O'Rourke, 2013p. 49).

The line as continuous movement and a flexible conception of a line is what interests me in my music. This is manifested in how the video I made by following elements of the ground creates a line that is continuous in its overall gesture but changes texture, colour, density, shape, contour, speed, and direction. One thing appears to follow another, but there is an overall connected fabric of related material, some repeated, some played back at different rates of speed.

My video score process is about producing actions without a precise awareness of what sounds will result, whereas my staff notation is about consciously and precisely writing out the characteristics of sounds that relate to the behaviours of the sounds produced as a result of the video score. The parameters I work with include the irregularity of rhythmic proportions, dynamic fluctuations, sudden glissando movements, and grains and swarms of sound texture. The video score can push me beyond what I can consciously notate which then feeds into the scored notation. The clearly defined staff notation is also taken a step further through the composer/performer relationship where I can discover new perspectives on the notation, and uncover new possibilities for the instrument I have written for. Through this process, the video and staff notation practices then become a symbiotic process of learning.

Chapter 1: Map-making

Mapping Australia

1.1 Choreographing lines and traces in the music

Mapping Australia (2014) is a multimedia work for piano, electronics, and video score, where the performer engages with Australian film footage of cartography practices of the 1960s as the basis for musical material. Found footage of geologists gesturing at map surfaces, showing the tracing of lines on surfaces are mapped onto a pianist's physical gestures with instructions to perform in designated zones within the piano. The piano, along with the performance materials, are therefore conceptually mediated into this analogy of mapping the landscape. This project offers a reflection on a performative relationship between the reductive abstraction of geographical map-making and the lived-experience of being and inhabiting the world, defined as gestural traces. Trace, as lines of movement in the world, can vary in their degrees of impact: either additive, reductive or as ruptures to the surface itself (Ingold, 2007, pp. 43-44) and in my work, I explore cartography's potential for instrument mapping and interpretive decision making processes. The use of documentary footage as musical score material allows for meta-meaning to be attached to the actions performed. My interest is in the physical (non-musical) gestures as a process for score making and as part of performance in order to allow for a transmission of conceptual and kinaesthetic instruction through video mediation.

The archival footage used in this piece was made in 1966 by the Australian Commonwealth Film Unit Production for the Department of National Development (Internet Archive, 1966). The video shows methods used by cartographers in Australia at the time and advertises Australia for foreign mining interests. I used fragments from the video as score material, such as a scene where a man moves his pencil around on a map, a rock-pick hitting hard

rock in the search for minerals in the earth, and terrain lines being drawn on plastic surfaces. The Indigenous Australian perspective on land and culture is not represented nor is there any acknowledgement of Aboriginal land rights. The film seems to accept the idea of *terra nullius*, land belonging to nobody, therefore open to be harvested for resources, so this politically motivated me put the work together. My political response to the archival footage became the framework for the piece, which led me to make decisions on how to represent the video, the map, and the piano. This led me to rethink how the piano can be mapped, not just by its notes, register or strings, but through other methods such as using visual or tactile prompts in the scoring to suggest sonic textures, dynamic contouring and spatial effects within the piano. By rethinking how the piano is represented I was able to open it up to new ways in which it can be used, notated, listened to, and perceived.

There is a tradition of geographical research (e.g. Gould and White 1974) which sets out from the premise that we are all cartographers in our daily lives, and that we use our bodies as the surveyor uses his instruments, to register a sensory input from multiple points of observation, which is then processed by our intelligence into an image which we carry around with us, like a map in our heads, wherever we go. (Ingold, 1993 p. 124)

The video material was useful for the purposes of copying visual lines as the archival footage contains clear close-up scenes of people working with maps and tracing lines, with close-ups of moving lines and pencils shown moving across the terrains of maps. A performer can imitate this by tracing their movements on to the surface of the instrument. My earlier experiments of tracing lines on the ground using my camera viewfinder, showed me that a line could be identified in a video and be used by a performer with instructions. When I explored these ideas in the piano work, the line walking video exercise gave me the

perspective of seeing the piano as something I could draw lines on. And the archival video added a conceptual reason to draw lines in a particular way.

I experimented with making a number of test videos as part of a compositional sketch process.² In these process-videos I explored the regions of the piano by experimenting with different types of materials, and lines of movement. These ideas were documented as videos so I could refer back to them during the later stages of the compositional process. I was doing this before I found the archival footage. I compiled these videos on a website and it became part of the poetic impetus for my musical ideas. These recordings were part of my sketch process whereby I could explore permutations and combination of materials. The movement and striking patterns I explored and catalogued included: sharp attacks with a long resonance, short fast continuous attacks, swiping across the surface, and drawing a circle on the surface. I wrote in my process diary at this time: “the inside of the piano is a terrain. The strings are a body awoken through a drama of surface tensions and colouring through materials”. When I discovered the archival film footage, my ideas fell into place as I discovered that the lines being drawn in the video could be transferred into lines drawn on the piano just as I was doing in my video sketches. More importantly there was now meaning behind the movements and reasons to construct the work in a particular way.

The process for developing the piano instructions and use of tools is a response to cartographic engraving practices in the 1960s, where light is used to create precise terrain lines. The cartographic process transforms the materials of the landscape into lines of light. And my performance transforms light emanating from the video screen into physical movement by the performer.

² Link to my video sketch process: <http://danielportelli.com.au/videosketchprocess>

The plastic sheets are taken one at a time and placed on a light table, where a soft light shines up through a white plastic surface. This illumination from below makes the lines of the map manuscript visible through the scribecoat. An engraver carefully cuts away the scribecoat along the lines and areas that are to be a certain colour on the finished map. For example, one sheet will have all the lines for rivers, lakes, and other bodies of water that are to be blue. (Cavette, 2016).

I am interested in the reductionism that occurs as a result of the mapping line, and the philosophical inquiries that can be drawn from that; such as turning a river into a functional representation, for example as a blue line, versus experiencing and sensing a river for qualities such as the sense of tranquility that occurs in being amongst the constant presence of a flowing stream, listening, sensing and contemplating its fluidity, its mirroring surface, its texture, its motion, its life-giving properties, its cultural or sacred significance, or religious symbolism. So in this piano performance, the map, the score and the video are all representations of something else and mediators of reality. There is also a distancing going on where there is no clear or immediate way of understanding all the elements in the piece. In other words, it is allusive. The non-grid like structure of the piece gives a sense of flowing sounds, which I sought to represent by using unstable metric divisions. The aim was to create a multi-sensory experience based on elements derived from the archival video.

1.2 Performance apparatus and sound qualities

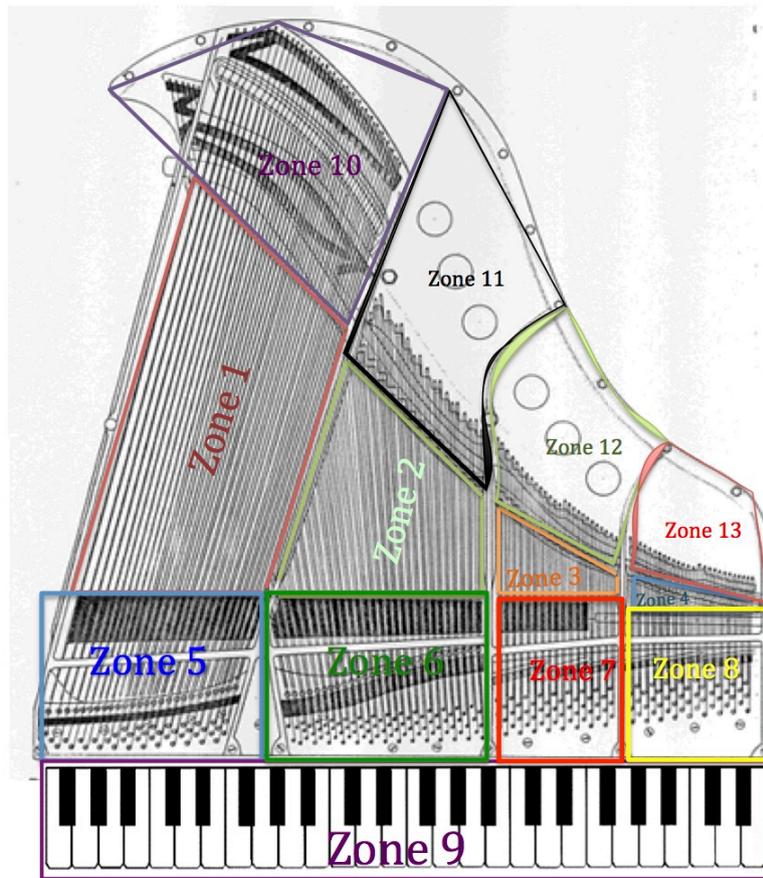
The translation of the engraving process from the archival film is made by tracing movements inside the piano with various tools such as an electric fan, shredded bamboo, and rubber and wooden mallets. I came across a bamboo wok cleaner at a Chinese supermarket in Haymarket, Sydney. The bamboo is shredded and makes a crispy, crackling,

grinding sound which I could relate to a scene in the performance video where a tree is constantly falling and rising back up again. Here the performer acts like a foley artist with the crackling of the bamboo evoking the crackling bark from the tree. This happens in real-time but the sound the performer makes does not sync up with the movement of the tree, it merely emulates the tree's surface texture. The performer twists and turns the bamboo on top of a piece of paper, which lies across the low strings, rattling against the strings when struck. The result is a rich timbral world with a dynamic percussive quality as it jolts, stutters and rolls around the sections of the piano. An electric fan with soft nylon string attached to each blade creates a soft sustaining resonance. The fan slowly glides over the piano strings, and is also used to sound the section around the tuning pegs making high tinny sounds. A wooden mallet scrapes and grinds over the strings, the metal plate and wooden case of the piano. Its rough surface creates varying sounds depending on the angle with which it is held and the location where it is played. The sharp attack on the stress bars causes the metal plate to vibrate suddenly producing an after glow of overtones from the strings.

1.3 Topography: Piano zones

The piano is broken up into 13 different zones, echoing the way in which the map-making procedures in the film divide terrain into areas based on physical characteristics, which are also connected to the potential for the land's economic exploitation. Here are the divisions:

Figure 2: A topographical view of the piano showing the layout of the zones



The identification system of the ‘zone’ is plain and systematic, and does not indicate pitches as well as being indifferent to the sound qualities of the area it is labeling. The video score instructs the performer which zone to perform in without precise notated information about what sound to make. In my concept, the performer is confronted and tempted to embody the hands of corporate greed, where land resources are replaced with the pleasures of tactile sensations and a luxurious sonic palette. The performer unknowingly moves to a zone and performs the action they see on screen. The score transcribes an ecological predicament about the repercussions of corporate actions, within an Australian context. The performer is plunged into questions about how they might create an ecological footprint, how much do they value and respect the practices of Indigenous people, and how far has Australian society come with Indigenous lands rights?

The proportions of the video on screen are scaled to the relative size of the zone on the piano, drawing similarities with how political economic ideology can impose itself onto territories. The instruction is to imagine that the video screen is stretched and morphed to the shape of that given zone; an awkward displacement. The exact proportions are to be estimated as if details are unimportant. The jagged terrain lines in the video are traced onto the rough, unstable surface of the piano strings. The terrain lines, which were once places, walking routes, camping grounds, places of ritual, fishing holes, are now abstracted glowing lines. These lines are further abstracted as they are transferred to the piano, and experienced sonically. A reading of the video could mean that the sound of these line drawings are a signifier of these forgotten places that are now left only to the imagination.

Fragments on the keyboard (zone 9) are played, at timecodes 1'00", 1'14", 2'23", 2'28", 3'48", from the video score. The notes and rhythms are a distilled reworking of music by the late Australian composer Robert Hughes as found in the archival footage (the music's title is the same as the documentary, *Mapping Australia* (1966)). I transcribed sections of this music selecting which notes and phrases to remove in order to leave behind only a trace, like a rubbed out line or a fading suggestion of the driving lyrical trajectory of the music. Within the sparse texture, the placement and duration of notes remains the same as the original but is also reappropriated to new arrangements of footage and visual stimuli.

1.4 Lapel microphone as prosthesis

The performer wears a small-capsuled lapel microphone on their left hand. The microphone is a prosthetic augmentation of the body: a mechanism for amplifying the senses that modifies the capabilities of listening through transmitting amplified sound that may not be

heard otherwise. The boundaries between performer and instrument are blurred as the instrument becomes integrated into the body's coordination system (Nijs, Lesaffre & Leman, 2012, p. 2). In this sense the piano is also a prosthesis, but my interest here lies in the prosthesis that extends the performer's ability to listen to the instrument via close miked sounds, and through an immediate and dynamic form of action that controls the microphone's distance to the strings as a sound source. Volume here is a function of distance, rather than pressure, which is the more familiar parameter in instrumental practice, e.g. bow pressure on string instruments, air pressure with brass and woodwinds, key pressure on a piano, and mallet or hand pressure on drum skins. The action of proximity determining volume is a physical replacement of an electronic process that relies on the performer to be conscious of their hand position in space as they navigate towards a sound. Karlheinz Stockhausen's *Mikrophonie I* for tam-tam (1964) is an early example of this use of proximity of microphone placement for musical effect. This action contains no substantial resistance or effort so it closely resembles the up and down gesture of moving the volume fader on a mixing desk. But unlike a mixing desk the lapel mic is also capable of being rotated to pick up different undulating textures of a sounding object. The performer searches for sounds of interests, and can make decisions that affect the clarity, obscurity or prominence of sounds. Intensity is created through increased loudness and sets up the possibility that the performer could make a sound that is suddenly very loud and possibly even create feedback. This could create anxiety for a listener as the piece has a large dynamic range and in the dramaturgy of the piece there are moments of suddenness, such as 0'24" in zone 2, when a wooden mallet suddenly brushes across the strings with the sustain pedal is down. The microphone moves backwards and forwards, cutting in and out of these sound worlds, exploring gradual transitions towards and away from focal points in the piano. In my mind, an analogy can be drawn between the movements of the lapel mic and the hovering of the planes that fly over and survey the land as shown in the original archival

video. The surveyors who are high above the land are not interested in every detail but are more interested in measuring terrains and drawing lines for the purposes of map-making. This could be compared to listening to something from afar with a consequent reduction of sonic information when compared to the types of sounds experienced when up close. Another aural relationship to this concept occurs in the music when the electric fan brushes against paper at 6'04" to 7'00", an allusion to the propellers on a plane.

