CHOREOGRAPHIC SOUND COMPOSITION

Towards a poetics of restriction

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

The University of Huddersfield

March 2019

Title: Choreographic Sound Composition

Subtitle: Towards a Poetics of Restriction

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Degree: Doctor of Philosophy

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Abstract

In the submitted commentary, I explain the creative process behind my dance and sound compositions mediated by interactive technology. Based on my literature review, the majority of research in interactive dance was associated with gesture-driven computer music in the 1990s. As a consequence, debates and criticisms followed concerning the gestural articulation of technology, which in turn built the assumption, without substantial practical research, that this would be useful for dance composition. I find that this approach misses the aesthetic aspects of creating choreography with professionally trained contemporary dancers. For this reason I adopt a different approach than gestural articulation to control sound synthesis. I integrate interactive sound systems into the creative process of choreographic composition. To achieve this, I investigate the fundamental principle of choreography on the basis of Rudolf Laban's choreutics theory, and also the choreographic methods of contemporary choreographers such as William Forsythe and Wayne McGregor. Based on these investigations, I use Gametrak controllers, a visible and tactile motion-sensing device, to provide choreographic stimuli. Tethering the controllers' cables to a dancer's body restricts the size and shape of the kinesphere. This restrictive condition primarily challenges the dancer to move beyond his or her habit during improvisations. The movements that are created result in sound composition. This is my own unique technique, which I call choreographic sound composition, for employing directed improvisation as a compositional strategy. Ultimately, I draw out not only the technological development as a compositional act, but also the holistic compositional cycle in collaboration as a composition. I explain this collaborative compositional process by adapting Simon Emmerson's model of composition. Finally, I present my portfolio of original works to demonstrate how this research idea is articulated in practice. *Locus* is the first experiment with my methodology of observing how the restrictions created by the Gametrak controllers affect the dancers' awareness of their bodies. In the following work *Pen-Y-Pass*, the technical aspects of this experiment are elaborated by employing visual composition as a choreographic stimulus as well. In *Temporal*, two chairs are used in addition to the Gametrak controllers to create double enforcement for the restriction as well as to evolve a dramaturgy. Eventually, the final work *The Music Room* considers the total condition of the piece – Gametrack controllers, the performance space, and the sound triggered by the dancers – as a physical enforcement of the restriction.

List of Works

2015

Locus 14’ 20”

(Interactive audiovisual dance composition)

Screendance Premiere: Sound/Image Colloquium, University of Greenwich, London, UK, 7th November 2015

Live Performance Premiere: La Escucha Errante Festival, Bilbao, Spain, 12th December 2015

Pre-study for *Locus*

Untitled 10 6’ 28”

(Audiovisual work – fixed media)

2016

Pen-Y-Pass 13’ 25”

(Dance film with interactive audiovisual)

Premiere: Artist Talk, Computation, Communication, Aesthetics & X Conference 2016, Bergamo, Italy, 8th July 2016

Pre-study for *Pen-Y-Pass*

NEON 7’ 27”

(Interactive audiovisual dance composition with live musical instruments)

Premiere: The Adaptive Music Technology Research Group Presents, Bates Mill, Huddersfield, UK, 24th February 2016

Temporal 12’

(Interactive sound and dance composition)

Premiere: Shaping Time.Space, Flux Factory, New York, USA, 23rd September 2016

Pre-study for *Temporal*

UnoChair 19’ 28’’

(Interactive scenography workshop)

Premiere: Public presentation, Charles III University of Madrid, Madrid, Spain, 24th June 2016

2017

The Music Room 5’ 45”

(Dance film)

Premiere: Athens Video Dance Project, Athens, Greece, 19th January 2018

Extra-study for *The Music Room*

Queen of the Night 5’ 06”

(Dance film)

Premiere: Athens Video Dance Project, Athens, Greece, 19th January 2018

Acknowledgements

Foremost, I would like to acknowledge my collaborating dancers Katerina Foti, Natasha Pandermali, Fumihiro Kikuchi, and Valerie Green. My research would have not been possible without their kind and generous dedication and support.

I also would like to acknowledge my friends in Athens, Maro Delfini, Dimitris Patrikios, Xaris Vasiliadis, and Christos Massalas, who brought their own cameras to help film *Locus*; the filmmaker Lucas Chih Peng Kao, the cinematographer Kirstin McMahon, and the grips Doug Newton and Dylan Newton for the great work on *Pen-Y-Pass*; Javior Aparicio, Alfredo Miralles, and all the staff members at Universidad Carlos III Madrid who helped organise the workshop *UnoChair*; and the workshop participants Eduardo Suarez Suarez, Yeonji Gong, Usama Chaikh Elghoul, Gonzalo Esteve Feliz, Elena Gámez Cruz, Peter Gehlshoj, Paloma Maestre Valencia, Angel Seijo Vaquero, and Rocío Tejeda Carerizo.

Thanks to Dance Cultural Centre DAN.C.CE Athens, Flux Factory, and *KIN*. Huddersfield for providing space for filming, and to P.A.R.T.S. Brussels for letting me access their library to study Anne Teresa De Keersmaeker's choreographic scores.

Thanks to the University of Huddersfield for offering me a research scholarship to initiate my research. Thanks to my supervisors Dr Julio d'Escrivan and Prof Monty Adkins, and my colleagues from CeReNeM. Special thanks to Dr Hilary Elliott from the drama department for her special supervision. Thanks to Tim Rutherford-Johnson for proofreading.

Thanks to my friends Dr Pete Furniss, Dr Dane Lukic, and the composer Dimitrios Skyllas for your advice and encouragement. Thanks to my family and to Boris, who have been always next to me with their biggest and most patient support and love.

Submitted Materials

Along with my written commentary I have submitted some supporting materials in the accompanying USB memory stick. The USB stick includes **1) my original works**, **2) video examples** indicated in this commentary, **3) audio examples** indicated in this commentary, and **4) Max and vvvv patches** I created for the original works.

The commentary may also be read at: **http://junginj.wixsite.com/junginphd**. Because my commentary contains many video examples I have therefore created this web version to help readers access these easily. The web version is an exact copy of the printed commentary but with embedded video links.

Introduction

In this commentary, I explain the creative process of my dance and sound compositions mediated by interactive technology, which I call choreographic sound composition. I should emphasise that what drives me to create interactive systems is the facilitation of a dialogue between the sound system and the dancer, to devise choreography and sound works together. According to the choreographer Wayne McGregor, creating choreography is a "physical thinking process" (McGregor, 2012). He believes that we are all experts in physical thinking in everyday life, but are rarely aware of it unless we have body problems. The aim of using Gametrak controllers in my choreographic sound composition was to cause physical problems with its restrictive characteristic, and consequently to provoke the cognitive physical thinking process. In turn this technology became the crucial communication method with my dancers to create the synthesis between dance and sound.

Figure 0.1: An image from the residency at Dance Base in Edinburgh in 2011 capturing the contrasting (active and still) movements from two dancers. (Photograph by Colin Chipchase)

The key moment for the development of my research was a one-month residency I did with the choreographer Skye Reynolds and a group of dancers at the Dance Base studio in Edinburgh in 2011 with the support from the composer Pippa Murphy and the sound artist Yann Seznec (Figure 0.1). Reynolds wanted to work with wearable interactive technologies, and at the time the most affordable wireless motion-tracking technology was the Nintendo Wii Remote controller. To incorporate the movement data from dancers, I started working with the computer music programming environment Max[1]. Movement data to Max was sent by Wii Remote controllers attached to the dancers' limbs with the armbands designed by Seznec. Because of the limited amount of time we had for the residency, I mapped some sound by imagining possible movements using the Wii remote controllers in Max before I met the dancers. Once the residency started, I tried it with the dancers and some features were added or removed depending on how well the mapping worked.

I found that working with a group of dancers was a challenge as each of them had different levels of understanding about interactive technology and experimental music. Also, when everybody performed together, they had hard time distinguishing the sounds mapped for each of them. Therefore, I mostly sought ways to orientate the dancers to perform better with the sound system at the beginning of the residency. Without any guidance, it was very easy for the dancers' actions to result in sonic chaos. The experience of interaction prompted them simply to activate the system without enough consideration of the sound produced. To address this problem, I organised a 'listening workshop' with Murphy to let the dancers become aware of environmental sound and how it worked in soundscape composition. We also wanted to encourage the dancers to be more mindful when they triggered sound with movement, but it was unfair to expect them to gain enough awareness of sound composition in that short amount of time.

As a result, Reynolds suggested to try another method that encouraged them to 'think how to move first before making sound'. For instance, Reynolds asked them to move all at the same time and then stop, and I checked the sound results. Then, Reynolds asked one dancer to start moving and the others to step in one-by-one, and I listened the results. Finally, I listened to what happened when only two people danced, and then when only three people danced… this was the most effective way to control the proportion of sound and silence triggered by the system. As a result of this experience

[1] http://www.cycling74.com/

I realised that using movement and relational interaction of this kind had significant potential for my work.