1.5 Surveillance inside the piano—with audio score

The camera points towards the inside of the piano and follows the performer's hand movements according to pre-recorded verbal instructions delivered via headphones. Pointing a camera inside the piano and showing the hands of the performer gives the audience access to the mechanics of performance and puts the performer under surveillance. Musicologist Maria Cizmic points out that: "for Foucault, the exercise of discipline involves a mechanism of observation, which coerces behavior" (Cizmic, 2010, p. 451). And that for a pianist "the audience's gaze participates in a system that subjects a pianist to conformity" (Cizmic, 2010, p. 451). Cartography, as portrayed in the video, is shown as a method of observation, of measurement, identification, and, in Cizmic's interpretation, it is also a display of power. Cizmic argues that when the pianist plays inside the piano, like in Henry Cowell's *Banshee* (1925), it "resists the power of discipline" because the player's hands are out of view from the audience and this "obscures traditional elements that define a pianist" (Cizmic, 2010, p. 451). Henry Cowell's *Banshee* (1925), one of the early inside-piano works is now well within an established tradition of non-standard uses of the piano that includes John Cage's prepared piano pieces, such as, *Sonata and Interludes* (1946–1948), Helmut Lachenmann's *Guero* (1969), Stefan Prins's *Piano Hero #1* (2011), and Claudia Molitor, Jennifer Walshe and Sarah Nicholls's *Performance Lecture On New Modes of Music Notation* (2011), to

name a few. In this performance lecture Nicholls performs on her inside-out piano, which brings the strings closer to the pianist and in view for the audience. The techniques employed in these works and others are now familiar performance practices, which reduces the transgressive impact of a piece like Cowell's for contemporary audiences. In the context of my piece, Cizmic's discussion on observation, discipline and conformity can be seen through the authority and strict time keeping of the video—with some actions needing to be in sync with a video shown to the audience. This is reinforced through the observational gaze of the camera where the audience can see the pianist's physical exertion, their mastery over the sequence of events, and poise throughout the performance. By means of surveillance the audience are able to compare the fixed video with the live actions. The use of the audio score obscures this relationship as it directs the camera to be angled away from the performer's hands. The camera sets up the illusion that it is the documenter, the observer, or the cartographer of this experience that will enlighten the audience as to how the sounds they are hearing are being made. But the camera subverts this role through the instructions in the audio score. It creates ambiguity as to the causation of sounds so the listener is left to ponder the sounds heard in relation to the political and aesthetic content of the documentary. The audio score results in a filtering of information starting from the video score. Firstly, the video is interpreted by the performer who responds with an action, which is subsequently captured by a video camera. In the video score I have isolated short fragments from the film, linked them together in sequences with some reoccurrences and changes in speed. The video camera isolates small fragments of the performer's actions, only showing parts of the performer or the piano. Occasionally the video camera zooms in to just one hand, which abstracts the experience, changing it from movements that are functional to the production of sound, into a spectacle for eyes on which to gaze and reflect. The viewfinder also captures the lapel mic of the left hand as it hangs suspended in the air waiting for the next instructed action. This promotes a further sense of surveillance on non-

sounding hand actions. From the audience's perspective the idling hand suspended in the air is a moment of stillness among the changing visual and sonic material.

1.6.1 Performer's perspective and efficiency of the video score

This piece was performed by the well-known Australian pianist, Tamara Cislowska, though the piece could be performed by a percussionist or a musician who does not specialise in the piano. The use of a video score means the performer is following a fixed sequence without having to count in metric time and is able to produce complex sonic results with relatively simple means. Actions on screen are copied and applied to a specified 'zone' on the piano. These zones can be measured by finding a ratio between pixels on the screen and the area on the piano in centimeters, but this could be one of many ways to interpret the piece. Copying the video movements in a precise way is one method a performer may choose. This can be seen as a development of the concept of *mapping* applied meticulously to the realisation of the score. However, an imprecise method also relates to the carelessness of the people in the video, so each method is appropriate. Skill however, is required to assemble the parts together and it is necessary that the performer remains focused on the video whilst listening and shaping the quality of sounds being produced. There is some freedom in choosing the amount of pressure on the strings that would create dynamic fluctuations. And when copying the line, which is often wavy, the performer only has a few seconds to make an estimated judgment of the general shape and characteristics of the line. Rhythmic variations can be made during the piece by changing the length and intensity of the erratic movements with gestures that are more still and regular. A performer needs to work with a degree of imprecision in the score and determine the dimensions of space and directions of the hand through their own rough estimations. This approach means that certain parameters could vary during a performance, such as where the beginning and end of a gesture is on the piano. For instance, at 0'24" the string on which the performer starts on and ends on can vary. The

performer also has to jump from zone 13 to zone 2 quickly. Such a fast, sweeping motion can lead to errors, namely not hitting the mark the performer was aiming for. This would still be a chromatic glissando using a wooden mallet in roughly the same register, but there is a possibility that the pitches will differ due to where the performer starts and ends this motion. Also at 1'18" the register and sounds of 'wood grinding on strings' will be similar but the executions of the line will vary based on the subtle deviations in the performer's hand positions. I see this as an acceptable margin of error, where the so-called error can lead to unexpected variations of gestures, and the performer has to come to terms with making these errors as an intentional act, and accept the differences in execution each time.

There was some uncertainty from Cislowska as to whether or not the engraver was actually touching the surface at a particular point, or whether the man's pencil was touching the map. We resolved that there is no right or wrong, and that discrepancies exist when determining the identification of a line. I interviewed Cislowska after a studio recording of this piece at the University of Western Sydney to discuss how my video score differs to working with staff notation. Cislowska explains:

In the piece (*Mapping Australia*), you can't just by memory create the sounds of what's on the screen, you actually have to really look at the screen because you have to do it at exactly the same time and that means there's a lot of precision involved so that's the hardest part about it. You know, even if you were counting in a piece or you're in a certain tempo there's a tiny bit of leeway there, you can have a tiny bit of rubato or ease into something. But in this case you can't. (Cislowska, 2014, audio interview)

Although it might be difficult for a performer to remember all aspects of the piece, memory does play a role as the score is fixed and can be rehearsed. What this notation does offer is:

- 1) A line of movement and angle of the mallet that can be interpreted differently each time;
- 2) A simple representation of speed of movement, and irregular lengths of phrases;
- 3) A quick and efficient way of delivering gestural information, such as the dimensions in space.

Staff notation would require all parameters to be written out independently such as: the angle of the mallet, speed of movement, line of movement, lengths of gestures, position on the piano, and any left hand instructions. If bars, time signatures, and tempi are used then this would be a complicated piece to perform, more suited to a percussionist. If time between phrases are broken up into seconds, then the length of gestures would be open to the performer's interpretation. The rigidity of time along with the left and right hand needing to work independently, and the eyes needing to dart from one place to another made things difficult for Cisłowska, and would be a problem for any performer. Solutions we came up with were to keep all notated elements in one place so the performer's head remains in one position and to be economical with the tools. For instance, we found a rubber mallet, which doubled up as a wooden mallet on the reverse end.

1.6.2 Timeline study score

To help the performer learn the piece I created a timeline paper version of the video score. Actions in the video are reduced down to lines (see below), and turned into a sequence of functional musical data to be interpreted by the performer. The lines in the 'study score' show the direction, shape, and relative spacing of each video gesture. By using the score, the performer can have an overview of the macrostructure and get a sense of the ordering of sequences and how long tools are used. These details can be difficult to see when the video and the instructions are happening in real-time.

Figure 3: Page 1 of the timeline score of *Mapping Australia*, with spatial notations to accompany the video score

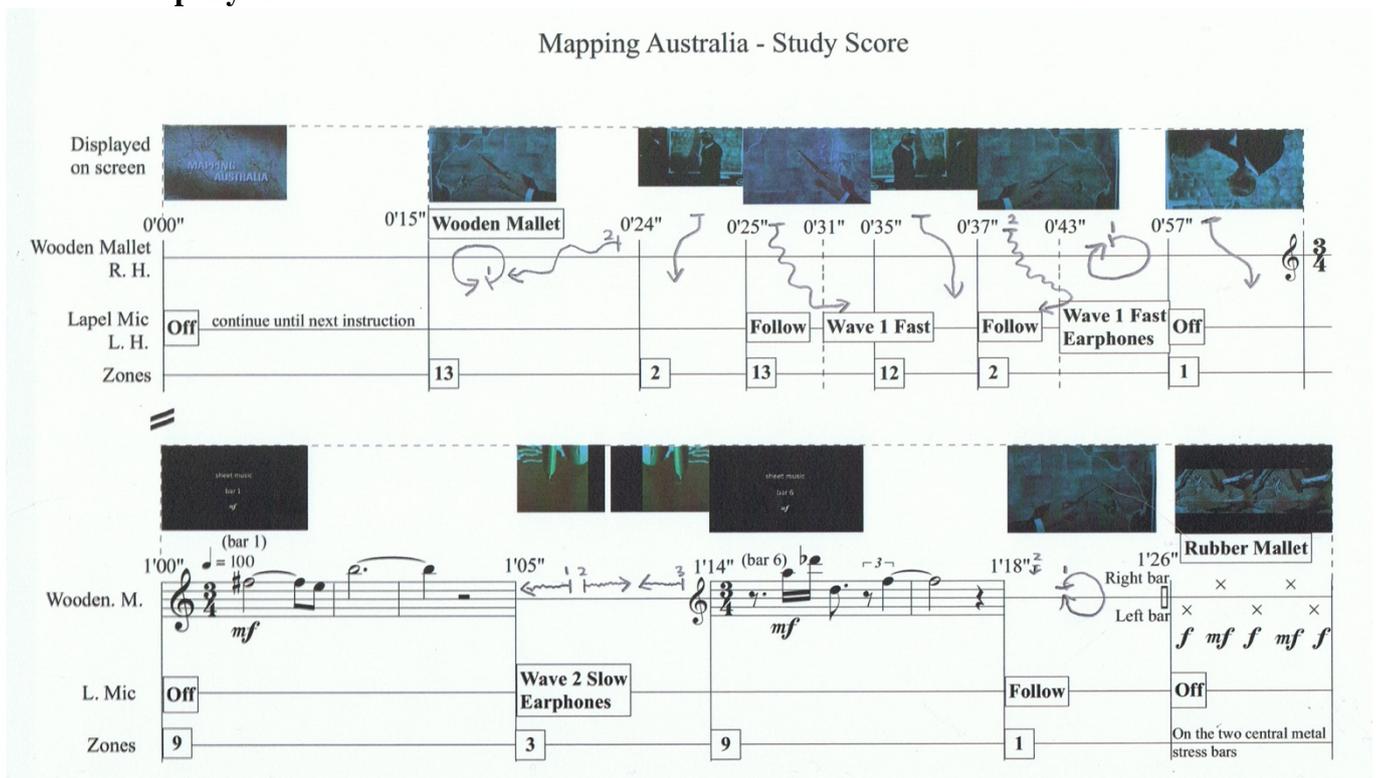


Figure 4: Example description of a video line gesture at 0'15''

Objects/ Material	Line	Pressure	Dura- tion	Speed	Resulting Texture
Wooden mallet on metal (Zone 13) with rough textured engravings		Light to medium (Using the weight of the wooden mallet)	9''	4.7 centimeters per second 209 pixels per second as shown on screen (measurements are approximate)	Grinding, and knocking sounds, high and tinny.

1.7 Political associations

My political response was to critique the footage and to counter the self-importance of the video, highlighting its disconnection with the land and its people. The piano conceptually represents land and is mapped and notated in a spatial-choreographical manner. The performer is asked to mimic silly movements in the video in an attempt to mock the source material. I also created humorous video manipulations to accompany the performance (e.g.

the pencil starts to moves like a conductor's baton at 6'31'' in the performance video) in an effort to subvert its authority.

In 1966 when the documentary was completed, Indigenous self-determination and rights to land ownership in Australia were at a pivotal moment in the struggle against mining companies wanting to mine on Aboriginal reserves and Aboriginal land without any consultation or negotiation with Indigenous Australians.

In 1966, 200 Aboriginal stockmen of the Gurindji people and their families walked off Wave Hill pastoral station in the Northern Territory, initially in protest over their wages. The strike soon spread to include the more fundamental issue about their traditional lands. The Wave Hill walk-off had started the first Aboriginal land claim (Creative Spirits, n.d.).

In the video it appears as if the cartographer's role of objectively representing the landscape is analogous to the government's disconnection and treatment to people at this time. At the time, there were also the ongoing land rights issues and mining disputes that resulted in the the *Yirrkala Bark Petitions of 1963* (National Archives of Australia, 2011). This meaning is tied to the lines of movement in my piece since each movement is the result of actions from the documentary. Lines drawn on the inside of the piano across the low strings with a wooden mallet relates to a person running a pencil across a map. There is an implied carelessness with what the man is doing as it is assumed that the man's interest is for the purposes of mining that is amplified by the political situations occurring at the time. In the performance this physical action leads to a sudden loud distorted string sounds, emphasising the negative political impact this video would have on a society and on Australian

Indigenous communities, who suffer enormous levels of disadvantage in Australian society.

The political ideas are communicated to the performer and audience through the video material, and programme notes about the work. The realism in the videos show old edited footage of men in suits clumsily pointing at maps, rock picks striking the earth, an engraving tool carving out glowing terrain lines, and a rising and falling tree. Whilst the full political dimensions of the work may not be entirely clear from these videos alone general themes around exploitation arise around these images. My intention is to work in a multifaceted way with layers of meaning from more overt commentary on Aboriginal land rights (as found in the programme notes presented to the audience and performer) to translations of the political into abstracted actions. An interpretation of the written political content and images can be made in sound as there is a bit of flexibility with the amount of mallet pressure the performer is to use on the strings, and in controlling the line of movement as it is converted from video to performed action. This allows room for the performer to make choices about whether to exert or restrict force throughout the piece and express their reaction to the image and written material. The political ideas are provided on a website along with the score material, and there is also a link to a published article about the work. This all forms part of the understanding of the work on a deeper level, in all its conceptual complexity. The political ideas are there to be explored as much as the performer is willing to investigate.

Whilst 'Mapping Australia' engaged with strong political ideas, my subsequent works move to something more neutral. It is the abstract gestures and particularly the focus on the hand movements that become the focus in later pieces such as *Copy-make*. My engagement with political ideas prompted the development of gestural vocabularies and strategies for navigating an instrument, and it is these elements which are transferred to later pieces. For instance, in *A Sense of Space* the guitarist makes circular motions across the body of the instrument and there is the use of the same bamboo whisk in *A Sense of Space* as in *Mapping Australia*. and the further development of video as a scoring practice (*Animal*) through to the creation of a video installation (*Copy-make*). *Animal* is the only other piece which directly interlaces the political with the creative work. The video score

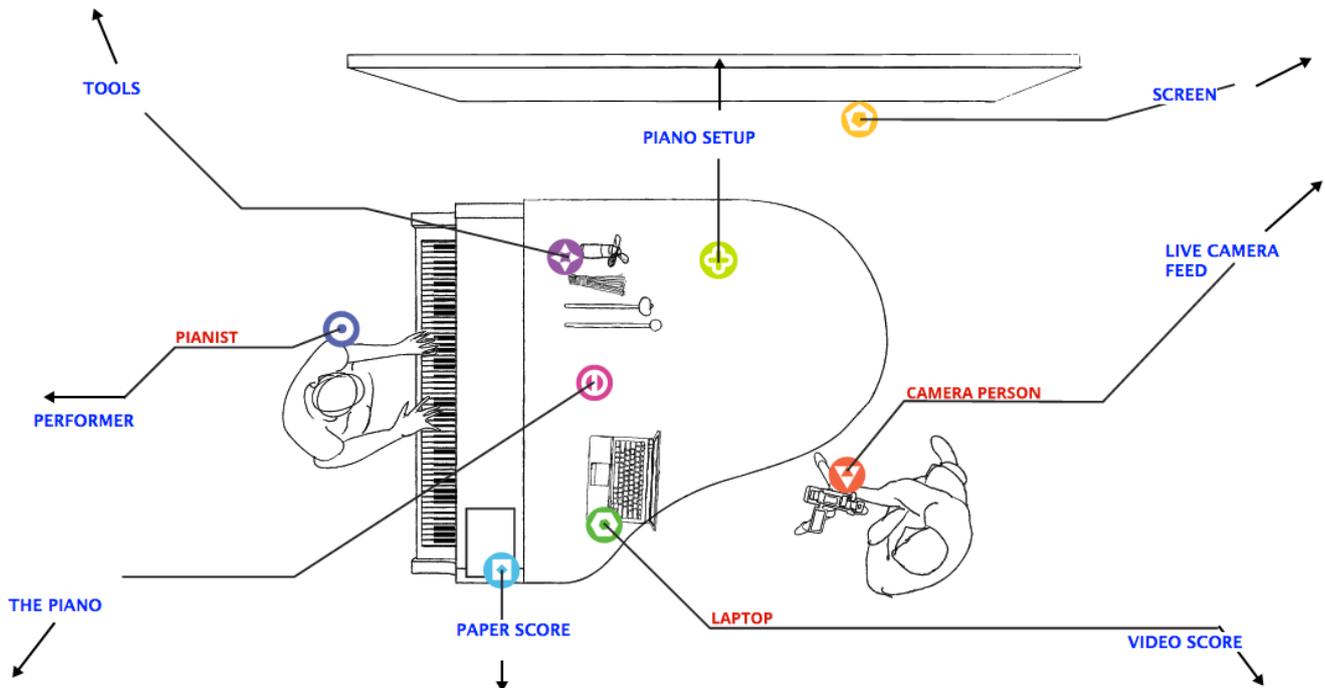
requires the choir to whisper short quotations from parents describing the mental state of their children living in Australian immigration detention centres. The image of the match box contributes to this meaning with text that reads 'keep away from children'. A programme note is again required to draw political meaning from the creative material, which would otherwise be ambiguous, or meaningless. The accompanying video serves a much subtler role in portraying political meaning when compared to *Mapping Australia*. The collage of the duplicated ocean footage plays a more neutral, reflective role.