The residency ended, but there were still some unresolved issues for me. The movement tasks we provided to the dancers were effective, but not provoked by the interactive technology we used. They were a pragmatic solution given such a short period of development time to create an interdisciplinary work. But I was left questioning, how did the technology itself stimulate choreographic movement in the end? What kind of technology would have been a better fit to integrate movement tasks to generate choreographic sound composition? As a consequence, this experience persuaded me to do further research on these issues.

Chapter 1. Study for Choreographic Sound Composition

1.1. Reviewing recent interactive dance and sound collaboration

The term *interactive dance* typically refers to dance works created with an interactive system that perceives movement data from the dancer in real-time to produce other events in other media such as sound or visuals. In turn, the sonic or visual results affect the creation of the choreography. The term has been in frequent use since the genre of *dance and technology* or *dance tech* emerged at the end of the 1990s as seeking the usage of newly developed tools "to reinvent the perceptual and ontological role of dance in the context of a digital zeitgeist" (Salter, 2010: 261). The origin of interactive dance can be traced back to John Cage and Merce Cunningham's collaboration *Variations V* in 1965, yet vigorous research on developing wearable or camera-based motion-tracking sensors has only been conducted by a larger number of composers since the 1990s. For instance, Todd Winkler created interactive dance works with Max using the analysis of gestural movement and music (Winkler, 1995a), and published a pedagogical book on interactive composition (Winkler, 1998). Wayne Siegel developed a wearable motion-tracking interface using flex sensors in collaboration with contemporary dancers (Siegel and Jacobsen, 1998). Because of its use of technology, interactive dance has also attracted scientific, engineering and computing research centres looking for artistic and real-world applications (Salter, 2010: 262–263). One example is the EyesWeb system, using gestural analysis of emotional and expressive values and developed by Antonio Camurri and his research team from InfoMus, University of Genoa, within the European Union-sponsored MEGA project (Camurri, 1997). The excitement around the genre became obvious as the entire *Dialogue* section of the 1998 Spring volume of the *Dance Research Journal* was dedicated to discussion about dance and technology, with both Richard Povall and Robert Wechsler writing about the subject.

As a consequence, debates and criticisms followed regarding the usage of technology. How could its use "enlarge dance as a historical and cultural practice" and what kind of aesthetics could be aroused with gesture-driven computer music in dance (Salter, 2010: 263)? Scott deLahunta (2001) argues that in the field of computer music the process of new musical instrument learning has been assumed to be a form of dance training. Julie Wilson-Bokowiec and Mark Alexander Bokowiec (2006: 48) point out that mapping sound to bodily movement has been described in utilitarian terms:

"what the technology is doing and not what the body is experiencing". According to Johannes Birringer (2008), developing interactive systems with this utilitarian perspective creates "disjuncture" between movement data and the outcome media whether that is image or sound. This is because the system requires performers to learn "specific physical techniques to play the instruments of the medium", which dancers find hard to think of as an "intuitive vocabulary" that they have gained through their physical and kinaesthetic practice (Birringer, 2008: 119). Discussions about creating musical instruments are still valuable to the development of interactive systems. However, I find that this narrow focus on the gestural or postural articulation of technology misses the aesthetic concerns in creating choreography with dancers.

Wilson-Bokowiec and Bokowiec (2006) provide honest insights about their Bodycoder System (Figure 1.1), a musical interface with sixteen bend sensors that can be placed on any flexing area of the body and a pair of gloves designed as switches. Similar glove-based interface designs have been used previously in Mattel's Nintendo PowerGlove (1989) and the *Lady's Glove* (1994) by the composer Laetitia Sonami to capture sophisticated finger movement. Winkler (1997) also began his research in movement by observing hand and finger gestures to help design musical instruments. Wilson-Bokowiec and Bokowiec (2006: 50) write that their initial idea to adopt physical techniques from contemporary dance seemed logical, but they stopped soon after realising that the system was associated with "specific economic movements" like playing an instrument. In interactive dance and music collaboration the dominant compositional approach has been to translate gestures into sonic results. This process of translation is usually initiated by composers and computer scientists with their own interpretations of movement qualities, and then realised by dancers. Unfortunately, due to the limits of time and budgets, it is not easy to collaborate with dancers throughout the entire composition process to find out which sounds feel most suitable for controlling the synthesis parameters with the dancers' diverse range of movements. Thus, composers have mostly sought ways to capture the most natural and precise movements by preserving dancers' free motion for movement analysis. However, I believe this effort ironically caused a disjuncture in the sonification of movement for some dancers because the assumed mapping scenarios and interpretations were not directly related to their dance vocabularies, but rather to an engineering perspective.

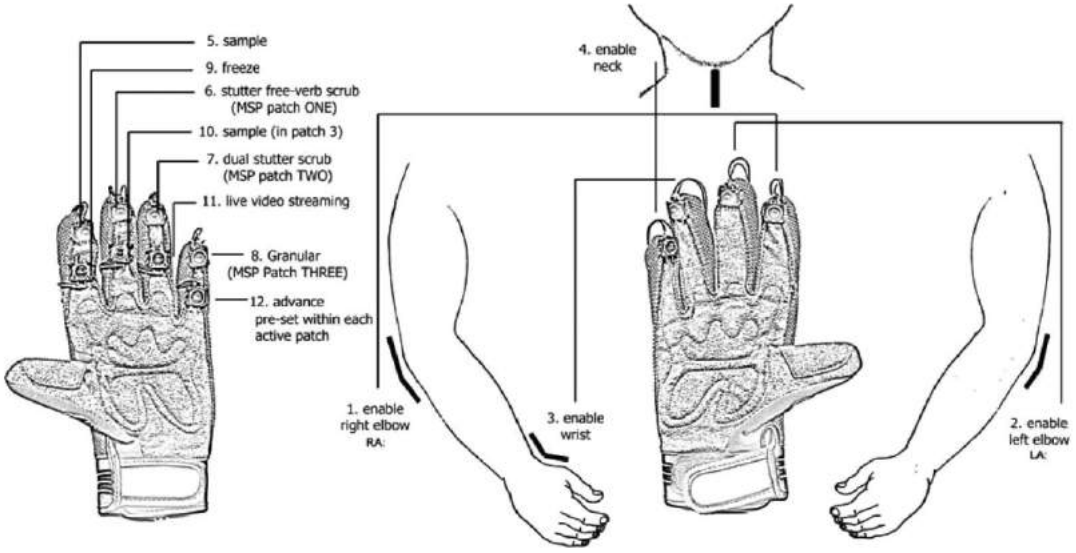


Figure 1.1: Bodycoder system (Wilson-Bokowiec and Bokowiec, 2006: 50)

Here, two research questions arise:

1) How can my interactive sound system aid collaboration by encouraging dancers to use their intuitive vocabulary, not just demand that they learn the technological and musical functions of the interface?
2) Once I have considered the sounds to be used in a piece, how should I direct dancers to create choreography as well as sound composition with my interactive system?

I decided to adopt a more rigorous approach to integrating interactive systems into the creative processes in sound and dance rather than merely to receive movement data to control my sound synthesis. The resulting performances investigate ways to carefully structure the relationship between music and dance when involving interactive systems in the creative and performance processes. To situate my work within a research perspective, I undertook a literature review of papers focusing on dance or choreography from *The International Conference on New Interfaces for Musical Expression (NIME), The International Computer Music Conferences (ICMC),* and *Sound and Music Computing (SMC)* from 2001 to 2016[2] to find what other approaches have evolved since the interactive dance scene of the 1990s. When I found interesting approaches from these conference proceedings, I used the bibliographies of these papers to follow up ideas in the cited publications.

[2] The reason that I chose this period was because the survey was done in 2016, and I decided to search the papers published from the 21st century strictly.

Composer Todor Todoroff composes electroacoustic music for dance and theatre, and his research focuses on developing sensors and gesture-based interactions to control sound synthesis. His research also started in the 1990s and was presented in the *NIME*, *ICMC*, and *SMC* communities. In recent years, he has developed wireless motion-tracking sensors with his research team and algorithms for stereoscopic cameras, which enable fast setup for dancers to use on stage (Todoroff, 2011). The systems were used in the project *FireTraSe* to control the patent-pending fire ramp designed by pyrotechnician Pierre D'haenens. Twenty fire ramps were placed in a row and as a dancer moved around behind the row the fire ramps were activated. Later, Todoroff decided to combine the project with his *Dancing Viola* project, in which the viola player controlled the fire while she was playing the instrument. The mapping of sound and movement was relatively simple; higher notes lay towards the left, the lower notes towards the right, and the amplitude of the sound determined the height of the fire. The project proved that the algorithm for the stereoscopic camera and the wireless sensors were stable and fast and easy to set up. The system also seemed to work well aesthetically with the viola player because she was moving in a limited way by holding and playing the viola. However, in looking at the test with the dancer,[3] it is hard to see how the system and the fire ramps are integrated in terms of creating choreography, rather than simply as an additive effect on stage.

Based on his research on the choreographer Doris Humphrey's classification of rhythms in dance, Carlos Guedes (2007) created Max objects that can extract rhythmic information from dance movement captured with a video camera. Capturing data and analysing patterns to create art became a method when art research combined with Human Computer Interaction (HCI) (Polotti, 2011). With this rather scientific approach to human movement, I noticed that some researchers tried to capture even more sophisticated data from dancers using physiological data capturing facilities. For example, Jeong-seob Lee and Woon Seung Yeo (2012) captured dancers' respiration patterns to improve the correspondence between music and dance, and Javier Jaimovich (2016) used electrocardiography and electromyography to reflect the biology of emotion in music. Nevertheless, these analytical approaches to evaluating the relationships between music and dance still caused me to ask where choreographers might put their aesthetical decisions during the compositional process.

[3] A video clip for the project development is available at: https://vimeo.com/198146154 (Accessed 12th February 2018).

The research I found interesting was the empirical research by Anna Källblad et al. (2008) for their interactive dance installation for children. They developed their installation in several steps. First, they observed children's movement in a free space with different types of music. Second, the contemporary dancers choreographed 23 minutes of dance based on the children's movement. The interesting part of this study was that the movement analysis was not based on theories of gesture but on a concrete resource that was captured in advance. The analysis of the children's movement became the choreographic challenge; the researchers found that there was "no expression of anticipation, planning or judging" in the children's movement, whereas the adult dancers found it very hard to have the same intent (Källblad et al., 2008: 129). Third, the composer analysed the finished choreography to find rhythmical and spatial patterns and themes, and then composed music containing six sections with different characters. Fourth, the music was decomposed based on the sections. Each section of the music was more broken down according to the time and spatial analysis and installed as an interactive installation; in this way, the decomposed pieces were "choreographed" into the room (Källblad et al., 2008: 130).

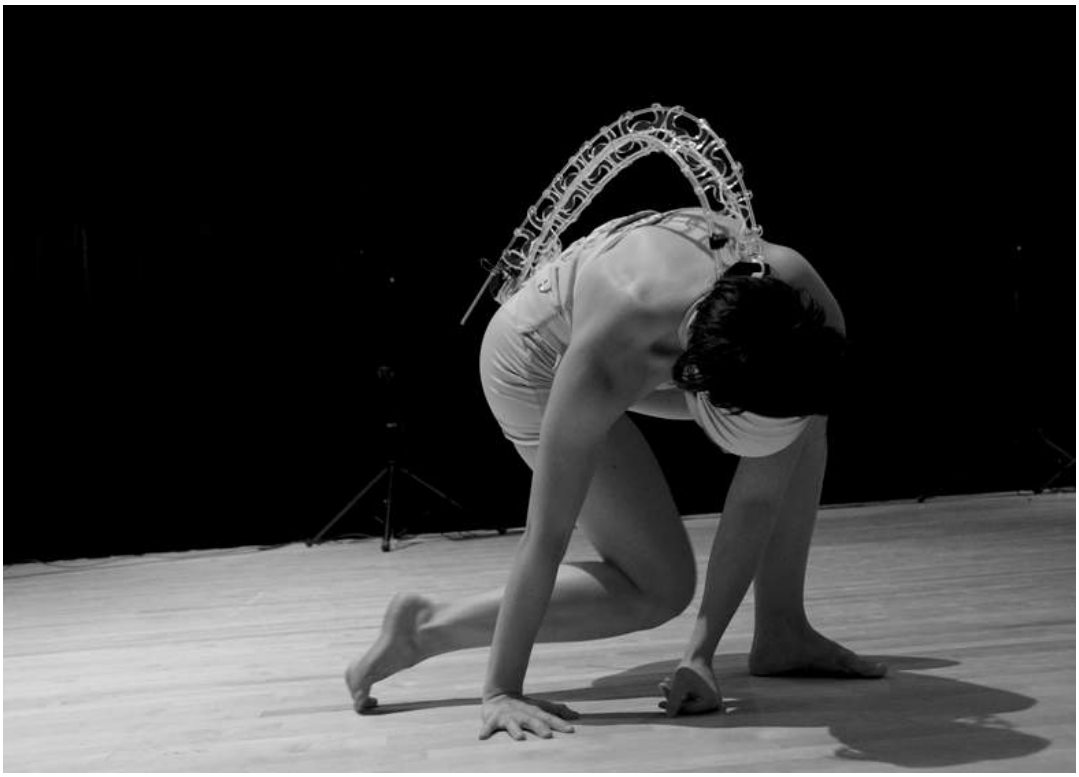


Figure 1.2: The *Spine* instrument designed by Joseph Malloch and Ian Hattwick.

Another interesting work is the prosthetic instruments designed by Ian Hattwick and Joseph Malloch (2014). Although the dominant perspective of Malloch's (2013) thesis was an engineering one, as its purpose was to design instruments that were usable by professional dancers, the design process was done in conjunction with frequent workshops with the choreographer Isabelle Van Grimde and her dance troupe Van Grimde Corps Secrets. They were aware of how the dancers predominantly create movement within a visual domain, as opposed to musicians, and took advice from the dancers when deciding on the appearance and material of their instruments (Malloch, 2013). I found their *Spine* instrument[4] (Figure 1.2) for the performance *Les Gestes* (2011–2013) remarkable because it provoked the dancers to create choreography in terms of the relational movement between their head and lower back, which in turn played the instrument. This way of triggering an interactive system with wearable motion-tracking sensors is not common as usually the sensors are placed on limbs or the joints of limbs to receive more natural movement and so preserve the freedom of motion of dancers (Malloch, 2013).

The common aspect of the two projects by Källblad et al. and Malloch et al. was that their collaborating dancers provided significant creative inputs towards the completion of their practical works, rather than just trying out those interactive systems. The main technical focus was not to extract more accurate motion-tracking data or movement patterns to produce generative music with gesture analysis, but to integrate their collaborators' choreographic ideas with their research outcomes.

I also searched other interactive dance works led by composers outside the *NIME*, *ICMC*, and *SMC* communities. One trend in media art in the twenty-first century is projection mapping. This can be seen in the interactive dance works made by the composer and visual artist Klaus Obermaier with Ars Electronica Futurelab. Obermaier's work *Apparition*,[5] premiered in 2004, showed two dancers dancing with a massive projection landscape and used a camera-based motion-tracking system to project visuals onto the dancers' bodies in real-time. This project's unique approach was that the projection was not controllable by independent behaviour, but could be influenced by the movement in conjunction with the properties of the dancer and the system (deLahunta, no date). Another collective that creates interactive dance works with projection mapping is that between musician Daito Manabe and Rhizomatiks Research. Their artistic ideas are realised commercially for the

[4] Available at: http://www.music.mcgill.ca/~mallochj/media/gestes_promo_vimeo.mp4?_=1 (Accessed: 11th April 2018)

[5] Available at: https://www.youtube.com/watch?v=EjzzgoJRlag&t=57s (Accessed: 10th April 2018)

mainstream market. Manabe used ideas developed by Obermaier (Dauerer, 2014), as can be seen in the work *Cube* (2013),[6] choreographed by MIKIKO. In the work *Border* (2015)[7] the dancers performed with 3D virtual dancers created with "massive amounts of movement data [collected] using motion capture, Kinect controllers and sensors to track dance movements" (Dauerer, 2014). Their audiovisual work showed another trend – tight synchronisation between computer generated visual work and sound that recall the aesthetics of Ryoji Ikeda and Ryoichi Kurokawa – with the visuals of augmented reality.

Both collectives present mesmerising and large-scale dance works with technology, but the choreographies were made to perform "with" the technology as a potential partner (deLahuntta, n.a). I found a more interesting approach to provoking new choreographic materials in Obermaier's previous non-interactive works *D.A.V.E.* (1998–2000)[8] and *VIVISECTOR* (2002).[9] In these works, the combination of the precise choreography and the images projected onto the moving dancers' bodies created an uncanny visual experience. Manabe's non-interactive biosignal technology in his previous work *Electric stimulus to face* (2009)[10] was used in *Rhizomatiks Circle*,[11] a promotional video for both Rhizomatiks Research and Nike trainers, and the creepy look of the electric wires attached to the hip-hop musician's face worked well with the narrative of the music video.