In the work, the piano is represented as colonised land. Initially I was drawn to the low end of the piano. I was drawn in by the rich, full-bodied sounds. My earlier practice videos reflect this tendency, seen in a video entitled: 'single gestures with resonance'³, containing a collage of ideas surrounding this notion. Later I decided to resist the urge to work mainly in the low-end section because the piano was a representation of colonised land for mining and greed and so I did not want to prioritise one area. Instead I chose to distribute the activity evenly around the piano. This led me in a counter-intuitive direction, which opened new avenues of thought and approach. This is reflected in the first section of the piece, which starts in zone 13 on the metal frame of the piano using a wooden mallet. Sections of the video are sped up and slowed down to control the pace of each gesture as a transformation of sonic material. The images are also flipped and moved around to change their direction and position. I treated video fragments in motivic ways akin to musical permutations, transforming them through transposition, inversion, and retrograde. This was my way of transforming the video from a static piece of history locked in time into something malleable and reinterpreted in a contemporary context.

³ See video at: <http://danielportelli.com.au/videosketchprocess>

The act of putting together the work itself is an act of mapping as seen in Figure 5:

Figure 5: A topographical view of the stage layout of *Mapping Australia*



1.8 Fabric of sounds

The piece has some recursive timbre-based ideas, which sets up the expectation that the piece may be structured and that the listener can make links between past, present and future events. The overall structure of the piece is close to being a continuous progression of sound, but with these reoccurrences that transform over a long period of time, it may be difficult for a listener to determine if there is an underlying order to the sequences or whether to experience each sound as a moment to moment event. My process is to create differences in duration, breaking up any intelligible order of events or perceived sections. The work could be seen as a collection of sonic experiments I made that are assembled together in sequence. But there is also an internal logic to the ordering of sequences, the lines of movement, and transformations in the timbre and materials as the piece unfolds. Transformation of pitch and rhythm may not seem apparent due to the frequent pauses, the

recurrence of similar ideas over long durations, and the indistinct sounds of non-pitched textural stasis (for example, wooden mallet rubbing on metal at 0'00" to 0'09"). Changes in timbre often happen quickly and erratically for instance, at 0'57" there is a change from distortion to purer sounds. The focus is firstly on the friction between the wood and the strings' bumpy surface, and the distortion created as multiple low end strings resonate loudly together, creating minor and major second interval beating patterns. At 1'00" a purer sound occurs as high F#, E and B notes played on the keys. It is simple and clear and highly contrasting to what was just played. Following this there are more clustered note distortions at 1'05". This return to the purer clearer sounds gives something to hold on to after listening to unpredictable gritty distorted sounds. In the table below you can see the arrangement of how timbre is organised. There is an overarching line from roughness to lightness with small periods of change created by performing on piano keys, through percussive moments using rubber mallets on stress bars, and in the recorded playback.

Figure 6: Types of timbres used in *Mapping Australia* and their duration in seconds across the full duration of the piece

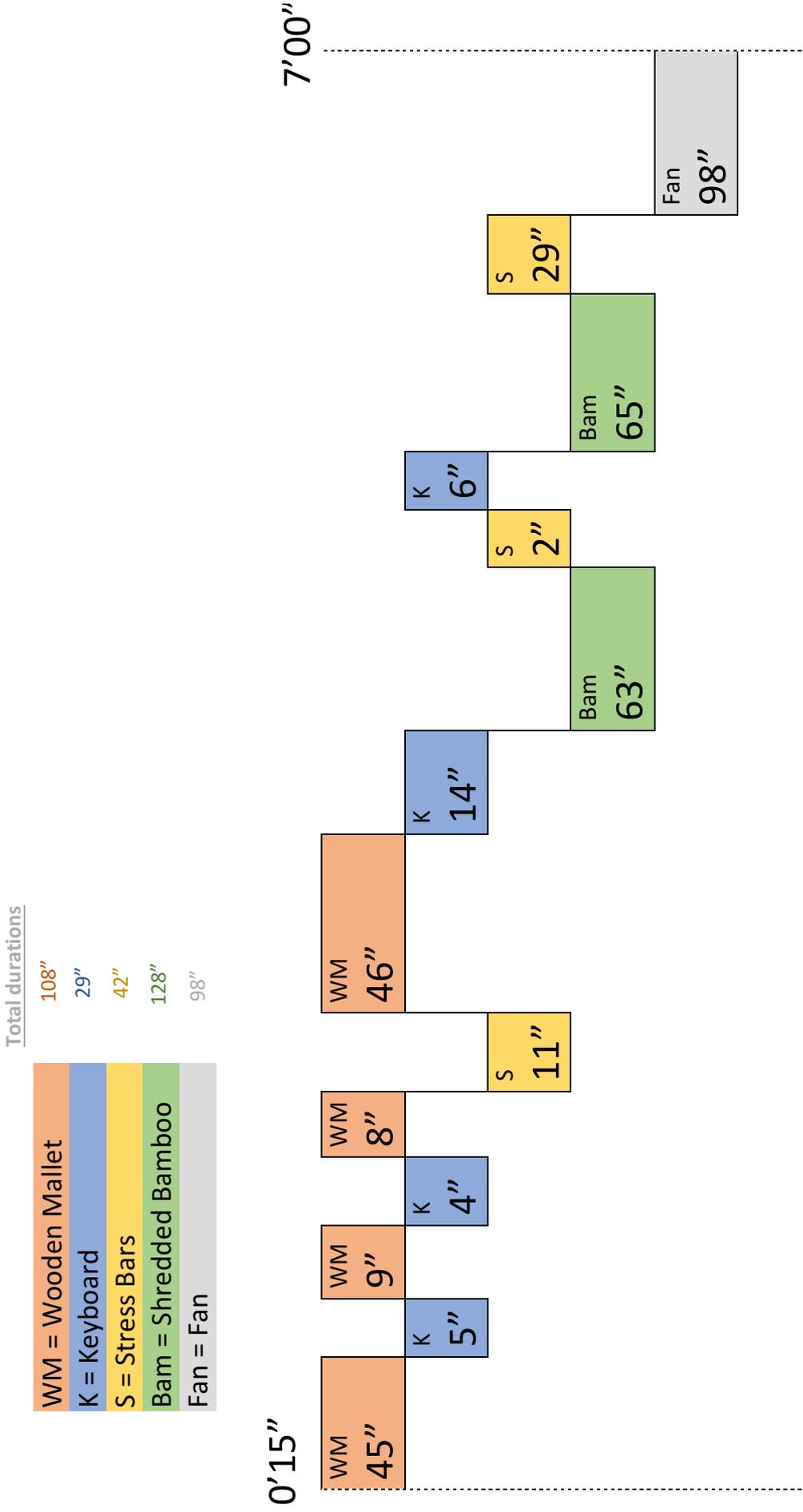


Table 1: The materials used in the piece, with their sonic descriptions, and associated physical actions

Long Duration of Material Changes			
	Wooden mallet on strings	Shredded bamboo	Fan with nylon blades
Description of Sound Qualities ➡	High roughness, high grit, high grind, high distortion.	Medium roughness, high grit, high grind, medium distortion, softer noise.	Soft, light grinding, light distortion, soft noise.
Physical Actions (including standing, sometimes looking at computer screen) ➡	Pick up mallet, swiping, dragging, gliding, jumps between zones, put down mallet.	Pick up bamboo, twisting, turning, pushing, pulling, put down bamboo.	Pick up fan, turn on fan, hovering, gliding, slow movements, put down fan.
Short Duration of Material Changes			
	Piano Keyboard	Rubber mallet on stress bars	Recorded playback (plays throughout)
Description of Sound Qualities ➡	Pure, stable in sound, clear, melodic, unresolved, suspended, resonant.	Sharp muffled attack with long string resonance, clear defined moments at irregular intervals, attributes of the sound are detailed and distinct from other parts.	Spoken word, triumphant music, melodic, strings, quiet, old grainy recording.
Physical Actions ➡	Fingers pressing down, piano key is pressed, hammer lifts up and strikes the strings.	Rubber Mallet is pick up moved towards the stress bars and struck.	No physical action from the performer.
	Articulation		
	Microphone on performer's hand		
Description of Sound Qualities ➡	Amplification of sound, wavering of intensity, details of sound, distance and presence		
Physical Actions ➡	Hand moving back and forth towards focal point.		

1.9 Lines as movement and concept

Gesture is broadly defined here as movement made by the performers on stage. In the book, *New Perspectives on Music and Gesture* (2016), Fatone, Clayton, Leante, and Rahaim, position physical gesture “within a complex of cross-modal actions associated with musical performance and transmission”, which “contributes to the way musical performance is experienced, and how mental images of spaces, actions and object motion - co-presented in physical gestures - can influence the way music is performed.” (Gritten et al., 2016, p. 203). While movement is fluid and continuously evolving throughout a performance, for the purpose of this discussion I specify units of time and durations of gestures by the performer, referring to the body parts (hands, fingers, arms, head, body posture, etc.), and discuss their lines of motion. Whether it is movement which directly results in a sound or movements which do not effect the sound (Gritten et al., 2016, pp. 45-46), it all contributes to a conceptual understanding of the performance and provides insight into cross-modal relationships. Gesture can also refer to the movements of something on screen. The diagram below, Figure 7, shows the lines of physical movements between each zone. The earthy colours represent the lines of movement with the wooden mallet, the purple lines are movements towards the piano keys, and green is movements towards the stress bars with the rubber mallet. This meshwork represents where the performer moves in the piece. The diagram shows the traces of movement implied in the score instructions and the sound is a trace of that movement also. The curves and irregularities of the lines are only an estimated representation of the movement as there was no precise measurement of the course of movement.

Figure 7: Diagram showing lines of movement made during the performance

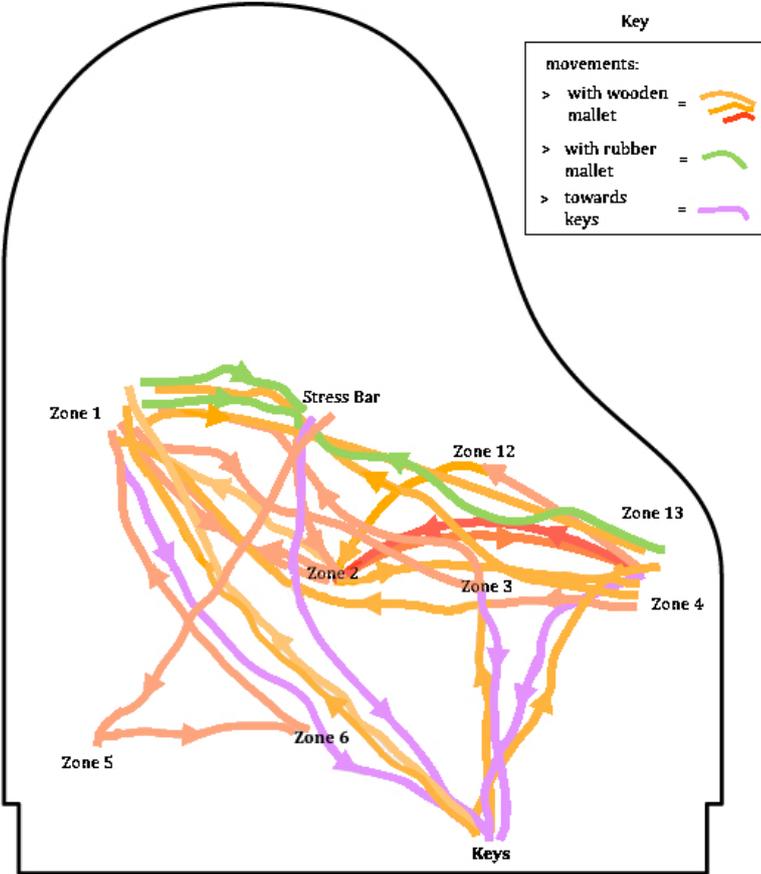
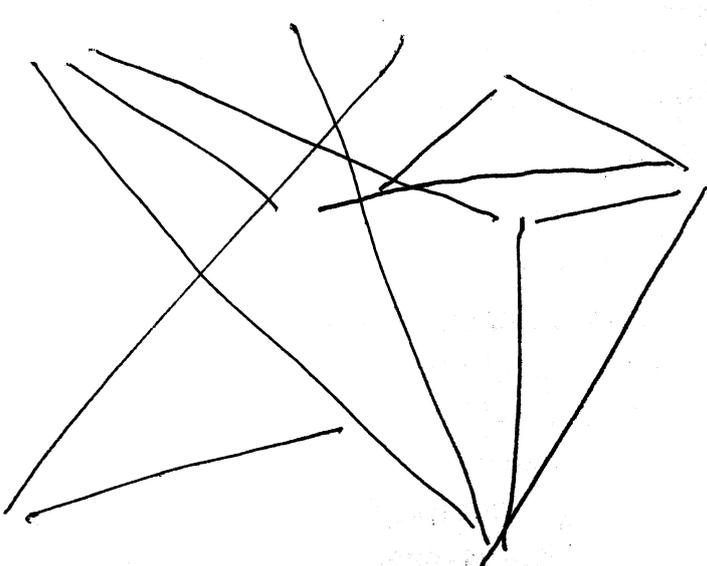


Figure 8: A sketch I made that shows the lines of movement using only single black lines. The piano frame has been removed, and only single lines are used instead of showing all lines between points.



These lines represent the performer's movement between zones, and are not movements that produce sound. These movements happen during moments of resonance when the strings or stress bars have been struck, and during moments of rest in the sound. The planes of movement (as shown in Figures 7 and 8), and the lines of movement that result in sound seen in the study score, show similar directions of movement, such as: up and down (in the study score at: 2'37", 3'48", 4'08", 4'35", 5'51, 6'08"), left and right (1'05", 5'22", 5'30", 5'53"), and diagonal (5'32"). Sonically, these lines and shapes are blurred, with only some instances of direction decipherable when the wooden mallet moves across the strings at 1'05", as you can hear the pitch going up or down, giving a sense of direction. The organisation of movement outlined in the diagrams above can be seen as a method of navigating the work, a mapping of the trajectories of movement.