Amongst interactive musical instrument and dance collaborations, I find the work *Eidos : Telos* (1995)[12] by the choreographer William Forsythe and the Studio for Electro-Instrumental Music (STEIM) composer Joel Ryan the most interesting, even though it was developed at the very beginning of the period of experimentation in interactive musical synthesis with computer in the 1990s. Across the stage, a net of massive steel cables are set to be amplified by contact microphones and in turn become a large-scale sonic instrument when plucked by the dancers (Figure 1.3). The choreography was composed around the steel cables; there was a moment when one dancer danced in front of the steel cables and a group of dancers danced behind the cables in

[6] Available at: https://www.youtube.com/watch?v=zBm3mJiJzh8 (Accessed: 10th April 2018)

[7] Available at: https://www.youtube.com/watch?v=gpE20khn8R0 (Accessed: 10th April 2018)

[8] Available at: https://www.youtube.com/watch?list=FLbnYNVoSbjcUoxinI4Jyxug&v=1bhNjYTQFQY (Accessed: 10th April 2018)

[9] Available at: https://www.youtube.com/watch?v=VtY-Ymval8M (Accessed: 10th April 2018)

[10] Available at: https://www.youtube.com/watch?v=pLAma-lrJRM&t=120s (Accessed: 10th April 2018)

[11] Available at: https://www.youtube.com/watch?v=mnX6xU2EwJY (Accessed: 10th April 2018)

[12] An exerpt of the first act of *Eidos : Telos* is available at: https://www.youtube.com/watch?v=Q237dffzzxo (Accessed 17th October 2018).

lines.[13] The stage lighting was set to become dimmer when the dancers stood behind of the cables. Later, the group of dancers came in front of the cables and joined the solo dancer. At another point, one dancer danced in front of the steel cables, and another dancer danced behind them in a black costume. The dancer with the black costume held a panel and scratched the cables while moving to the left and right sides of the stage.[14] The instrument was "audio scenography: the replacement of visual scenography with a continually transforming audio landscape" and showed "the shifting of dance music composition in Forsythe's work towards the design of total acoustic environments" (Salter, 2011: 57–58). Unfortunately, Ryan's initial idea of using wearable acceleration sensors to control the signal processing techniques applied to a violin and the lights in the Frankfurt Opera House auditorium did not happen because of unstable communication between the STEIM-built sensor device and the house lighting console (Salter, 2001: 71). However, the instrument created simple and modern-looking scenography without superfluous technological aesthetic, which Forsythe usually seeks in his other works, and acted as work's core compositional as well as dramaturgical strategy.

Figure 1.3: From the first act *Self Meant to Govern* of *Eidos : Telos*.

[13] See 1:08–1:45 of the first act excerpt: https://www.youtube.com/watch?v=Q237dffzzxo (Accessed 17th October 2018).

[14] See 6:57–7:47 of the first act excerpt: https://www.youtube.com/watch?v=Q237dffzzxo (Accessed 17th October 2018).

1.2. Physical restriction as a core choreographic method

My first research question was "How can my interactive sound system aid collaboration by encouraging dancers to use their intuitive vocabulary, not just demand that they learn the technological and musical functions of the interface?" To answer this, I decided to study first how choreographers and dancers create choreography and seek ways to integrate motion-sensing devices as primarily a choreographic tool.

Some criticisms have arisen in the dance technology community towards artists who were "eager to work with newly arising digital tools", but who had "little understanding of the inner workings of electronics or computer code", which in turn created trivial works that were mere demonstrations of the technology (Salter, 2010: 263–264). This is a critical point of view; however, I found it not entirely fair towards the artists. The ease of use of Max, with its graphical interface, and flexible and user-friendly tools like Isadora[15] attracted composers and artists who were new to programming, enabling them to create interactive artworks intuitively (Winkler, 1995b; Dixon, 2007: 198). There are creative users who are not necessarily software developers. I thought the problem was not lack of knowledge of how to adapt the technology effectively, but a lack of investigation and observation required to comprehend artistic media that the artists did not primarily practise. For instance, Winkler's research into gestural composition (1995a) neglected dance practice or techniques, but assumed that their interactive syntheses could be used effectively for dance composition. Marcelo M. Wanderley (2001) thoroughly analyses the gestural qualities of expert instrumentalists during performance, but does not explain how this movement analysis is valuable for dance creation.

The mapping strategy should also vary depending on the style of dance. Based on my previous experiments with a variety of dancers, I found some styles of dance create an interesting aesthetic when the movement results in a clear relationship with sound, but this is not the case for every style. For instance, when I worked with a break dancer, his popping dance movement resulted in an interesting one-to-one interaction with the tightly synchronised music, as this is a genre of dance usually danced to the musical beat.[16] But when I tried to apply the same principle to other

[15] https://troikatronix.com/

[16] This is one of the performances I developed during the 2011 residency in Edinburgh with Yann Seznec. Available at: https://vimeo.com/27396331 (Accessed: 11th April 2018).

contemporary dancers, the results were too obvious and tedious. For my PhD research, I decided to work with contemporary dancers, and therefore, my contextualisation is strictly based on contemporary dance technique and music.

What, then, is choreography? Can the instrumentalist's movement be assumed to be dancing? "The term choreography has gone viral", says Susan Leigh Foster (2010). She writes that since the mid-2000s the word has been used as "general referent for any structuring of movement, not necessarily the movement of human beings" (Foster, 2010: 32). I saw a good example for Foster's statement when I recently attended the conference *Moving Matter(s): On Code, Choreography and Dance Data* as part of the *Fiber Festival* in Amsterdam in 2017. The artist Ruairi Glynn presented his choreographic idea in his work *Fearful Symmetry*,[17] which he exhibited at Tate Modern in 2012. However, Glynn's work did not include a human figure, but rather a kinetic sculpture that encouraged the audience to react and move along with it (Figure 1.4). The reason this kind of movement from non-dancers and also non-human movement has come to be recognised as 'choreographic' is because dance has changed dramatically since the mid-twentieth century to eliminate virtuosic movements. For example, choreographers such as Paul Taylor and the Judson Dance Theater deliberately incorporated everyday movements such as walking, running, and sitting into their work (Au, 2002: 161, 168). Also, as shown at the 2011 exhibition *Move: Choreographing You: Art and Dance since the 1960s at the Hayward Gallery*, the term has been used to describe the process of paintings, sculptures, and installations such as Allan Kaprow's movement score *18 Happenings in 6 parts* (1959), Bruce Nauman's *Green Light Corridor* (1970), and Pablo Bronstein's *Magnificent Triumphal Arch* (2010). These works were focused on certain movements of the artists or the viewers, and were, therefore, choreographed. In his essay *Notes on Music and Dance*, Steve Reich (1973: 41) writes that the Judson group choreographers have embraced "any movement as dance", equivalent to John Cage's statement that "any sound is music". It seems that dance has become a more approachable place for laypeople to propose ideas.

[17] Available at: https://vimeo.com/56649989 (Accessed: 11th April 2018).

Figure 1.4: *Fearful Symmetry* (2012) by Ruairi Glynn at Tate Modern.

Yet, what I have learned from my previous collaborations with dancers is that I should be aware that dancers and musicians have acquired different physical practices.[18] If I only focus on the mappings of body movement to my sound synthesis, I can easily mistreat dancers as substitute musicians. I therefore felt the need to understand what choreography means in dance first. Movement art pioneer Rudolf Laban describes choreography as "the planning and composition of a ballet or a dance" and its notation with "drawings of figures and symbols of movements" (Ullmann, 2011: viii). Jack Anderson (1974: 9) writes that "dance is movement that has been organized so that it is rewarding to behold, and the craft of making and arranging dances is called choreography". In their book on choreographic composition techniques, Lynne Anne Blom and L. Tarin Chaplin (1982: 3) express the difficulty of turning creative ideas for dances into "choreographic entities; the fully completed presentation". What I deduced from these definitions of the term was that choreography is composed of ideas with regards to organising, arranging, and structuring movements, not mere fragments of gestures.

[18] In case more scientific proof is needed about how musicians and dancers perceive movement differently, ongoing research is being conducted by Hanna Poikonen at the University of Helsinki into how musicians and dancers use their brains. Poikonen explains that musicians have a tendency to seek precision in certain acts whereas dancers see the entire flow of a movement that uses the whole body. See her article at https://www.helsinki.fi/en/news/health/a-dancers-brain-develops-in-a-unique-way.

Here, I explain further how Laban writes about movement in his book *Choreutics*.[19] Laban insists that it is "essential to find out the natural characteristics of the single phases[20] which we wish to join together in order to create a sensible sequence. … [however] we must always feel and comprehend both the preceding and the following phase" (Ullmann, 2011: 4). I looked at some studies in which Laban's movement analysis was used. These included the sonification of dance movement research from InfoMus,[21] which is based on the emotional quality of movement and music from choreutic theory. However, I find this approach is rather musicological or HCI-related. Also, my collaborating dancers and I do not presuppose an emotional direction when we start our collaborations, rather we let the dramaturgy be evoked as we experiment. Just as Laban created a new dance notation system in his choreutics, so can similar attempts be seen in the dance movement archive project by Royce Neagle et al. (2002) and the movement library *Topos*[22] for dance and music gesture control by Luiz Naveda and Ivani Santana (2014). Although these classified dance movement according to a vast amount of movement data and detailed analysis with different parts of the body, it was hard to find within them the flexibility of using different limbs to express the same quality of movement. In fact, Laban's dance notation did not indicate specific limbs because he wanted to preserve the individual's freedom to choose which limbs to perform the notation with, according to their own style of dance (Ullmann, 2011: 30–31). It seemed to me, that these projects focused too much on singular gestural information and did not consider the entire flow of a dance construction.

What I found most interesting from Laban's analysis was that he sees choreography as a "continuous flux" of movement that should be understood alongside both "the preceding and the following phases" (Ullmann, 2011: 4). Laban's dance notation shows movement "trace-forms" through directional symbols inside the kinesphere[23] rather than specific postures (Figure 1.5), and it inspired me to think about what principally stimulates which movement. The common way of using motion-tracking or motion-sensing devices in interactive music and dance collaborations is to use the technology as a mere interface for preserving the freedom of the dancer's movement (Figure 1.6), and to connect the presupposed musicality of movement data to the output result. Instead, to

[19] Choreutics means "the art, or the science, dealing with the analysis and synthesis of movement" (Ullmann, 2011: 8).

[20] I should clarify that I mean to use the word phase as a direct quotation from Laban since I am often asked to clarify between the two words phase and phrase. I believe Laban uses the word phase to express that single movement status as a temporal status within a constant progress of movement containing the result of the previous status, or the intention towards the next status.

[21] http://dance.dibris.unige.it/

[22] http://luiznaveda.weebly.com/topos.html

[23] Laban defines Kinesphere as "the sphere around the body whose periphery can be reached by easily extended limbs without stepping away from that place which is the point of support when standing on one foot" (Ullmann, 2011: 10).

actively stimulate and engage dancers to create choreography with the interactive system, I decided to provide a physical and tactile motion-sensing device that primarily challenged performers to 'dance', and to let these movements create the sounding results (Figure 1.7).

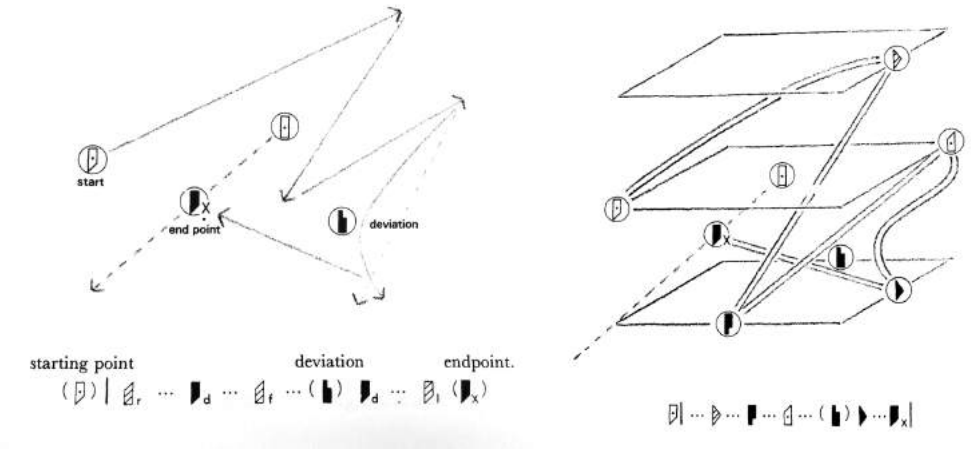


Figure 1.5: The dance notation invented by Rudolf Laban. The symbols indicate directions of a movement in flow (left) and the same movement is described in "scaffold-writing" to demonstrate how it looks in the kinesphere (right). The three planes indicate bottom, middle and top of body. (Ullmann, 2011: 129–130)

Figure 1.6: Motion-sensing device as interface to preserve the dancer's freedom of movement.

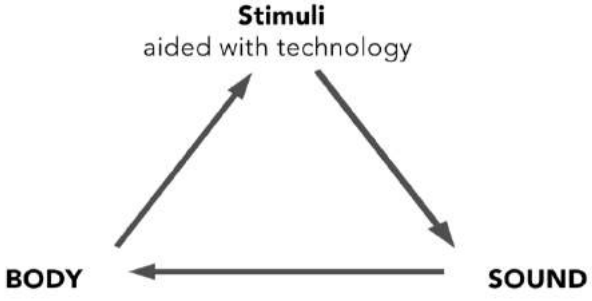


Figure 1.7: Providing stimuli to dance with the motion-sensing device to result in sound composition.

Figure 1.8: (above) Gametrak controllers are originally designed for PlayStation's Real World Golf game by In2Games. (below) I could easily hack only the potentiometers from the newer model of Gametrak controllers.

For my own research, I used Gametrak controllers and found them to be a good fit for my purposes. Gametrak was developed as a pre-wireless motion-tracking technology and disappeared quickly after the introduction of Nintendo Wii Remote controllers and Kinect cameras. In comparison with the wireless motion sensors, Gametrak's motion tracking system is simple and limited. Each unit has a pair of potentiometers tethered by red cables that users can extend to action the controller through 360˚; the controller tracks the movement direction and length of the cable. Originally the controller came with a pair of gloves that let users play a golf game (Figure 1.8). However, I removed the gloves so as to prevent the dancers from using the controllers only with their hands, which can easily mislead them to treat the controllers solely as musical instruments. Instead, I connected carabiner clips to the end of the controllers so that they could be hooked onto belts and bracelets.

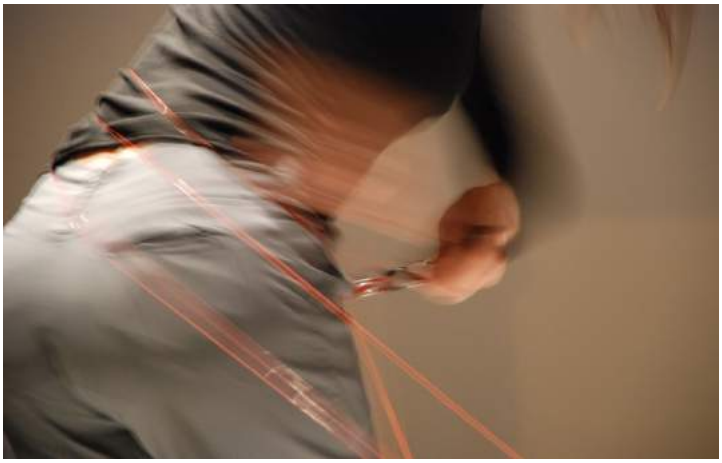


Figure 1.9: Choreographer Skye Reynolds twists her body with six cables of Gametrak controllers. (Photograph by Rocio Jungenfeld)

The kinetic characteristics of the Gametrak invite dancers to move in certain intuitive ways by playing with the cables – pulling and twisting them, for example. However, the dancers soon understand that they can only reach a limited distance with the tethered controllers. Once I asked my former collaborator and choreographer Skye Reynolds to improvise while tethering six cables of Gametraks around her waist so that I could observe how a dancer would perform within an extremely restrictive setting (Figure 1.9). Reynolds became very cautious with the entangled cables and kept moving forward and backward to check how far she could reach. To my eyes this repetitive and somewhat glitch-like movement, in which the controller technology naturally created that restrictive movement, was fascinating. This experience led me to stop looking for higher quality motion-tracking technology and instead explore the Gametrak's intrinsic physicality. As a consequence, the difference from wearable sensors is that I am 'restricting' the dancers' bodies instead of letting them dance freely.

Gametraks have been used by other artists, musicians, and researchers in recent years. For instance, Yann Seznec created the new musical instrument *StyHarp*[24] for the live performance of the composer Matthew Herbert's album *One Pig* (2011). As the name suggested, the *StyHarp* was designed to mimic a pigsty, and also to trigger sound by pulling, plucking, and twisting the strings. As another example, Di Mainstone developed Gametrak-inspired controllers with her research team from Queen Mary University of London for large-scale installations (Meckin et al., 2012) such as *Human Harp* (2013)[25] on Brooklyn Bridge. Similar to Seznec, this work suggested the musical

[24] http://www.yannseznec.com/works/one-pig-live/

[25] http://dimainstone.com/project/human-harp/

instrument harp as well. It is apparent that these artists have been attracted to the visual characteristics of the Gametrak in creating their interactive musical installations. Although Mainstone's works were demonstrated by dancers, her primary focus was on the use of the controllers as a visual element with the surrounding architecture while triggering sound simultaneously in an interactive installation rather than a choreographic method to guide the dancers. In fact, *Human Harp* could be played by any pedestrians not only by dancers.[26] However, I set my research goal as to integrate the visual characteristics of the Gametrak with choreographic methods so as to play my sound synthesis by professionally trained dancers.