What the diagrams do not encapsulate is the representation of the relationship between things occurring at the same time like the left and right hand of the performer. For instance, at 1'16" the left hand waves the microphone while the right hand drags the wooden mallet across the strings. The hand action for waving the microphone in the air looks similar to the wavy lines actions seen in the study score at 0'25", 0'37" and 1'37, and the camera instruction of the handheld shaky camera relates to this motion as well. There are also comparisons that could be drawn between the visual movements in the projected video (the live feed and the pre-made video), and the camera movements made by the camera operator, in relation to what the performer is doing.

Choreographer William Forsythe's work *Improvisation Technologies: A Tool for the Analytical Dance Eye* (1999) outlines a method of dance analysis and production of movement ideas where he draws lines and points in space in a series of video demonstrations (Forsythe, 2008). The videos construct imagined lines in space, on the body

and between points on the body, such as between elbow and hip. Movement is made in relation to the line through processes of rotating, sliding, collapsing, folding, moving over, under, back or on top of the line. In my piece, the rotation of the bamboo whisk, its axis, and contact with the strings form such points and lines. The lines of movement in the video score are a concrete realisation of the imagined lines used by Forsythe, except my lines are not straight, and the performer imitates instead of implementing a kinaesthetic language in relation to a fixed line. Instead, there are changes in the types of surfaces on which the line is enacted and there are changes in the textures of the apparatus used. The unstable piano surfaces combined with the guess work needed to position the line onto the piano results in new variations of lines. For instance, as the performer attempts to replicate the line of the video the wooden mallet may get stuck between the strings and temporarily go off course, the performer then tries to bring the mallet back on course, resulting in a new pathway. Ingold makes the distinction between the line that goes for the walk, taken from Klee, and the line made by assembly, or mapping (Ingold, 2007, pp. 72-75). The title and video content of my work is about mapping but this is ironic as it is more about the problems with mapping—trying to quantify human frames, temporal movements and sound in a musical performance. The emphasis is on the perpetually emergent present tense of the word *mapping*, that implies a state of transformation. The zones are an aerial depiction of the spatial dimension the performer works in. They act as frames that can help to understand and measure the temporal movement surrounding it. From an architectural perspective the piano's surfaces and frames are like furniture for the performer to navigate. Architect Stephen Turk, describes the relationship between furniture and the performer in Forsythe's work *Synchronous Objects* (2009) where the performer must negotiate a grid-like layout of tables on stage, and: "the shifting planes of a newly mobile and fluid set of surfaces, an artificial and somewhat uncanny horizon. They are in a sense partially buried or floating in an unstable world." (Turk, 2011, p. 2) The inside of the piano is much more populated,

staggered and irregular in its construction, with its grid-like structure of the strings intersected with stress bars, a curved frame, and rows of tuning pegs. The piano keys in contrast are a smooth symmetrical grid. In my piece the unstable movement of the performer is matched with the instability of the furniture (the inside of the piano). As the performer moves a wooden mallet over the grid of strings, the line of movement has the potential to be interrupted. The player then has to decide how to incorporate that into their line. Forsythe's choreography *Synchronous Objects* shows a representation of the meshwork, with its curves and contours of dance movements showing no fixed points. *Mapping Australia* also has this meshwork of movement, shown in Figure 7, but what sets my work apart from Forsythe is the emphasis on the tactility of performance surfaces. Forsythe's work is not concerned with moving between different densities of texture in a haptic and aural sense. The dancers tend to make movements on low friction surfaces that are comparatively simple and static in texture, such as: in the air, on smooth flat tables, or on the ground. Both pieces share the idea of no fixed points. My notation may have directions, zones, and ordered note sequences, but the flow of movement, and sound means it is read by the audience as continuous motion and is ephemeral. In an interview called *William Forsythe discusses Synchronous Objects* (Ohio State University, 2012) Forsythe talks about how he wanted to capture the ephemeral nature of his choreography explaining that "dance has no objects". The performance of my work can be read as having no objects and this perspective opens up the possibility of creating knowledge beyond the fixed notational parts.

In Forsythe's *Improvisation Technologies* he establishes a straight line then makes the gestural trace in relation to that line. Forsythe's line making can be compared to Klee's complementary lines that moves around a freely moving line (Klee, 1972, p. 16).

Figure 9: Paul Klee's example of a line accompanied by a complementary line. (Klee, 1972, p. 16)



Forsythe's gesture starts as an abstract and analytical process. As something known and fixed in space, that gives the performer a reference point, and a guide in which to explore with. The outcome appears similar to Klee's complementary line but Klee bases his fixed line on something that was already a dynamic exploratory motion: "a line on a walk, moving freely without goal" (Klee, 1972, p. 16). My wavy video lines, although were initially fixed, are now re-shaped, elongated, morphed, sped up, slowed down, and flipped as part of the compositional process. And through this process they are turned into a dynamic exploratory motion as Klee describes. Something my video lines have which Klee does not is to specify the speed of the line on a walk—the nuances of changing speed over the course of the life of a line give the movement its particular dynamism and liveliness.

There is potential in this idea of establishing a line and working with it in relation to spatial constructions on the piano. This could include making invisible sonic lines in space derived from lines in a video. A different approach to asking the performer to make imitation-based gestures, would be to give the performer a set of superimposed action-based lines to use in conjunction with a moving video line.

Forsythe points out the elusive nature of the term choreography explaining "the word itself, like the processes it describes, is elusive, agile, and maddeningly unmanageable" (Forsythe,

2009). It is elusive because of the ephemeral nature of his dance and because the process of choreographing the work took on many layered, dynamic forms. I find a similarity in the sheer magnitude of ideas at play in the piano work with its intricate sonic nuances, in the way the durations of events break up intelligible order, and in the changing nature of the video that shapes or choreographs movement. I see my connection to the visual arts as a way to extend my compositional practice, through working with cross-modalities; as lines of motion, video gestures that are part of sonic actions, and through creating audio scores that instructs a live camera operator capturing the pianist's actions.

1.10 Choreographic thinking in recent music

Jennifer Walshe is also a composer who sees the visual arts and conceptualism as a way to extend her compositional thinking, and I agree with Walshe when she explains:

The conceptual (and visual) approach only serves me as long as it facilitates the creation of new types of sonic material, allows me to engage more deeply with sonic material, and promotes new ways of working with sonic material. That sonic material might be concrete, realized, or imaginary, but the engagement with sound takes primacy. (Walshe, 2015, p. 1).

As I shape imagined sounds in notation, I am also shaping the movements of the performer—a type of choreography. As I am writing down, manipulating and thinking within the imagined or unimaginable spaces of the physical body in motion, which may only be heard as a sound trace as a recording on the radio or online streaming service, then is this as an end result an example of physical thinking without a body? Forsythe in the same essay asks the questions: “is it possible for choreography to generate autonomous expressions of

its principles, a choreographic object, without the body?” and “What else, besides the body, could physical thinking look like?” (Forsythe, 2009). This question can be applied to music: what does musical thinking look like? My three video scoring pieces: *Mapping Australia*, *Animal*, and *Copy-Make*, and my line walking video, reflect this endeavour.

Notation that shows a continuous line of movement such as glissando would be closer to representing physical thinking than a fragmented line that requires the performer to jump from point to point such as a cellist having to make interval leaps of 3rds, 4ths, 5ths or 13ths for instance. Composer Cat Hope makes a similar connection when referring to glissandi that makes a smooth line of movement, rather than a line that refers to the contour of melody. Hope draws on the work of Iannis Xenakis who used the line as a key element to “unite music, architecture and mathematics” and “compared the straight line or curve of mathematics to a wave in physics, to a glissando or sine tone in music” (Hope & Terran, 2016, p. 1). *Metastaseis* (1955) is an example of this, where multiple lines move together as glissando. But there must be other ways to hear or notate lines of motions beyond glissando. A scene from the video score is one continuous action which does not always result in glissando. A line of motion is sometimes translated into a textural effect such as the crackling sounds from the bamboo as its twists, grinds, and bounces off the strings. I can hear the tension in the bamboo strands and the force of physical energy exerted by the performer. The speed and agitation of the wooden mallet can be heard as it darts across the areas of the piano. In Simon Steen-Andersen’s *Run Time Error* (2009-) he creates a line of objects found throughout the performance space, walks past them holding a microphone, and hits them in succession. The line here is a large scale linearity of physical objects in space and is also a work of sonic line walking. The conception of line breaks down when only the audio of the piece is listened to. This difference is a part of *Mapping Australia* where the

lines the performer makes are disconnected to the lines of audio being produced. In Andersen's work *Beside Besides* (2004/2006) he draws a line in another way using a physical musical action, emphasising the bowing of the 'cello by syncing it with a wooden drum stick that grinds against the side of the snare drum. This is a line where the audio and visual results are in sync and *Mapping Australia* also has moments like this when the wooden mallet brushes across the strings coordinated with the video on screen.

I attended a talk at the Royal Academy of Music, UK, by pianist Zubin Kanga titled *The Android Pianist: Extending the Piano with New Technologies* where he discussed Stefan Prins's *Piano Hero #1*. He labelled the piece a dislocation, where barriers between the virtual and the real breaks down. The pitch and rhythmic key gestures are mapped to trigger an avatar of virtual video gestures. At the beginning, the virtual and the real performer are separate, but then there is a section where the pianist is projected on the screen, and the real becomes the virtual, challenging these preconceived roles (Zubin, 2016). In my piece the pianist is more possessed by the virtual, as the virtual has direct control over the physical actions of the performer, and the performer also has a virtual presence throughout the performance via the camera feed. A result is that there is more of a dynamic interplay between virtual worlds than in the Prins. The mapped actions of the performer gives the impression that the performer becomes the people in the video. The video plays the role of an avatar of the performer, but the performer also plays the role of an avatar of the video.

1.11 Lines in anthropology: Tim Ingold and the meshwork of lines

Ingold uses the word 'trace' to describe the paths of movements made by things in the world. He uses an example of a slug's slime trail (Ingold, 2013, p. 132) and describes it as a meshwork of interwoven lines. Meshwork are lines of entanglement, movement and growth.

They are temporal ‘lines of becoming’ in a Deleuzian sense (cited in Ingold, 2013, p. 132). A slug’s trail shows the animal’s course of movement and this is what makes it a meshwork. A slug does not map its course before setting out. It is a mesh of entangled movement. In a similar way, music can be seen as being a meshwork of movement made by the performers. In Ingold’s example of a slug’s slimy trail, he describes it as containing loops, crossings, interlaces, intricacies, entanglements, twists, turns, curves, contours, or as if someone has scribbled on the pavement (Ingold, 2013, p. 132).⁴ I call these terms the “lines of the everyday” as these descriptions can also relate to how people move throughout the day. Imagine if we could all leave behind a trail of movement throughout the course of the day. We might find similar contours of movement. What about if we just tracked the movement of our hands, wrists, arms, fingers, head, eyes or feet? What would that look like?

Ingold points out the difference between something made using points and connectors, such as a line used on a map, and ones made without points, like the meshwork of the slug’s trail (Ingold, 2007, pp. 80-81). Ingold differentiates this kind of organic meshwork from a network which is defined as a spatial construct with connectors and points (Ingold, 2013, p. 132). Ingold’s descriptions of these systems are deeply rooted in his anthropological findings. For instance, Ingold challenges the author Bruce Chatwin in his book ‘Songlines’ on Indigenous Australians:

Australian Aboriginal people, writes Bruce Chatwin, imagine their country not as a surface area that can be divided into blocks but as an ‘interlocking network’ of lines or ‘ways through’. ‘All our words for “country”’, Chatwin’s Aboriginal interlocutor told him, ‘are the same as the words for “line”’ (cited in Ingold, 2007, p. 80).

⁴ A paraphrase of all the descriptive words Ingold uses to describe the slug’s trail and the ‘meshwork.’

Ingold disputes Chatwin's claim of the lines being part of a network, something consisting of fixed points and linkages, and sees it more as a meshwork as interwoven lines or a web of lines on the land.

Mapping Australia consists of line characteristics described in Ingold's meshwork, winding and intricate, in which abstract notions derived from the found video are implemented as notational cues. My creative process is not an attempt to try and copy an exact representation of a particular line that is measured in a video then meticulously learnt and imitated by the performer. What is more interesting for me is the transference of movement that is transformed by the performer who, eventually makes it their own in the form of individualised movements in the general manner or shape suggested by the video movement.

Chapter 2: Cross-modal perspectives

Animal

2.1 Cross-modal thinking in *Animal*

Animal is a piece for violin, 'cello, percussion, keyboard, choir with video score, and accompanying video, and was commissioned and premiered by Soundstream Collective on the 16 April 2015, at the Anne & Gordon Samstag Museum at the University of South Australia. The use of the term multi-modality refers to the different sensory modalities (auditory, tactile, visual, kinaesthetic, and the imagination) that are observed or experienced during a musical performance or as a part of the process of composition of my work. Cross-modality is the overlapping of these streams and their interplay. *Animal* integrates video into the performance, where the gestures of performers on stage merge with suggested virtual motor actions onscreen, with further correlated vocalisations by the choir which occur asynchronously. This kinaesthetic and tactile/haptic notational language influences the relationship between what is seen and heard, and these simultaneous modalities and their conceptual counterparts are unified into meaningful action. They can also be collated together and analysed as multi-modal units, gestures and swarms. The cross-modal interpretations of this work are based on what is observable in the score material, in the video recordings of the performances, and in the accompanying video material that forms part of the work.

There is footage at the beginning of the work of a match being struck, moving back and forth in a looped sequence. At the end, the match sparks a flame and burns in slow motion, showing a transformation of this visual motif. These visual cues are prompts for the percussionist to create similar back and forth looping effects by brushing across sandpaper with a small piece of wood, at varying speeds. This sets up a subtly irregular rhythmic pattern at a local level which can also be perceived as regular because the texture is

homogenous and continuous. This interlaced relationship between regularity and irregularity hinges on the qualities afforded by the physical gesture used (to and fro) and the nature of the material's resistance, tension, and friction. The accompanying video also includes ocean footage multiplied nine times and arranged on a 3 by 3 grid and repeated at different rates of speed that slowly emerge and dissolve over a 7-minute duration.

Video material in *Animal* becomes a signifier for analogous meaning where friction and rough textures are seen as representations of resistance or tension, where fire symbolizes hope as well as danger, and crashing waves symbolize compassion or calm reflection. These video materials are also used in guiding the performers' production of vocalised textures, as well as their navigation of unmetred time and irregular metrical layering. It is assumed that the performer has prior knowledge about the object shown in their video scores (a match being struck) and what it might sound like. Whereas in many of my scores, I provide precise specifications in the detailing of sound, such as: changing bow positions (*Animal*), breath ratios in the flute (*A Sense of Space*), snare dynamics, mallet changes, and varying positions on the drum skin (*Lines of Fragmentation*), changes in finger pressures during harmonic glissando passages (*Memory Tape*), and speeds of multiphonic trilling (*Undulations*), in the video score in *Animal* it is up to the performers to find and shape the sounds themselves. Using video cues, I aim to prompt the performers to work with a sound palette that is subtle yet rich and complex, and is not too collectively similar or overly exaggerated.