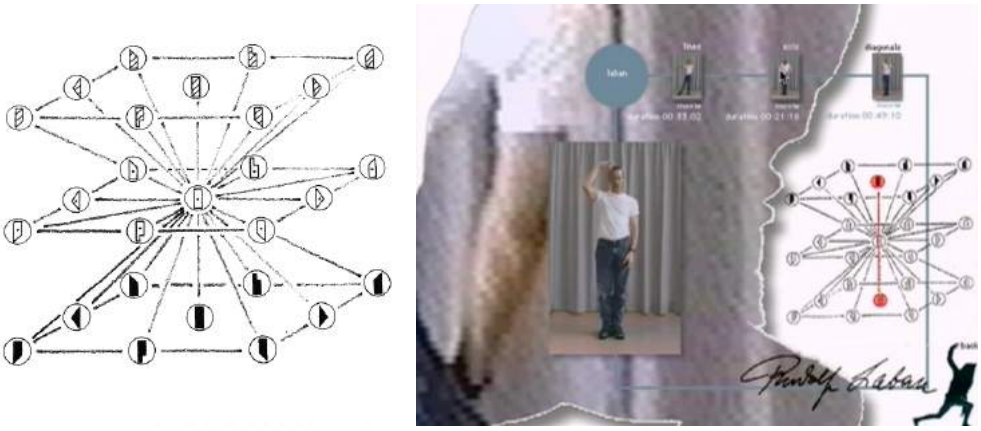


Figure 1.10: (Left) Rudolf Laban's main directional indication in cubic space (Ullmann, 2011: 16). The three planes are bottom, middle, and top of the body. (Right) William Forsythe explains how to read Rudolf Laban's notation system in his lecture video *Improvisation Technologies*.

I found Forsythe's choreographic approach was interesting because he extended Laban's notion of the kinesphere, as shown in his lecture video *Improvisation Technologies* published with ZKM in 2011 (Figure 1.10) (cited in Clark and Ando, 2014: 182). In the video, Forsythe demonstrates possible movement variations depending on a newly given axis without stepping away from the first position; the axis of movement is no longer the centre of the body. For instance, he shows a normal scale of kinesphere of the entire body in a cubic space, and then creates a smaller scale to isolate his left arm to make arm movement variation (Figure 1.11). Another example is that he imagines his right knee attached to the floor surface and creates a round shape forwards with his arms. To keep this relationship between his knee and arms, if the floor surface moves in front of his face he should move his arm upwards (Figure 1.12). Furthermore, Forsythe asks his dancers to imagine objects or

[26] See the interview with Di Mainstone available at: https://youtu.be/_U02X8UWgxY (Accessed: 21st September 2018).

geometric lines to create movement with or around. Re-orientating physical perception with these imaginary space and objects is Forsythe's core movement creation technique.

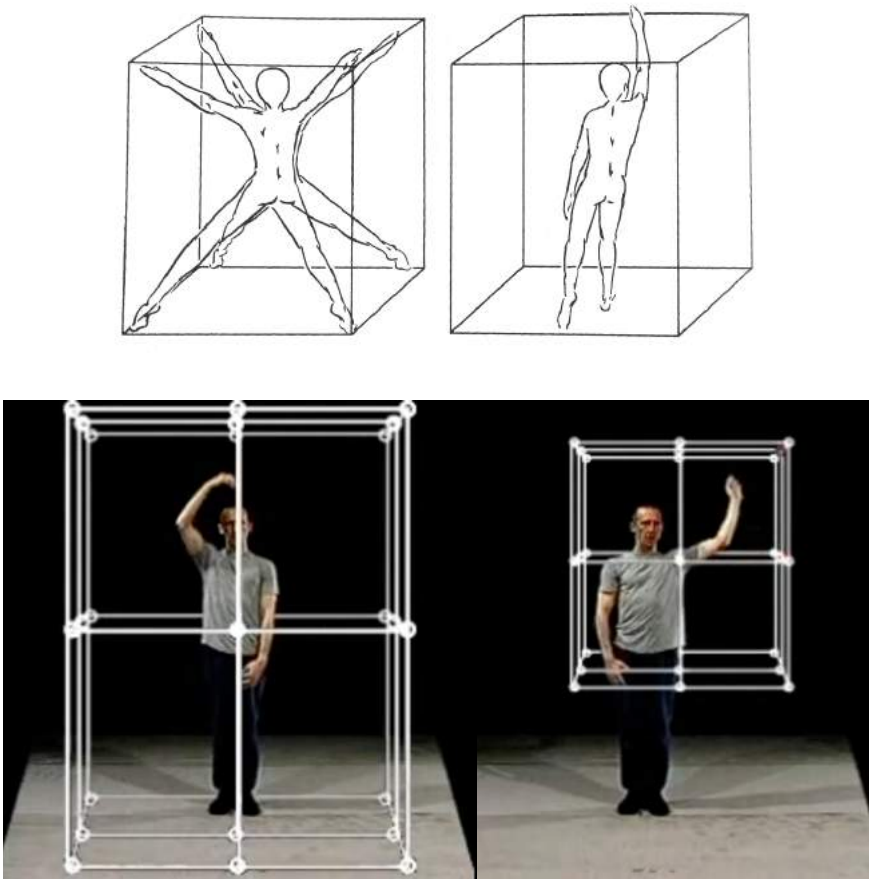


Figure 1.11: (Above) Kinesphere is explained as a cubic space in *Choreutics* (Ullmann, 2011: 140). (Below) William Forsythe explains a cubic space around his entire body, and then scale it down only for his left arm.

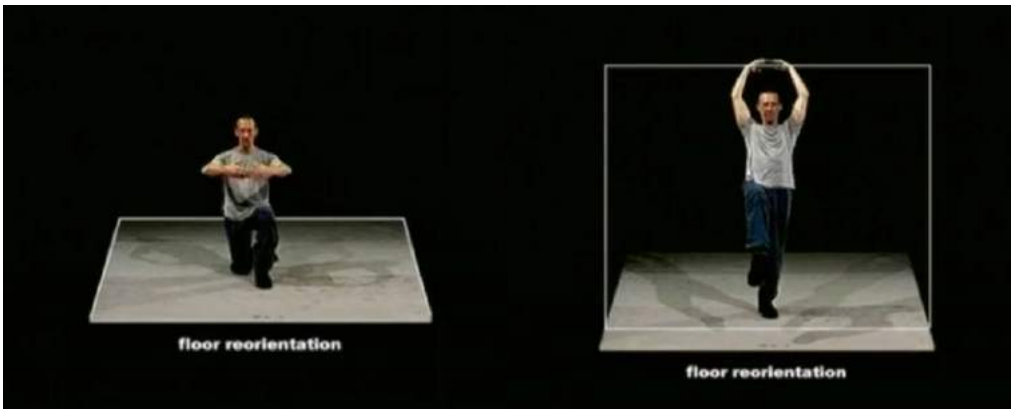


Figure 1.12: William Forsythe examples how his movement variation can be created by re-orientating his body placement with the floor.

Based on these techniques, Forsythe's dancers improvise with imaginary objects. For example, in the lecture video, the dancer Noah De Gelber improvises with an imaginary table or a chair (Figure 1.13). Forsythe provides inputs at "the beginning of a movement rather than on the end" and "in the process, discover[s] new ways of moving" (Forsythe and Kaiser, 1999). Similar to Forsythe, McGregor proposes that his dancers imagine an object as well as using other sensations such as colour or music to compose choreography (Figure 1.14). Another technique McGregor uses is to provide dancers with a physical problem, which they have to solve through movement. For example, dancers are asked to "picture a rod connected to their shoulder, which is then pushed or pulled by a partner some distance away" (Clark and Ando, 2014: 187). McGregor describes these ways of creating movement phrases with specific physical conditions as a "physical thinking process" (McGregor, 2012).

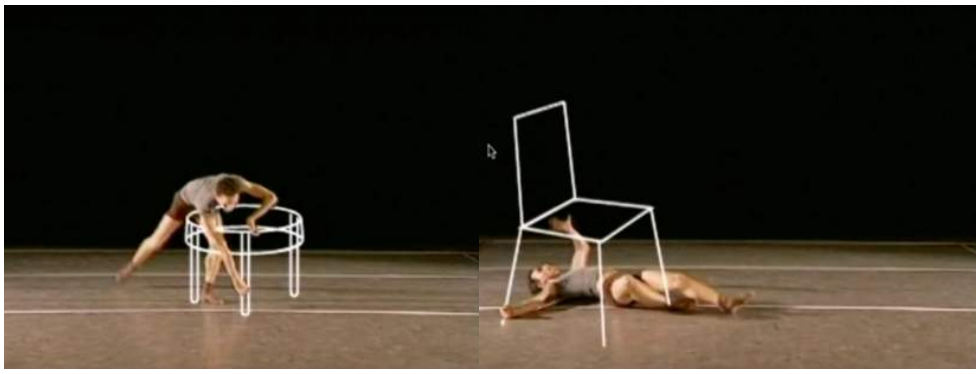


Figure 1.13: Using imaginary objects to devise choreography in William Forsythe's lecture video *Improvisation Technologies*.