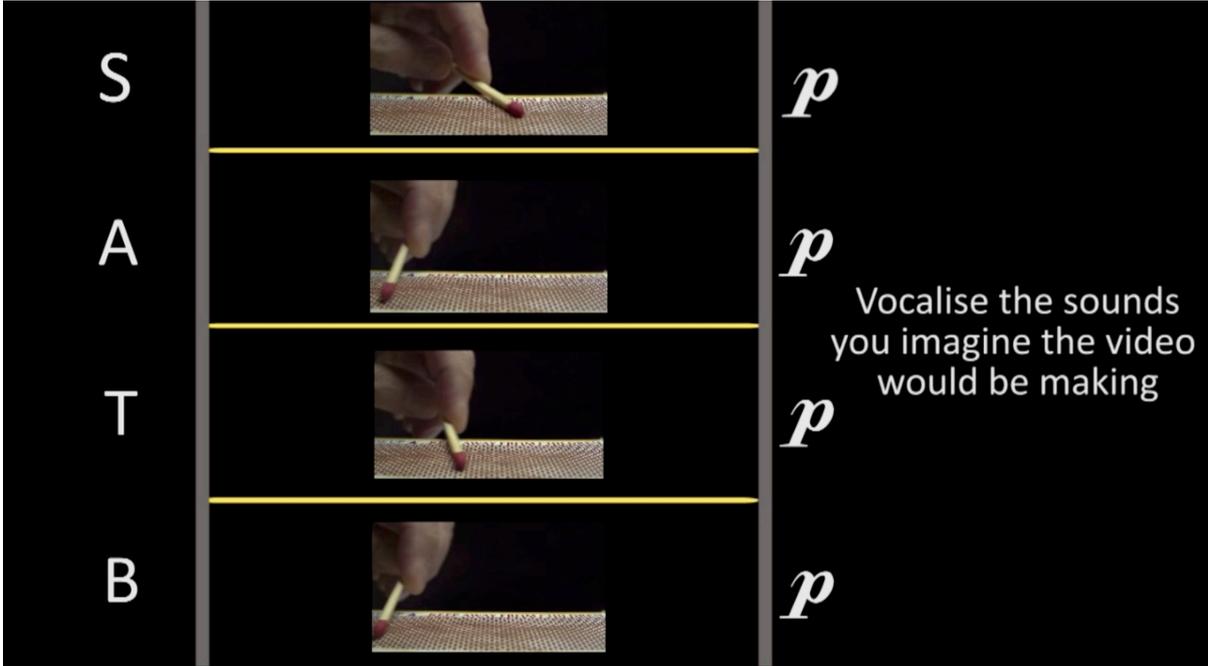
2.2 Video as notation for community choir

The video score was created using Adobe Premiere, which is a graphic interface with a timeline of events. I inserted staff lines and inside each staff I added fragments of text or graphics that scroll across the screen, a function called crawling titles. The speed of scrolling can be set individually for each block of text or graphic. In this way I could control the

speed of every small element in the score and visually one becomes aware of the video as an essay in different rates of change. I cut together a sequence of consonants and vowels for the choir to vocalise and inserted them in as a scrolling graphic into premiere. Text instructions and dynamics are placed within the frame structure and I was able to set the duration or their appearance on screen. Stationary videos are also added to each staff and I then composed the score as a time-line sequence of events.

The video also provides notational cues for the choir who follow the instruction: “vocalise the sounds you imagine the video would be making” as shown in Figure 10.

Figure 10: Screenshot at 25 seconds into the choir’s video score



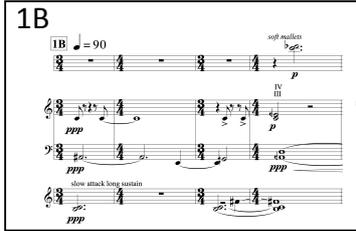
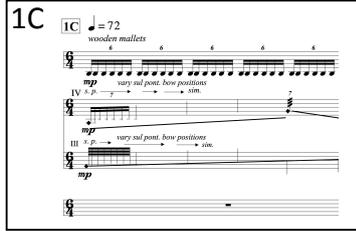
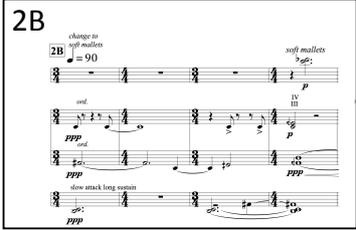
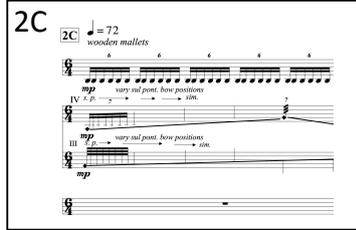
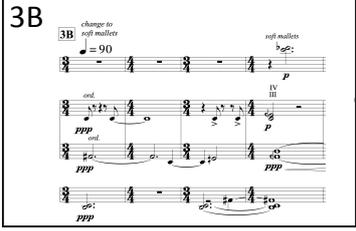
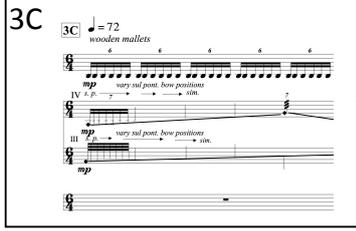
The videos showing a match being struck suggests a gritty sound and show the specific timings as to when to make the sound and when to stop.

The image in Figure 11 shows the structure of the graphic layout used in the ensemble score. Here you can see the macro structure of repeated sections, which may look symmetrical and uniform in the image but the sections vary in duration with their identities and demarcations

blurred by an interweaving choir part that changes in its character throughout. The 3 by 3 grid structure is a visual idea also used in my work *Copy-Make*, and in the accompanying video-installation for *Animal*.

Figure 11: A page from the performance instructions from the ensemble score of *Animal*

Macro Structure

<p>1A</p> <p style="text-align: center;">20"</p> <p style="text-align: center;">Slow Pace Light Pressure</p> <p>Violin, cello and keyboard players are to walk index and middle finger across lines on their instrument, playfully</p> <p>Vibraphone is to brush a sheet of sand paper across a piece of wood</p>	<p>1B</p> <p>change to soft mallets ♩ = 90</p> 	<p>1C</p> <p>♩ = 72 wooden mallets</p> 
<p>2A</p> <p style="text-align: center;">20"</p> <p style="text-align: center;">Medium Pace Medium Pressure</p> <p>Violin, cello and keyboard players are to walk index and middle finger across lines on their instrument, playfully</p> <p>Vibraphone is to brush a sheet of sand paper across a piece of wood</p>	<p>2B</p> <p>change to soft mallets ♩ = 90</p> 	<p>2C</p> <p>♩ = 72 wooden mallets</p> 
<p>3A</p> <p style="text-align: center;">20"</p> <p style="text-align: center;">Fast Pace Heavy Pressure</p> <p>Violin, cello and keyboard players are to walk index and middle finger across lines on their instrument, playfully</p> <p>Vibraphone is to brush a sheet of sand paper across a piece of wood</p>	<p>3B</p> <p>change to soft mallets ♩ = 90</p> 	<p>3C</p> <p>♩ = 72 wooden mallets</p> 

The transference of gesture to performative outcome starts with a silent video of a match scratching across a rough surface. The performer then identifies, imagines, and recreates the sonic gesture using a closed mouth position and the forceful release of air pressure creating a ‘shh’ sound. The scrolling graphic notation format resembles the graphic notation of composer Cat Hope, and her development of the Decibel Score Player application for iPad. My scoring system only resembles Hope’s system as I was unaware of her system when making my own. There are differences in that my system has independently moving staves for each instrument, meaning the scroll speed can change from fast to slow in each staff. The fast staggered spoken word section is an effective example of this, allowing the

performers vocalise a fast passage, perceive the differences in speed throughout the vocal parts, then prepare for a part with a slow glissando. Hope's scores require a multi-modal engagement of the senses, with its colourful lines, movement and sonification. Sometimes the instructional parts of the score disappear and the performer is just looking at abstract lines, such as in the piece: *her pockets full of inertia* (2015). The score functions as a form of visual art as well as interpretable material for a musician to engage with. Cornelius Cardew's *Treatise* (1963-1967) was able to frame complex graphical lines and symbols as a musical score going beyond the conventions of staff notation. The score's visual appeal and openness to interpretation by the performer, brings the work much closer to the visual arts and therefore open to cross-disciplinary dialogue. While my video scores could be notated as staff notation, I think it would lack the same capacity to solidify the concepts that the video brings out, reducing their potential for socio-political impact (whether just on the performer, or to a wider audience). In this regard, Cardew is a point of reference and inspiration for me particularly *The Great Learning* (1968-71). In paragraph 6 of the work, an ancient Confucian text is accompanied by performance instructions that the players perform at a pace in which the text is read or in their own time. It also specifies what to listen for within the group to play in sync, and when and how to make a sound or a pause. The text is thus fused with the instruction and is the identity of the piece.⁵ Hope and I share a similar goal of not using fixed tempi or beats, finding methods of obscuring a sense of pulse and tempo. A visual display of the duration of the line as a moving object is used without reference to grids of measurement—metre, tempo, or rhythmic symbols. Hope sees this as a way to keep the rate of movement of the line smooth and coordinated, allowing the performer to focus on crafting other aspects of the composition particularly the ability to predict the direction of any change in pitch. (Hope & Terren, 2016, p. 3). This can be seen in *her pockets full of*

⁵ I had the opportunity to perform *The Great Learning: paragraph 6* at the Union Chapel, London, UK on 12 July 2015.

inertia (2015) where there is a steady stream of lines and dots with different colours to differentiate parts. In my work, the use of moving images allowed for the amateur choir to work with complex irregular patterns, for example, the opening section up until 1'17". Given the amateur nature of the choir, if this section had been notated using traditional rhythmic notation, it would have been a barrier to an effective realisation of the work. The phasing of video speeds and the independent movements of fragmented text created the desired outcome of irregular patterns within the choir and in their relationship to the ensemble.

2.3 The line in parametric notation

I describe the music of *Animal* as being made of fast asymmetrical fluctuations and slowly evolving irregular oscillations of sounds that interweave throughout the course of a composition. These two temporal descriptions though not entirely absolute are part of what I call irregular lines. In the music they can occur at the same time, referred to as an interference, that is, when two sounds overlap each other creating a masking effect or giving rise to an irregular metric relationship. Lines can also occur one after the other in a continuous or discontinuous manner. By continuous, I mean that the previous line is continued by another distinctively different timbre without a perceivable break. The shape and speed of the line remains relatively the same in order to maintain the continuity. This can be related to my video sketching example where I filmed lines along the ground in Huddersfield. When one line ended I found another line to follow. When watching that footage, the line appears to continue on, with changing background colour and textures, which I translate as changes in sonic textures, friction, and grains of sound. A specific example can be found in the ensemble part of *Animal* in the lines of movement of sul ponticello bowing positions that produce fluctuating high harmonics and a nasal tone in bars 7-12 of the 'cello part. Examples of discontinuous lines are ones with a break or demarcation

with a definitive change in relation to the shape of the previous line, for instance from wavy to straight, or slow oscillating glissandi with a rest, followed on by a fast string of notes. This can be seen in bars 6-7 in the violin in Figure 12. In the context of the piece as a whole these aspects may not be distinguishable as ‘line-like’, but through the layering of these parts a more global meshwork of intricate lines is constructed that forms the identity of the piece. Instability is found in the instrumental writing in the shaping of these parametric lines, appearing as visible irregular configurations that are used to shape rapid timbral changes and sonic behaviours. In listening to the music there is a point where the irregular becomes regular and where the high-density of sounds spills over from a perceived disjointedness into an evocative sense of a totality. Regularity is found in the consistency of the irregular activity. When one irregular line finishes, another one continues on. The shape and precision of the lines maintains a thread through the music even though on the surface there may be the impression of disjointedness. Examples of the vocabulary of regular and irregular, continuous and discontinuous lines that make up the meshwork of the piece are as follows:

Figure 12: Bars 2-16 *Animal*: linear irregularity with discontinuous change

In bars 2-15, the aspect of irregularity in the line is seen in the inconsistency of the changing rhythms and metric divisions, and change in articulation, with pitch roughly centred around C natural. This occurs in fairly quick succession, starting with held tones (C, E quarter-tone flat) with straight bowing to microtonal glissando (C to D quarter-tone flat) to short accented spiccato to bowing single tones that alternate around C, E quarter-tone sharp, C quarter-tone

sharp and B quarter-tone sharp with subtle sul pontello changes and then into lateral bow sweeping.

Figure 13: Bars 54-64 *Animal*: perceived regularity within subtly changing speeds of iteration

The image shows a musical score for vibraphone, labeled 'Vib.' on the left. It consists of five staves of music, numbered 54, 56, 58, 60, and 63. The tempo is marked as 72 with a quarter note symbol. The instrument is specified as 'wooden mallets'. The music is a continuous tremolo pattern of quarter notes, with various fingerings (6, 5, 7, 4) indicated above the notes. There is a break in the line in bar 61, which is highlighted to show irregularity in the repetition.

Figure 13 shows the vibraphone repeating a B natural with subtle changes in the speed of iteration of the written-out tremolo. The line is continuous with a break in bar 61 that highlights the irregularity not only of the repetition across units but the basic occurrence of irregularity as a natural aspect of the physical ‘grain’ of live performance.

2.4 Comparisons to other recent cross-modal approaches to performance

The inter-modal aspects in *Animal* can be compared to other works where there is often an independent stream of gestural actions or images in conjunction with sound, or the sound-making process. From a psychological perspective, Fatone et al. (2016) state that we experience musical performance as auditory phenomena and through motor actions and visual imagery (Gritten et al., 2016, p. 203). In Walshe’s *Language Ruins Everything* (2013) there are choreographed parts and visual imagery displayed on a screen, along with vocalisations, and sounds from the piano. There are sharp contrasts between modalities of image and sound, such as when there is a calm visual image of the ocean, giving a sense of stillness and reflection, which is suddenly broken with the sound of fast snapping made by

of scissors. Here the audience is lulled into a false sense of security through the visual and then is suddenly woken from this through sound. In another part, as soon as the chorus of voices finish saying “THEN IT LEAVES” the actions of the vocalist and pianist suddenly begin to change. The performers start to curl their bodies inwards, as if they are reacting to the absence of the voices, or what was said. Throughout this work it appears as if each modality contributes to a cross-sensory dialogue, as played out on stage or through the audience’s sensory relationship with the work. The experience of multi-modal activity is found in various aspects of *Animal* with choreographed parts for performers who are instructed to ‘walk’ their fingers along lines on their instruments. The result is as much about the visual dramaturgy, in dialogue with the evocative use of video imagery, as it is about the sonic outcome. Visual and choreographic elements set up a framework to experience the sound that can be complementary. An example is when the performers on stage imply a frantic mode of being through actions without sound, which then has the potential to intensify the perception of a suddenly quiet, still sound occurring afterwards. Walshe explains that “the extra-musical apparatus serves to prime people for a certain type of listening, a certain type of engagement which encourages reflection. All this intermedial apparatus is in the service of sound.” (Walshe, 2015, p. 1). This shaping of the aesthetic experience or reception of sound can also be a vessel for higher conceptual ideas. *Language Ruins Everything* is a cross-modal meshwork which features physical gestures, musical gestures with and without sound, sounds where the source is not seen, and moving images. The pacing and content of the extra-musical movements, and moving image suggests they serve to prime the audience into a state of reflection and kinaesthetic empathy. There is a contrasting relationship between the spoken word and frantic movements, to the slower, fragile, or quiet actions. It becomes a juxtaposed sensory experience of parallel sonic and gestural imaginary; a composition dispersed among the senses rather than just sound. The term meta-gesture is used to describe the unitary cognitive experience that occurs through

the simultaneity of the different modalities: aural, visual, motor, and imagined (Gritten et al., 2016, pp. 215-16). Walshe's piece is a key example of visual and motor skills being integrated with musical action. She appears to compose for the different senses that are independent from one another. This has its roots in John Cage and Merce Cunningham's approach, as Cunningham explains:

What we have done in our work is to bring together three separate elements in time and space, the music, the dance and the décor, allowing each one to remain independent. The three arts don't come from a single idea which the dance demonstrates, the music supports and the décor illustrates, but rather they are three separate elements each central to itself (cited in Perloff, 2012).

In Walshe's work she typically assembles the artforms herself rather than relying on cross-art form collaboration. To relate this to a previous quotation by Walshe, this type of cross-modal thinking "facilitates the creation of new types of sonic material" and "promotes new ways of working with sonic material" (Walshe, 2015, p. 1). And by using stimuli from different modalities Walshe creates the unitary cognitive experience, and the context for the sound to be perceived. In *Dirty White Fields* (2002), Walshe provides a picture and a poetic description of a situation, what it looks like, feels like, sounds like, smells like et cetera, then uses this to make specific instrumental technique choices. When performers approach my works, *Mapping Australia* and *Animal*, they are also engaging with the content of the videos, with some level of interpretation of the score based on their own experience. The video score is also a way to open up the sensory world of the performer. This is something a performer is probably capable of doing without a video to some degree, but through the realism of the video it sets up a particular context for the sonic material to occupy and this

becomes the vehicle to access a certain area of one's memory and employ an appropriate sensory response. This resonates through to the senses as haptic pressures and gestural expressions, and through to the performers' attitude to the work—their seriousness, playfulness or sensitivity. It is also important to note that we already experience music as cross-modal (Gritten et al., 2016, pp. 215-16).

Hatten's broad definition of gesture of all types, which is, 'significant energetic shapings through time' (2004:93) helps us grasp the concept of cross-modal images combining cognitively as a unitary experience. 'The basic shape of an expressive gesture', Hatten states, 'is isomorphic and intermodal across all systems of production and interpretation, (2004:109). If this is the case, it may follow that multi-modalizing (whether one on is performing, teaching or listening) - is a spontaneous and automatic process (Gritten et al., 2016, p. 218).

2.5 Images and actions as musical meaning

Imagery and motor actions depicted in my scores and video sketching play the role of transmitting embodied musical knowledge between composer and performer, such as the nuances of friction and texture found in everyday objects, lines in musical actions and sound, gestural tracing, and music making as cartography incorporated with the political. It is also a way to access a deeper relationship, or correspondence with more abstract and intangible notions of temporality, sound, and the processes of making. My use of imagery to portray musical experience appears similar, in concept, to an example in North Indian vocal music, as highlighted by Gritten et al. (2016), where vocal teacher, Veena Sahasrabuddhep, materialises a compositional idea into a physical action to convey musical meaning to performers. For example, Sahasrabuddhep evokes a sense of 'elasticity' by using a concrete

object, in this case a rubber band, to portray elasticity as a musical property (Gritten et al., 2016, p. 217). Sahasrabuddhep also uses the image of tying a knot to convey the musical ideas of stretching, elasticity and the flow of musical phrases (Gritten et al., 2011, p. 211). This is considered a kinetic anaphone or pantomimic gesture. Kinetic anaphones are representations by means of sound and patterns of movement. The gesture accompanying the performance of these anaphones is a way to embody, and at the same time project, the meaning and the image the musician associates with it (Gritten et al., 2016, pp. 210-11).

Musicologist Philip Tagg discusses music in terms of analogy and anaphones: "if analogy means another way of saying the same thing, anaphone just means using an existing model outside music to produce musical sounds resembling that model (Gritten et al., 2016, p. 210).

Kinetic anaphones entail the stylised musical representation of movement rather than sound [...] as the subjectivised movement of objectively stationary objects or beings, e.g. the sort of movement the human hand makes when outlining rolling hills, waves on the sea, quadratic skyscrapers, jagged rocks, etc. (Tagg, 2004, p. 2).

In *Animal*, the match striking video is an example of a kinetic anaphone where texture is the central musical property being transferred. It is an existing visual representation used in the production of sound. For the hand actions of 'rolling hills' or 'waves on the sea' to become sounds they could just be assigned to a parameter like pitch or volume, but then why would it matter if it is a hill or a wave, it could just be represented as an abstract line and this probably would not make a difference in the musical performance. But if the object being traced is applied in a more meaningful way, this contributes to further meaning in the sound making

process. In the example from Sahasrabuddhep, the elastic band shows the musical phrases and is also a transmission to the student of the understanding of time as elastic. In relation to the match stick in my work, a rough texture is imagined, but there is also a transmission of concepts of resistance, tension, as well as monotony from the repeated videos, all of which can influence the type of sounds that the performers make.

Copy-Make

2.6 Video-based gestural sketches to facilitate musical thinking

Copy-Make (2015) is an interactive video installation work made as part of the ‘Composition Beyond Music’ course at Impuls Music Academy in Graz, Austria which I undertook on 13-25 February 2015. The installation, designed in Max/MSP, involves a webcam, a glass surface, semi-transparent paper, a projector, tape, two cushions, and two participants. Audience members or performers are invited to play with sound and movement on a glass surface. The installation is a way to explore gestures of the hands with lengths of recorded fragments being determined at the performers’ own discretion within limits. This typically builds a mosaic of independent lengths of segments and subtle differences of hand positions and lines of movement. A webcam records the movement, and plays back the footage on a projected 3 by 3 grid. Two people are required in the realisation of the work: one person is in front of the camera performing and signals to the another as to when to press record and stop. The instruction given is that each recording can be no longer than three seconds. A video sample is taken and becomes one of eight videos (the ninth being the live feed) that plays back and is projected onto the semi-transparent paper.

Figure 14: Photograph of the interactive video installation *Copy-Make* in Graz 2015, Composition Beyond Music



The text instruction is the scaffold of the work that is open to be realised as a video performance. In my video documentation I have discussed two approaches to realising the work. One is the 'blank-canvas' method, where time unfolds at the pace at which the video records gestures being made, copied, and interpreted. The performer is asked to copy their previous recording as a guide for their next recording until all eight spaces are filled with moving images. The performer then erases the gestures and starts the process again. The second variation in approach is to use a performance template with set timings. The performer records a set of eight gestures with the guide of a template that specifies differing gestural actions, such as movements that are slow and evolving, or short strikes in uneven rhythms, slow and soft, restricted force and a dense wavy line. Dynamics, duration, and texture are already assigned to each space and are overlaid over the images. This becomes a

fixed sequence that can be rehearsed, which distinguishes itself from a real-time generated score. It is also obviously more deterministic than version 1 where the visual score has no instructions and is wide open to the performer's interpretation.

In the more determined version, one panel is highlighted at a time by a transparent blue screen that scrolls through each panel one by one, which the performer follows and responds to by either imitating or inverting the movement or making complementary movements around the given shape in the video. There is a timer at the top left of each screen which counts down the duration in seconds showing how long to play that section for. Duration numbers were taken from my *Mapping Australia* structural diagram shown in Figure 6. Top right is the zone number; the performer works out the zones on their instruments beforehand and a diagram is used to label these areas on an instrument or on the glass surface area. Performers can draw lines on transparent paper in front of the camera, to be re-traced during the performance. Staff notation can be part of this template approach. It can be used to specify more detailed indications of rhythms, and details of hand and finger configurations and positions. Alternatively, another video of a hand moving could be used to communicate these instructions, eliminating the need for staff notation.

Additionally, parameters can be tailored to the performer. The dynamics, durations and textures can be determined by individual characteristics of the performer, such as how long their index finger is, the circumference of their head, and height etc. which are assigned parameters to specific durations, pressures and speeds. This information is inputted into the system and becomes a fixed part of the score.

In this installation I am working with video in the same way I would work with audio or score material. I think there is something revealing about working with compositional ideas

visually and physically that allows for non-conscious compositional processes to be discussed, examined and openly shared with others. Here the performer is also the composer or choreographer, as the performer builds a video collage of movements at the same time as shaping the sound.

Jean-Luc Nancy's *Listening* (2007) provides a useful framework for ideas around tactility and cross-modality, which are the central themes of my work *Copy-Make*. Nancy asserts that there are generalised assumptions, preconceived notions, and commonplace metaphors within the senses that affect our relationship with them (Nancy, 2007, p. 3). This is palpable in relation to the ear which is said to be related to withdrawal, and turning inward, and being resonant, and the eye as manifestation and display, and making evident (Nancy, 2007, p. 3). I explore an inversion of these eye-ear relationships with *Copy-Make*, which aims to make visible and evident the inner invisible place of music, an unseen world. At the same time the work explores the visuality of resonance: as one gesture is traced until all squares are filled with different variations on the same gesture, these looping structures create a saturation of the visual field until the system is turned off and reset leaving a visual resonance. A performer of *Copy-Make* records personal intimate gestures that are abstracted and displayed on screen, creating a public-private dichotomy which the performer negotiates—an inside and outside. The work can even be viewed from inside and outside of the installation's construction, as the the video is projected on transparent paper on a glass surface, which further articulates this metaphor. Nancy claims: 'To be listening is to be at the same time outside and inside'. (Nancy, 2007, p. 14).

Copy-Make focuses on the sensation of touch, as hand gestures move across a surface. For Nancy, it is touch that combines the senses. Touch puts "into the play the whole system of the senses" (Nancy, 2007, p. 3) "To listen, as well as to look or contemplate is to touch the

work in each part or else to be touched by it." (Nancy, 2007, p. 65). In *Copy-Make*, performers touch the glass and by doing so touch the work as it is being made, and are, in turn, touched by the work. It then becomes a collage of touch and sensation, and then, once the process is complete and the screen wiped clean, it becomes a memory of sensation, a process of 'feeling-oneself-feel', which is most present in the sense of the sonorous (Nancy, 2007 p. 8). But what Nancy is proposing is that the different modalities (or registers) crossover, stating: "nothing is said of the sonorous that must not also be true "for" the other registers" (Nancy, 2007, p. 71). Similarly, *Copy-Make* aims to bring ideas that may be apparent in the sonorous register to the visual and haptic senses, creating a process of inquiry, a critique of the senses, a delicate marriage of sensation, and a (re)composition of the sensory. (Nancy, 2007, p. 65). It is also much more common to: 'hear what you see': a piano, or some leaves stirred by the wind, but less common to 'see what you hear'. (Nancy, 2007, p. 10). I interrogated this assumption in *Copy-Make*, by experimenting with the notion of how we are *affected* by sound, listening and composition, and all its processes, and transferring these processes into a visual plane.

I wanted to present the perspective of music as a multi-gestural system, and as a spatial construction reflecting how the audience might perceive musicians' gestures on stage and how relationships can be made between the performers' movement and resulting sound. The installation takes participants through the process of creating the multi-gestural system that becomes unique to that person. The work challenges people to come up with their own process of making something. When recording the eight video sequences they cannot be redone, so any perceived mistakes are part of the work.

In Graz, the recording process was itself a live performance as gallery attendees gathered around to watch the videos being constructed. The performers often hit the glass surface with their hands or rubbed their fingers along it to create squeaky sounds. No audio recording was made of these so only the video reminiscences are left on screen. The audience members who saw the performance would remember how the sounds were made and so the video could conceivably act as a trigger for the memory of that sound. Once a work is done and the next person comes to record their work, the videos are erased creating a blank slate for the next person. To see their version of the work disappear came as a shock to some people who often asked whether I had saved the work. I see this as a reminder of the impermanence of sound when listening to live performance, an experience I value, rather than needing to own a recording or seeing a piece of music as fixed. I wanted the installation to reflect the spontaneity of making, which involves a correspondence between the people, the space, and available resources, where the resulting work is both personal and fleeting.

Claudia Molitor's video *Exquisite Glass* (2011) is a piece that was intriguing and prompted me to explore this visual approach to composition. To me, it communicates the delicate and fragile qualities that are evoked when I experience very soft sounds. A piece that evokes a similar response in me is the silent musical film by Jennifer Walshe called *The Softest Music in the World* (2008) made through her alter ego Turf Boon as part of her invented art collective Grúpat. Walshe's work shows how a video can suggest multiple sounds at once which led me to explore similar ideas in a composer-performer context.

The thinking behind the installation is cross-modal in that I am implementing the concepts I prioritise in my compositions, such as ephemerality, temporal independence, and dynamic stasis to shape the visual and performative experience. The gestures on screen are constantly moving but are within a fixed frame, reflecting the notion of dynamic stasis. The use of the

camera to capture dynamic movement and to reveal the grain of surface textures is analogous to how I treat sound textures and their magnifications. The silent hand gestures are a catalyst for reflecting on the potential of using physical gestures for structuring a composition before any consideration of the sound. In this way, the piece reflects my approach to video sketching as a part of my compositional practice in a fertile cross-fertilisation between aural, visual, and kinaesthetic sensory modalities.

Chapter 3: Dynamic stasis and kinaesthetic lines: grains and swarms

Memory Tape and *A Sense of Space* are two more recent works where I explore noise at the granular level and also in dynamic configurations to create effects of swarming. Both compositions use parametric staff notation to explore multifaceted kinaesthetic lines that produce a sense of dynamic stasis. My piece *Hyperbodies*, written for robotic piano using MIDI data, is also discussed below and shows how these concepts can cross-over from the kinaesthetic in embodied performance to the mechanical. The dual quality of dynamic stasis by which I mean something that contains qualities that are both fast changing and yet create effects of slowness or stillness at the same time, is expressed in these works as a combination of two contrasting motions: slow gradual changes occurring with rapidly changing material. Stasis is also found in the homogeneity of an instrument's timbre that has a consistency overall. Rhythmic irregularity can produce a statistical evenness that creates a sense of unchanging states at a higher formal level. Grains that form swarms of sound are viewed as thickly textured 'lines', which are part of my broad definition of a line in sound. The music creates an interweaving dynamic relationship between these dense lines in flux.

Memory Tape

3.1 Lines of texture and grains of sound

Memory Tape (2015) is a work for trombone, 'cello, and recorded media, and was performed by Stephen Menotti (trombone) and Ellen Fallowfield ('cello) at St Paul's Hall in Huddersfield on 5th February 2015. The work explores a lexicon of soft textured instrumental sounds taking their cue from the iterations of whispers produced by an empty rotating reel-to-reel tape machine. I focused on composing with microscopic grains of instrumental friction sounds that articulate wavering divisions of time as an orchestration of these tape sound qualities.

A tape machine is placed on stage and is turning but not producing any sound from its speakers. Small speakers are spread out across the space and are playing the recordings of multiple tapes crackling. The tape machine acts as a concrete visual representation for the listeners to associate with the sounds. The set up creates a dislocation between what appears to be a sound source (the tape machine) and the actual sounds coming from the speakers. The speakers were placed around St Paul's Hall near the entrance, on the audience's seats, to the left and right of the audience and behind them. The speakers played textured sounds, such as various grainy crackling noises that provide spatial colouring to the listening experience. Each speaker had its own channel of sound which looped repeatedly throughout the performance. The tape sounds on each channel moved at different speeds with varying degrees of noise. The sounds are low in volume, not intended to be distracting, and could easily be drowned out by musicians on stage. As the speakers are situated around the performance space, the audience are aware of their presence as they take their seat.

My interest in these subtly changing textures where I work with different levels of magnification is directly connected to my experiments with the video camera. By zooming in on objects with the camera, details of the texture of surfaces are revealed that display a more dynamic and complex liveliness than can be perceived by the naked eye. *Memory Tape* is a further study of that formative experience of following lines on the ground with a video camera and the constantly changing shapes and densities of detail revealed. In the work a sustained pitch is a conceptual 'ground' which is revealed to contain myriad microtonal fluctuations and changes in timbral and textural detail. The ways in which I explore this at a micro-level gives rise to a higher order structure in that transformations between the trombonist's vocalisations and multiphonics, with the 'cellist's bowing speed and airiness of tone define a pattern of phrases.