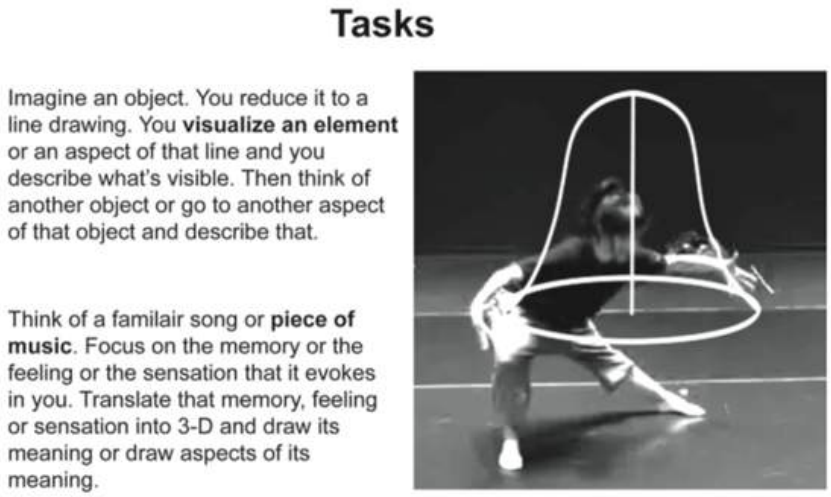


Figure 1.14: Sample tasks from Wayne McGregor described in the *Journal of Dance & Somatic Practices* (deLahunta et al., 2011: 252).

Both Forsythe and McGregor use mental imagery as a choreographic stimulus. Instead of freely improvising, they restrict their physical condition with the imagined objects and space. Inspired by this method, I decided to replace the mental imagery with actual physical restriction using the cables of the Gametrak controllers (Figure 1.15). In this way, the Gametrak provides a technological restriction that governs my sound composition and movement creation as both an interface and a physical limitation that has to be accounted for by the dancers.

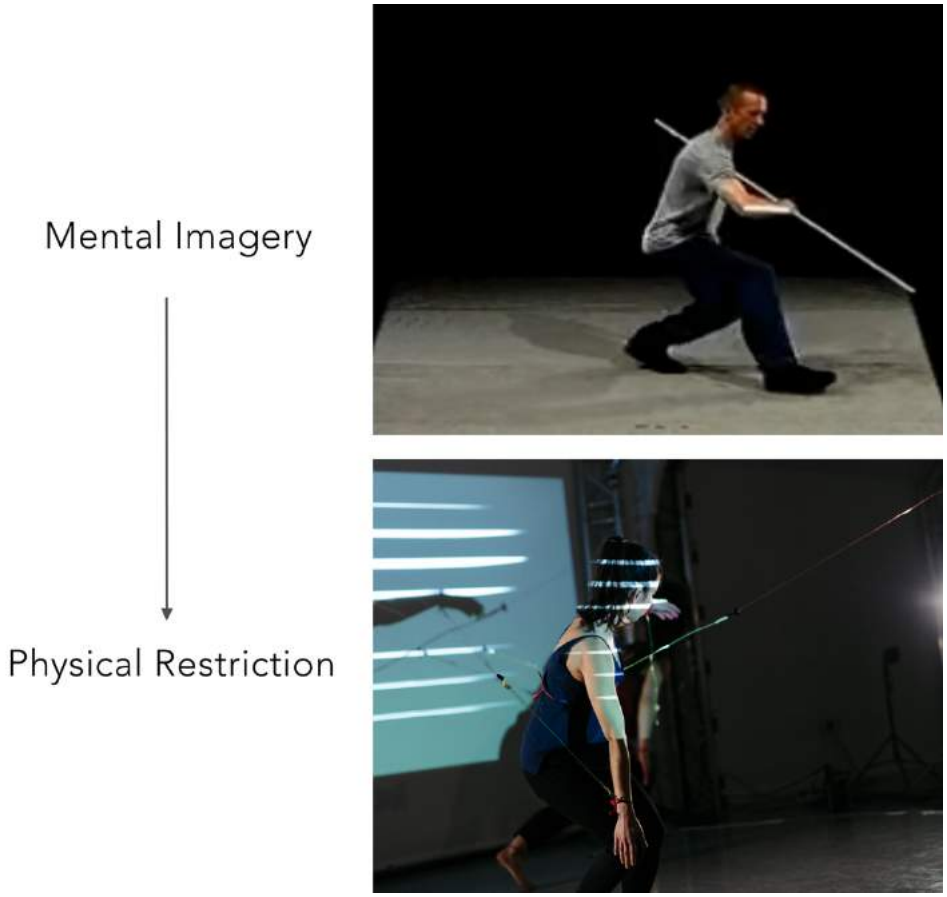


Figure 1.15: Gametrak controllers' cables work as physical restrictions in the process of developing choreography.

This intrinsic physicality of the Gametrak made it possible to provide concrete movement tasks to the dancers, who could then play sound naturally as a result of executing these tasks. This process is explained in Figure 1.16, which shows the transition between different media from body (dance) to sound via visible and tactile technology. First, the dancers are required to tether to the Gametrak, and to find out how it affects their physical movement and what its limitations are by freely improvising. Second, they learn other visual stimuli and choreographic rules depending on the work. Third, the dancers listen to the sound they are triggering as they execute these tasks. Fourth, the

dancers start devising movement phrases according to both the choreographic tasks and the sounds they are creating.

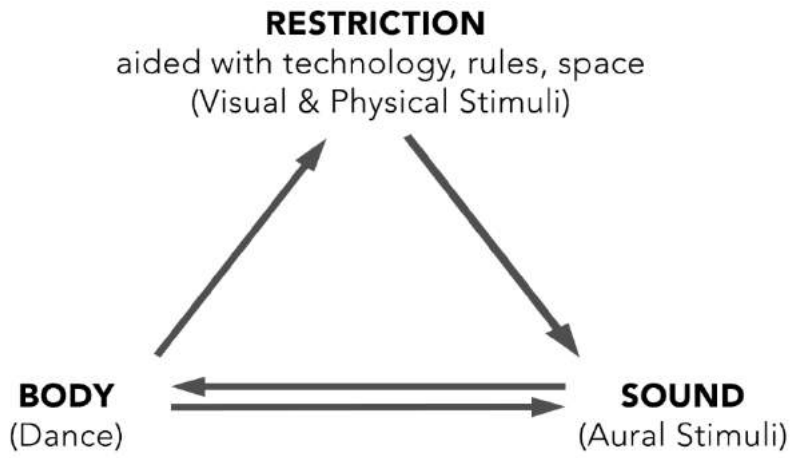


Figure 1.16: A diagram of the choreographic sound composition process.

Beyond using mental imagery, McGregor also showed physical transformation of the dancer's body in *Nemesis* (2001)[27] by extending the arms with prostheses to seek new possible movements. The prosthetic instrument by Malloch and Hattwick (see Figure 1.2) is similar to this approach, as Malloch describes their instrument as an "extra limb" (Malloch, 2013). However, I wanted to discover the intrinsic and potential choreographic physicality of already existing objects or spaces rather than designing a new interface. I found Forsythe's recent works were good directions towards achieving this idea. Forsythe's solo exhibition *The Fact of Matter* at the Museum für Moderne Kunst, Frankfurt am Main, showed his "performative and space-related Choreographic Objects" (Forsythe, 2015). The works were curated together with some building features of the museum, and a brief instruction was provided alongside each of the works. For example, the work *A Volume, Within Which It Is Not Possible for Certain Classes of Action to Arise* (2015) is a low and small space in the building, and the instruction says "The space may be entered". Figure 1.17 shows possible movements that can be created within the specific space. Another example from the show is *Aufwand* (2015), presented with the instruction "If you encounter difficulty opening the door, please persist". Figure 1.18 shows how a number of people tried to open the door. Each adopts a different physical movement approach to deal with the same challenging task. Following these examples, I used ordinary chairs

[27] http://waynemcgregor.com/productions/nemesis

in my composition *Temporal* (Figure 1.19) and the corner of a room in *The Music Room* (Figure 1.20) and *Queen of the Night* as additional restrictive elements to create choreography.

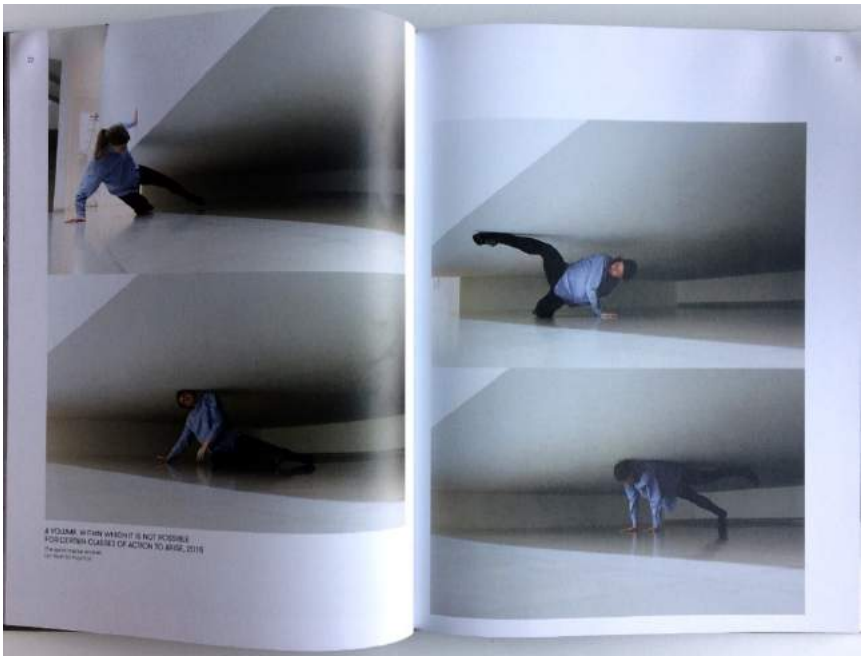


Figure 1.17: *A Volume, Within Which It Is Not Possible for Certain Classes of Action to Arise* (2015) by William Forsythe (Forsythe, 2015: 22–23).