Examples of the way in which I magnify micro-particles of sound can be seen in the ‘cello part, where there are changing transitions of bow position. For instance, from sul ponticello to distortion in bars 1-2, with a gradual transition to soft dynamics which I refer to as a low level of magnification. The changing microscopic grains are influenced by the bow position and the grinding tremolo with its changing speed, as well as the beating sounds that result from the microtonal pitches. Stasis comes from the slow overall pace of the piece, reinforced with some sustained notes such as the low C in the ‘cello at the beginning. There are subtle microtonal changes but this still gives a sense of an overall evenness and continuous sound resulting in a drone effect. Inside this slow pace is the ebb and flow of faster dynamic movement such as when the ‘cello plays fast rough edged distorted tremolo sounds.

Figure 15: Excerpt from *Memory Tape*, ‘cello and trombone, bars 53-58

The image shows a musical score for two instruments: Trombone (Tbn.) and Cello (Vc.).

- Tbn. (Trombone):** The staff is in 5/4 time. The melody consists of a series of notes with dynamic markings: *mp*, *ppp*, *mp*, *ppp*, *mp*, *ppp*, and *mp*. The notes are connected by slurs, indicating a continuous line.
- Vc. (Cello):** The staff is in 4/4 time. It features a complex texture with multiple layers of notes. The first measure starts with a *f* dynamic. Above the notes, there are various microtonal interval notations: $I [6+11+5]$, $II [6+11+5]$, $II [4+11+7+3]$, $II [6+11+5]$, $II [4+11+7+3]$, $II [6+11+5]$, $II [4+11+7+3]$, $II [6+11+5]$, and $II [4+11+7+3]$. The notes are often beamed together, suggesting a fast, textured tremolo or multiphonic effect.

Pitch is typically organised around an exploration of beating effects as a result of two tones moving in and out of phase with each other. Both the ‘cello (using double stops or multiphonics) and trombone (playing and singing) create these pitch phase shifts moving in and out of relation through intervals of major and minor 2nds and 3rds, 4ths, 5ths, microtonal shifts, and glissandi, shown in Figure 15. Shifting rates of beating patterns create a densely textured and dynamically multi-faceted soundscape.

Compositionally, there is a broad spectrum of parameters covered across the course of the piece, resulting in a variability of sound identities which generally have a short life span and do not necessarily connect in motivic ways. Figure 16 shows an example of the short life span of higher order phrases. This non-motivic characteristic is a way of representing a dynamic flow of musical activity where the focus is on changing grains of texture, producing lines of varied frictions and dense multiphonics rather than a single focus of a limited set of parameters or specific sound character. *Memory Tape* has instances of sounds in a low dynamic range, which allows for moments of reflection, such as towards the end where the trombone bell is placed in water and plays long notes with airy tones of the ‘cello, but this is more part of a global fluctuation rather than a consistent attribute. The focus on the music is not on long term developmental threads through time. The form is more like a winding journey that fluctuates as swarms of textural density. On a micro level there are some small actions that are repeated but not in such a way that is significant to the form. The piece is not made up of easily categorised phrases in terms of pitch relations even though there are recurring timbres or techniques such as singing and playing simultaneously on the trombone. Even here, the timbre becomes so different, blended and morphed over time that it loses its identity and there is generally no consistent thread, except that its inconsistency is a form of consistency. For me, the overall slow pace, containing faster micro movements created through tremolo, interval dissonance or timbral grittiness, establishes a loose fabric in the music.

The sonic template provided by the turning tape machine and its turning wheels guides the piece and frames the placement of the many changing sonic events. However, the changing material is also supported by regularity in the music such as in the ‘cello when it continuously uses a tremolo effect, repeats glissando gestures and the jeté technique, or plays with breathy tones for extended periods of time. These aspects are what can be

associated to the looping tape machine. There are gradual changes in timbre with different sonic behaviours that expand, contract and morph over time. This can be found in the trombone and partly in 'cello, shown below in Figure 16.

A Sense of Space

3.2 The performance space and the kinaesthetic transference of gestural lines

A Sense of Space (2015/16) is scored for flute, guitar, voice (also playing percussion such as shredded bamboo whisk, sandpaper on wood, and thin flexible plastic). The work was performed by Tracensemble: Alba Bru Carci (flute), Diego Castro Magaš (guitar), Peyee Chen (soprano with percussion) in St. Paul's Hall at the University of Huddersfield, on the 5 March 2016. The piece continues the language of working with different levels of magnification of sound that reveals grains and particles. The particulate sound vocabulary includes scratching on guitar strings with different durations and speeds, the sounds of crumbling shredded bamboo, and brushing sandpaper on wood. The vocalist with her breathy sounds emulates these qualities. I was interested in the tactility of these elements and the ways in which a minuscule perception of texture creates both abstract and concrete effects. My previous pieces have worked with magnification of visual materials through a video sketch process and this analogy can clearly be applied to details of sonic texture which can be increased or decreased at different levels of magnification. At the abstract level, I can work with similar categories of sound with a white noise spectrum that can be heard as distortion or airy tones. Varying degrees of density or resistance are shaped where physical pressure is the key parameter for controlling the audibility of the graininess or grittiness of the material.

At a more concrete and perhaps emotional level, the form of the work reflects on the dynamic qualities of sounds that I experience in daily life. I notice my sensitisation to white-noise spectra when I go to busy coffee shops with their soundscapes of colliding voices, the irregular thuds and release of steam from coffee machines, glassware, chairs moving, or traffic sounds in the surrounding area. A performance space might be quieter but is still

populated with all sorts of activity, from the reverberant resonance of tiny creaks as people move in their seats, passing traffic or the audible hum of air conditioning. This sonic activity can go unnoticed, especially when there are other sounds that we are choosing to focus on. A *Sense of Space* is an interaction with sounds present in such a space, and memories of public spaces, emulating the details of their sonic characteristics as well as amplifying them. The piece explores in a dynamic way the relationship between these sonorities and highlights the point that sounds in a space are not static, but rather we are always engaging with an environment populated by changing sonic ‘grains’. The approach in my instrumental writing is about articulating that kind of dynamism through gestural variations, changing volume envelopes, and differences in textures from the instruments. The frequent interpolation of rests as well as quiet passages allows the sounds of the performance space to become more present to audience attention. Each instrument generally has an equal level of contribution, making it non-hierarchical in its timbral distributions. Pauses often occur after sections that are populated with the dense sound activity of a flourishing string of micro-tonal pitches, and parts offset in uneven rhythms.

The vocabulary of lines in the staff notation can be used to explain the relationships of movements with instruments like the slow fingernail scratch across the line of a guitar string. Fatone et al. (2016) shows how there are unseen lines of movement found in the vocal tract of the vocalist, such as inclining the cartilages of the larynx to raise the pitch of a sung note (Gritten et al., 2016, p. 203). The soprano in my piece creates quiet, air sounds with changing vowels as if a language was being whispered or is just out of audible range. In the guitar part there are tracings across the spatial landscape of the instrument where the guitarist is asked to rub their fingers across the body of the guitar, and produce scratch tones on the top two strings.

Bregman's work on gestalt theory and in particular, stream segregation of auditory phenomena provides a useful tool for understanding my compositional choices in *A Sense of Space*. Stream segregation refers to the ability to differentiate between high and low pitches and noise concurrently. If pitch or noise is separated into high and low frequency bands, we are able to hear them as two independent streams (Bregman & Ahad, 1990, p. 11). This separation will also be strengthened if there is timbral segregation (Bregman & Ahad, 1990, p. 26). However, Bregman and Ahad's studies on pattern recognition show that when there is rapid movement across the perceptual streams it can be difficult to pay attention to meaningful pitched activities occurring at the same time, creating the effect of sounds interfering with one another, resulting in an ambiguous blur, with details missed on first listening. When listening to my piece I am sometimes able to determine the individual timbres of the ensemble, whether this is the guitar playing a melody using a slide or making clearer melodic lines or more fragmented breathy grains of sound. As the speed and the amount of activity increases I am no longer able to pay attention to all the details that move rapidly through the high and low perceptual streams. A kind of perceptual overload occurs, and in the music this tends to be followed by sections with a reduced sound density and speed, or a focus on an isolated timbre. A compositional strategy I use is to place two instruments of similar timbre in the same range such as the flute and the high strings of the guitar. The purpose of this is to create ambiguity of instrumental timbre, that can possibly lead to misperceptions of listening, and the necessity for multiple listens to determine what is happening, or to experience another line of listening. This occurs throughout the piece, where there is an alternation between timbral fusion and timbral segregation. A similar example of this is when the light crushing sounds of the bamboo, masks and distracts from the pitched material, or the clarity of another sound, or during moments of rest. I do this to create interference between the sounds, and to break up the clarity of the instruments, increasing their sense of unpredictability. This is somewhat comparable to the examples of

‘noise bursts’ given by Bregman & Ahad (1990). They claim that when a sound is followed by a more complex or intense sound the auditory system tries to detect continuity with the preceding sound (Bregman & Ahad, 1990, pp. 60-70). Whilst my intention is not to create textbook examples for Bregman’s theory, the work can usefully be considered a study in perceptual continuities and discontinuities. I am interested in expanding the definition to include textured sounds of indefinite and definite pitch, to shape different levels of timbral continuity as well as effects of repetition around fragments which have swarming characteristic. The auditory phenomena triggered by ‘noise bursts’, is also of interest as a strategy to create effects of continuity despite surface discontinuities in materials. In *A Sense of Space*, any loud, short, and relatively complex sound, can act in this way. But they also go through transformations as timbral variations, nuances, contours, and dynamic expressivity. They sometimes act as distractors but are also focal points of interest, and integrate into larger swarms of activity. This opens up another perceptual entity, around foreground and background features, distinguished not necessarily due to differences in volume, but as a result of the complexity of the sound or noise spectra, that masks other sounds momentarily.

Table 2: The perceptual entities and gestalts at play in *A Sense of Space*

Overload	Reduction
Fusion	Segregation
Continuity	Interference
Swarms	Grains
Dynamic	Stasis

Figure 17: Excerpt from *A Sense of Space*, bars 59-64, showing a swarm

Figure 18: Excerpt from *A Sense of Space*, bars 1-11, showing grains and swarms, and how they create continuity but also act as interferences between each other

Figure 19: Excerpt from *A Sense of Space*, bars 118-123, showing a perceptual overload, with examples of both timbral fusion and segregation, with localised grains of sound

An aspect of my compositional process is to integrate the sounds of the ensemble, making it difficult to determine which instrument is playing what sound. This creates a fusion of interweaving timbres with a goal of hearing the ensemble as a combined swarm, where part of the listening experience is about the larger formations of sound over longer timespans. In addition to listening for swarms there is also a complex mesh of sounds to explore on the micro level. An example of this is when all instruments are playing at once during bars 59-63.

Sequential integration happens between the flute and guitar when the pitched sequences pass between the instruments and the pauses are filled with noises from the percussion that give it a sense of continuity—seen in bars 118-126. While the musical activity is changing and dynamic, its continuity is generally fragmented, constantly returning to a global rest, and without a regular pulse. Through these means, I aim to create work which has qualities of either being stationary overall, which moves at an extremely slow pace. The collection of fragmented grains of sound, and kinaesthetic gestural lines, can then be perceived as dynamic swarms of density, that is encased in a larger and slower container of perceived movement.

Hyperbodies

3.3 Robotic gesture: lines as swarms and hyper gestural imagery

*Hyperbodies*⁶ (2015) was composed using Ableton Live's MIDI sequencer, working with MIDI data to control pitch, velocity, and durations of each note. The process behind the work was to use a single short rhythmic sequence $\parallel : \text{♩} \text{♩} \text{♩} \text{♩} \mid \text{♩} \text{♩} \text{♩} \text{♩} : \parallel$. This rhythmic template is repeated and assigned to all 88 keys of the piano—with each key also

⁶ *Hyperbodies*, for a computer-controlled piano, was made as part of a workshop at the University of Huddersfield run by Prof. Peter Ablinger and Prof. Winfried Ritsch, 19-25 October 2015.

Figure 22: Time-line MIDI note sequence of *Hyperbodies 10'40"*; arrows indicating lines of glissando

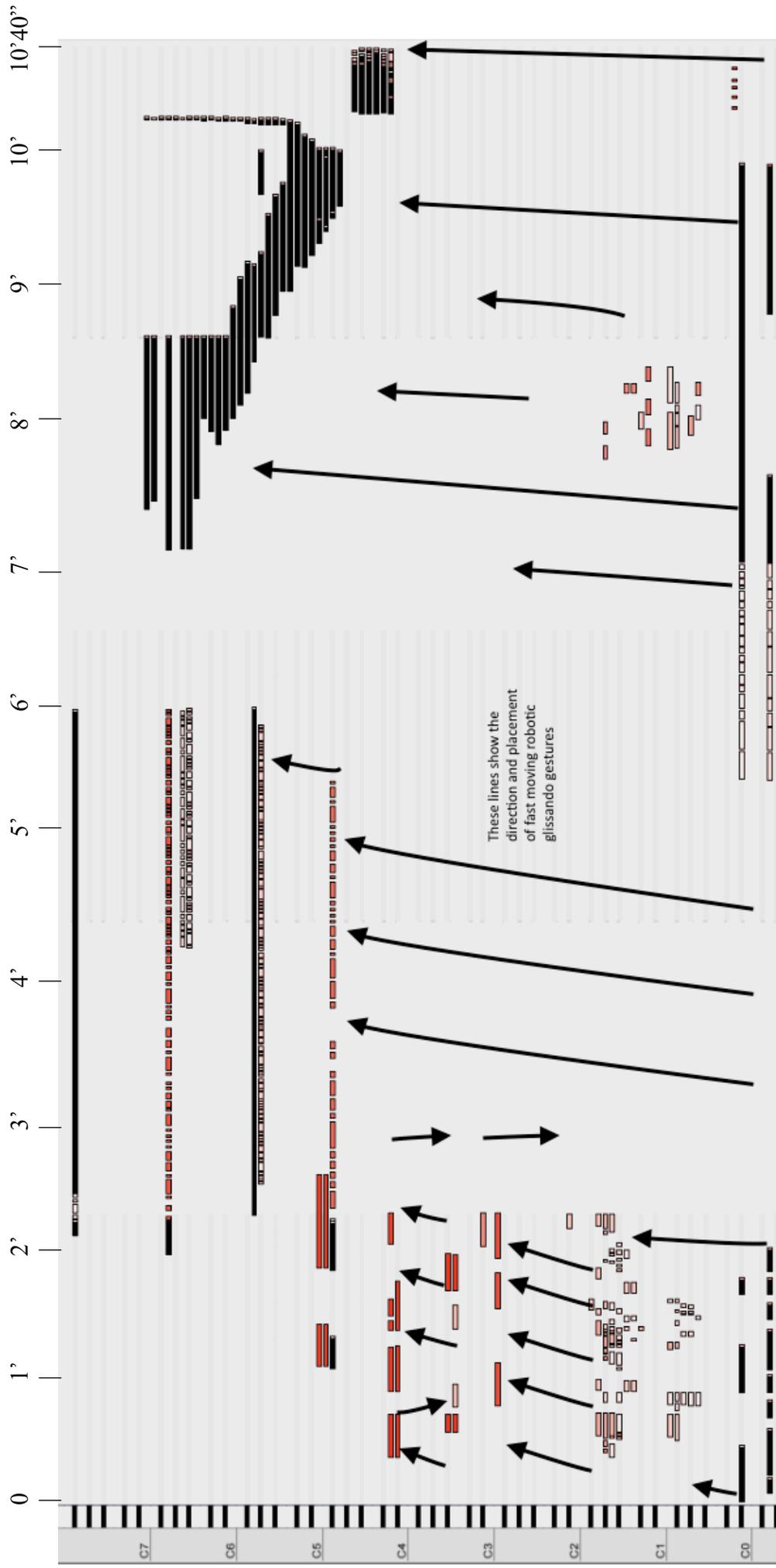
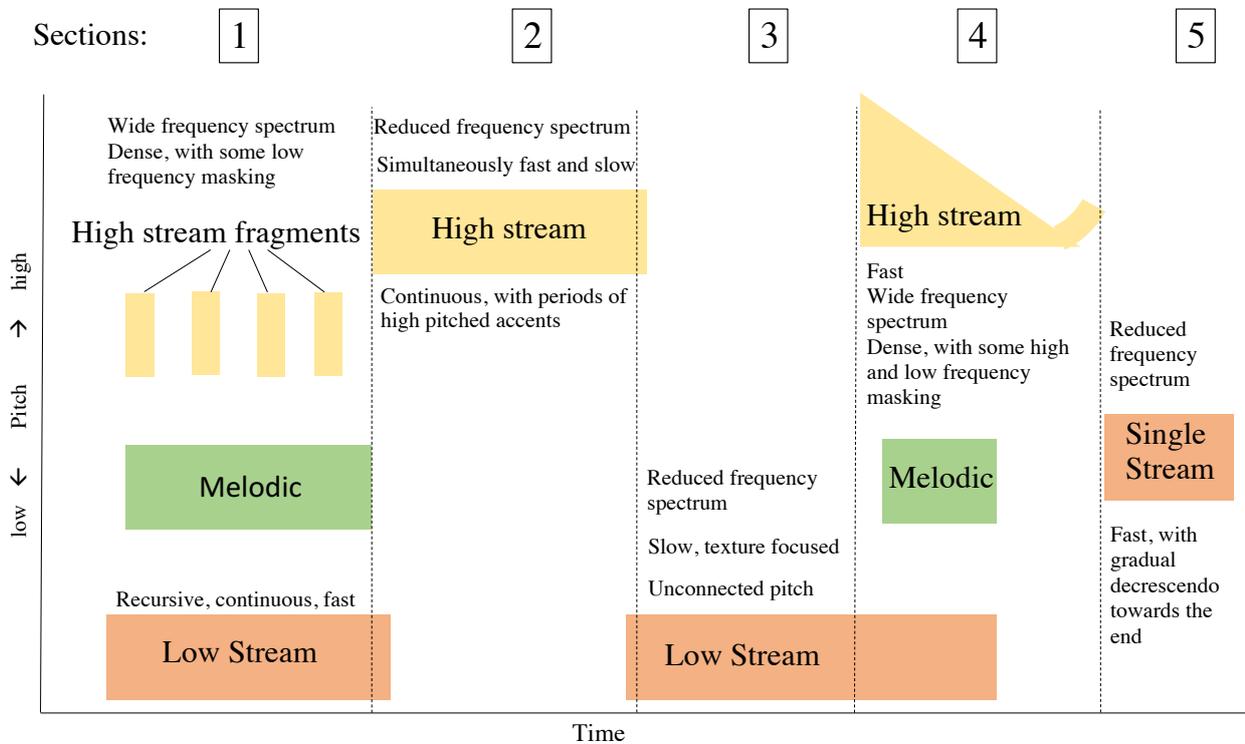


Figure 23: A graph showing the overall form of *Hyperbodies* broken up into high and low streams with text describing sonic characteristics, without glissando



The overall form of the piece moves between parts that have wide frequency spectra with rapid movement across the high and low streams, and masking of sounds, to parts that have a reduced frequency spectrum and are more concentrated and focused. Sections are differentiated by contrasting speeds, levels of density, and by the separation of high and low streams. Most registers of the piano are used, along with their timbre differences, which have a fairly even distribution. Long and regular glissando sweeps generally occur every 20 to 30 seconds, in sections 2, 4, & 5. This temporarily opens up the frequency spectrum, analogous with my experiences with making my line walking videos and how suddenly, colourful objects would pass the viewfinder, like a patch of grass, then disappear off screen and then the focus would be back on the line again, or in this case the reduced frequency bandwidth of fast repeated pitches. Section 1 has smaller and more frequent glissando lines that integrates with the faster, denser, and more blended characteristic of that section.

Section 3 has no glissando sweeps and this absence is replaced by slow speeds with a reduction in pitch material, and where the grains and overtones of the low piano keys become the focus.

The original rhythmic sequence can be distinguished but at times its pattern is masked, as the multiple repeating patterns are playing at once, giving the impression of a swarm of pulsating textures in a suspended stasis. The precision of the machine means that fast swarming clusters of notes sound uniformly together but I also broke up this uniformity and embedded into the MIDI notes irregular subtleties and inconsistencies that introduce a more 'human' quality to the texture. This was achieved by an imprecise method of lining up MIDI notes by hand. For instance, many of the glissando lines are not perfectly in time or lined up geometrically in regular intervals, and rather have subtle pauses or glitches, or may even sound unfinished, or incomplete. To me this represents an unstable line with a course that is uncertain, appearing to decide its direction in real-time and which could radically change at any point. This is obviously a constructed idea in this piece because all activity is pre-programmed, but this representation of inconsistency is what gives this impression. The changing speeds of glissandi lines give a sense of flux that punctuates the piece, and the additional notes and melodies surrounding the repeated patterns break up its regularity. The sequence played on the low register creates a muddiness, masking the clarity of the rhythm, becoming a rumbling pulsating sustained tone.

Hyperbodies takes some of its cues in its handling of temporal layers from Conlon Nancarrow's multi-tempi approach particularly *Study for Player Piano No. 5* (1962) & *Study for Player Piano No. 37* (1982). I was interested in how sheer speed, force, and complex temporal layering opens up new questions in relation to sonic gestalts already outlined. What is gesture without the body? And what is heard when the music transitions beyond the

realm of human performability? Musicologist Rolf Inge Godøy proposes that gestural imagery is “our mental capacity for imagining gestures without seeing them or actually carrying them out, meaning that we can recall and re-experience or even invent new gestures through our 'inner eye' and inner sense of movement and effort.” (Godøy, 2003, p. 55). *Hyperbodies* at times is performed beyond the listener’s inner gestural imagery capacity with tempi ranges at around 300 bpm. It gives the impression of a hyperactive virtuosity—as explained by Eric Drott in his article *Conlon Nancarrow and the Technological Sublime* (2004). The sounds of the piano can then be thought of as a multi-dimensional "hyper-real" gestural-sonic sensorial experience. Lines are perceived as visual mechanical gestures of the moving robotic parts moving in sequence during a glissando. At these speeds, the digitised line becomes moving swarms of rapidly occurring note clusters. The work remains close to gestures of a performer’s ability. It establishes plausible pianistic gestures but then transcends this into the hyper-real or something beyond our grasp to relate to as real performed experience. There is a superhuman frenzy that overloads the listener's cognitive capacities (Drott, 2004, pp. 534-535).

The global structures of the piece are thought of in terms of an analogy to the hyperbody in architectural terms:

Hyperbodies are buildings and environments which can continuously change shape and content. The mutations of such buildings depend on the input coming from their user as well as from the surroundings. This interaction between user and building is determined by a data flow which the hyperbody uses and converts into a hypersurface structure, which then alters our perception of space in and around the hyperbody. (Oosterhuis, 2003).

I compare this idea in architecture with my relationship to the computer-controlled piano (or possibly any piano). The data (whether score, or MIDI file) is input into the piano, and in this case, causes the mechanical devices to move up and down and press the keys. My concept relates to the architectural hyperbody where in this case the sounds are perceived as a flux of slowly evolving changes. The large-scale clusters and extremes of speeds make the original sequence no longer recognisable. There are also elements that are abstracted from this system such as sustained pitches, hidden melodic fragments during loud passages, and fast chromatic glissandi. The robot piano could not control the sustain pedal so instead I programmed the MIDI file to continuously hold down the notes that were not being used to create a resonance for the sounding keys. Figure 22 shows arrows that indicate lines of robotic glissando that are beyond the capacity for a human performer. The lines create distinctive points of reference across the textures of irregular swarming patterns.

Hyperbodies further develops my aesthetic ideas around dynamic stasis. The work is dynamic in that it has fast rhythmic speeds, rapid movements of pitch across high and low registers, changing contrasting sections, a wide dynamic (volume) range, a wide frequency spectrum, and frequent changes between these parameters. Stasis is seen through the use of repeated rhythms on single notes and the resulting drone-like characteristic (some producing lower frequency resonance), temporal wavering or irregularity that breaks up regular divisions of time and a sense of pitch continuity. In *Memory Tape*, instead of a repeated rhythmic pattern to create a drone quality the 'cello uses small recursive actions with slight micro-tonal pitch changes to vary the effect of stasis. Here the 'cello's 'stasis' is relative when compared to the rapid dynamic changes of the trombone happening simultaneously. The instruments in *A Sense of Space* play a much more integrated role, with frequent rests that break apart a collective momentum and overall pitch continuity. A suspended quality is

maintained as a result of the large vocabulary of breath-like and noise textures some with indefinite pitch, and some with small amounts of pitch and more noise content that are distributed in a quasi-statistical manner. In parts where pitch is more audible it tends to be restricted to microtonal or semitone pitch movement in an ascending direction, or as a series of transient moments, or appears as oscillating patterns and hence does not result in forward movement.

Conclusion

The use of a video camera in my PhD project was a way initially of keeping a record of a particular perception of the world that highlights visual, kinaesthetic and tactile qualities. I see this method as a way to illuminate life, as a creative spontaneous act, or improvisation with my environment. Nancy proposed that what is true for the sonorous is also true for the other modalities (Nancy, 2007, p. 71). My objective in *Copy-make* was for there to be a cross-fertilisation of the senses. I wanted to break down assumptions such as the association between the ear and qualities of inwardness and resonance, and between the eye and the capacity for making evident. These associations were inverted in *Copy-make* by making an inward visual resonance. Kagel had a similar desire to re-humanise music-making and challenge the audience to shift between the theatrical, auditory and instrumental based movements outside the frame of standard performance practice. The drawings of Kandinsky were a particular inspiration for my work in the ways they revealed a relationship between lines drawn on paper and lines made in space and time, where lines become planes and planes become bodily movements and vice versa. This expanded my thinking as to the possibility of working closely with line drawings and the body, and turning these gestures into a music notation. I engaged with these concepts in *Mapping Australia* through the use of a video score that displayed sequenced movements derived from the orientations and actions of the hand, and lines drawn on a surface.

It is possible for my eyes to replace the viewfinder, and for my memory to replace the video file on my hard drive. But through the use of the camera I was able to extend a simple receptivity to my surroundings, and the dynamic life of walking, into an elaborated map of sonic and gestural lines in my compositional practice that is essentially multimodal in its approaches. The abstract line in notation is compared with everyday lines, as found in

walking, bringing the abstract into a social space. (Butler & Zegher, 2010, p.182). The difficulties I encountered in finding ways to share my experiences, to find productive ways of transforming an initial idea, and for keeping records of my experiments for later reference have prompted a line of research. It has opened up my work to a practice that is about exchange or correspondence with others, whether performers or audience members. Video sketch processes have enabled me to articulate my observations and experiences as well as challenging me to see through someone else's or something else's perspective. A dynamic interchange underpins my use of the found footage in *Mapping Australia*, where I had to understand the context of the video, and the video informed the way I dealt with the piano, and the formulation of a performance practice responsive to moving images. The composer and performer relationship in this work is a highly comprehensive exchange that is concentrated into the 7 minutes of the performance.

My pieces have been concerned with a language of micro grains of sound permeating saturated textures as a stippling effect of multiple gradients and degree of swarm densities and clusters, that when zoomed out are observed as multi-constellation forms. Dynamic stasis is embedded into the framework of the pieces with its quality seen on the micro and macro level whether as irregular temporalities with fast changing segregated timbres and wide dynamic ranges, or as a fleeting, texturally dense, fused multi-instrument that creates a pulsating drone.

My view of the creative works presented in this portfolio is that they are not complete, fixed entities, considered to be a historical record like a window into the past. This was discussed by Ingold in his lecture at Leeds that I attended; he critiqued the misapprehension of the idea of looking backwards at an artwork, and trying to understand the artist's intentions at the time. He said 'this gets you nowhere when it comes to learning something from the artwork,

[one has] to join in with the art-making process, which is a process of becoming, and think forward with the art' (Ingold, 2014, 16'20"). For my own works it is more useful for me to think forward with them so they can be reinterpreted, and to see the score material as fluid objects capable of being recomposed, transformed, or repurposed for a new piece. This follows through on my theme of dynamism as present in the content and process. If video can be used as a sketch process for sound, then surely other virtual environments can become sources or even frameworks for sound to inhabit. One example might be making a score generated in a video game that performers rehearse and experience in the lead up to a performance. My video sketch process of filming lines could be replaced by a compositional process of filming dance as a way of further developing the ideas that are explored in this thesis: gestural tracing, multimodality, ephemerality, levels of granularity, swarming forms or building a collection of filmed footage to create notational maps. While filming, my compositional eye can focus on the movement, timing and speed of the body in relation to the speed of the camera, and in relation to any unplanned background content, as well as considering the distance between these objects, textured surfaces, and visual granularity that passes across my viewfinder. From here, I can think about ways of mapping this onto the parametric approaches to notation I have developed through this portfolio. Alternatively, I could use the camera primarily as a procedural tool for modeling my compositional thinking, with the video as a tangible multifaceted object to refer to in my creative process. My staff notation and video practices are methods of mapping the diverse and dynamic manifestations of the life of lines through multimodal perspectives and disciplines, brought to the foreground in my compositional practice.

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Score

Kagel, M. (1969/70). *Atem; for 1 wind instrument*. Darmstadt, Germany.

Appendix

The portfolio is supplied with a USB stick containing digital media that is referred to in the thesis and media that is part of the documentation of the creative works, that includes: audio recordings, video documentation, videos that accompany performances, and video score material. Some works also use websites as a platform for the notation.

The content of the USB stick is as follows:

1 Line-Walking Southgate 6 March 2014.mpeg (14'15")
2.1 Mapping Australia Audio (recording of performance).wav (7'39")* 2.2 Mapping Australia Video (recording of performance).mp4 (7'32") 2.3 Mapping Australia Video (score).mp4 (7'05")
3.1 Memory Tape Audio (recording of performance).wav (11'35") 3.2 Memory Tape Video (recording of performance).mp4 (11'14")
4 Copy-Make Video (documentation).mp4 (6'16")
5.1 Animal Audio (recording of performance).wav (10'33")** 5.2 Animal Video (to accompany live performance).mp4 (10'21") 5.3 Animal Video (choirs score).mp4 (10'10")
6.1 Hyperbodies Audio (recording of performance).wav (10'28") 6.2 Hyperbodies Video (recording of performance).mp4 (10'28")
7 Lines of Fragmentation Audio (recording of performance).wav (6'42")
8.1 A Sense of Space Audio (recording of performance).wav (9'29") 8.2 A Sense of Space Video (recording of performance).mp4 (9'27")

*Website containing score materials: <http://www.danielportelli.com.au/piano>

**Website containing score materials: <http://danielportelli.com.au/choirandensemble>

There is no audio or video documentation for:

Undulations (2014)

for two soprano saxophones - 6'09"

Tokyo University Players