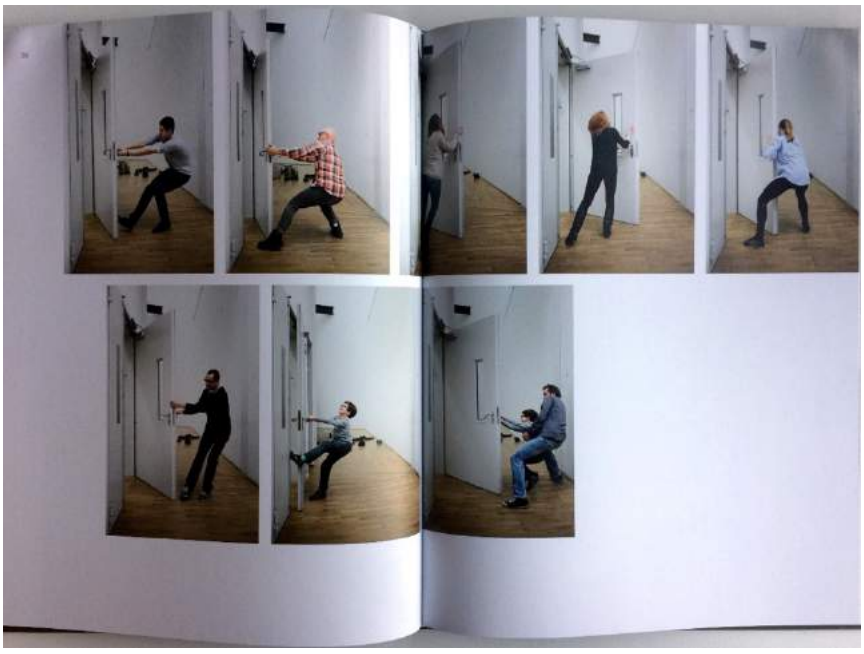


Figure 1.18: *Aufwand* (2015) by William Forsythe (Forsythe, 2015: 38–39).

Figure 1.19: Attached the cables of Gametrak controllers to chairs in *Temporal*.

Figure 1.20: The corner of the room is used in *The Music Room*.

As explained above, the integration of motion-sensing technology to create physical restriction is my own technique for employing directed improvisation as a compositional strategy. I also provided other choreographic rules and tasks related to the arrangement of the Gametrak cables. When the physical restriction mediated with technology combined with my choreographic rules, it eventually evolved into a choreographic sound composition (Figure 1.21). For me, such a restriction was an effective way to organise my sound, and a language with which to communicate with the performers. The process of choreographic sound composition with this method is explained in detail in Chapter 2.

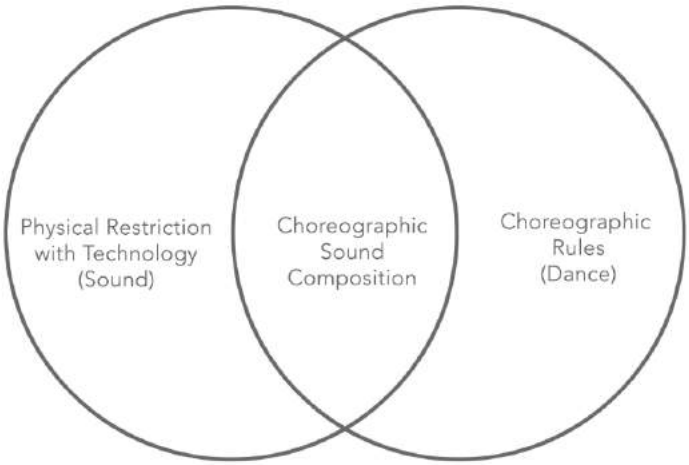


Figure 1.21: Choreographic sound composition from physical restriction mediated with technology and choreographic rules and restrictions.

1.3. Dialogue between dance and music

My second research question was 'Once I have considered the sounds to be used in a piece, how should I direct dancers to create choreography as well as sound composition with my interactive system?' My background research (see Section 1.1) indicates that the primary concern in research so far into new interface design for dance has focused on the kinds of motion that can be captured to control musical parameters, either in one-to-one or more complex interactions. However, this prevalent concern in mapping body movement to sound is limited to musicians and computer scientists (Wilson-Bokowiec and Bokowiec, 2006: 48), and rarely takes account of a purely choreographic perspective. My purpose in this research is not necessarily to hand over control of the music to the dancers. Rather, my main interest is in what kind of dialogue can be created

between music and dance as a stimulus to collaborative composition, not necessarily that one medium has to determine the other.

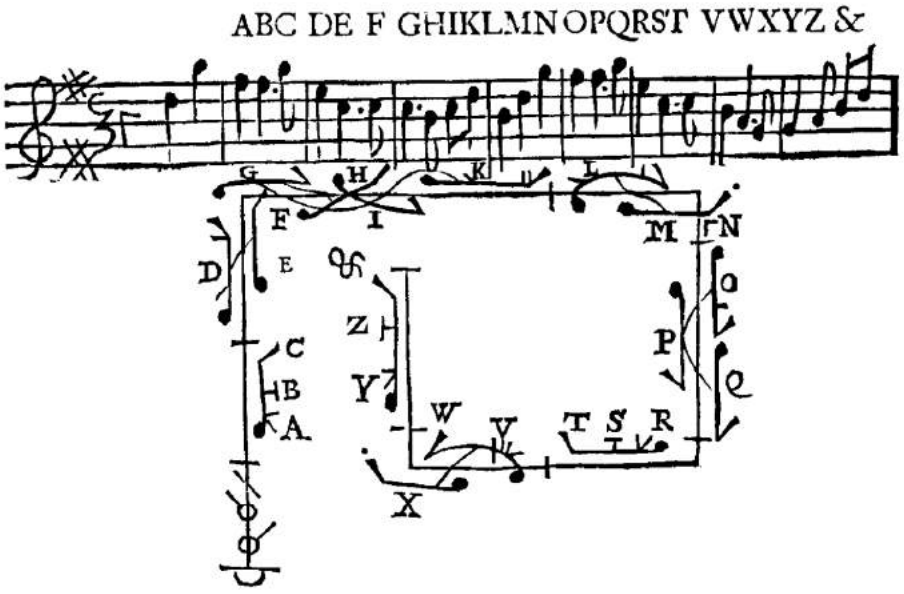


Figure 1.22: The first printed dance notation was invented by Pierre Beauchamps, and published in the book *Chorégraphie* by Raoul Auger Feuillet (Au, 2002: 26). The example is from the English translation version by John Weaver, published in 1706, and shows how dance steps and musical notes are indicated in synchronisation with the alphabet letters.

In order to create a dialogue between music and dance it was essential to look at how they have served as impetuses for each other both historically and more recently. Traditionally choreographers made choreography for already written music, and dance had to be organised to synchronise with music that had been composed for it (Percival, 1971: 17). This is clearly demonstrated in the dance notation from the seventeenth century; as shown in Figure 1.22 the music notation is presented above the dance notation, and the alphabet letters indicate how to synchronise dance steps with each musical note (Weaver, 1706). However, since the twentieth century, there have been huge changes in this traditional relationship. Vaslav Nijinsky premiered the ballet *L'Après-midi d'un faune* in 1912, using Claude Debussy's music "purely as an accompaniment". This was to demonstrate that the music and the stage design were "equally important in setting a mood" and "equally irrelevant to the movements being performed by the dancers, except that the total length of the action was determined by that of the music" (Percival, 1971: 16). Around the same time, Laban choreographed to a very minimalistic use of percussive musical instruments or sometimes even in silence so as to preserve dance as an independent art form, as seen in his works *Die Geblendeten* (1921) and *Der*

Schwingende Tempel (1922) (Laban, 1975: 89, 96). Laban did not agree with the dance theatre tradition of that time, according to which dance had to be organised as a literal translation of music (Laban, 1975: 175–179). Later, from the late 1940s, Cunningham and Cage started collaborating using methods of indeterminacy and chance, treating music and dance as independent entities (Au, 2002: 155–156). From my research on interactive music and dance collaboration, the most frequently referenced example as the origin of interactive music and dance collaboration is Cage and Cunningham's *Variations V* (1965), yet notoriously they did not seek to connect expressive musicality and movement. In contrast to these movements, music and dance had a close relationship in Philip Glass's opera *Einstein on the Beach* (1976), with Lucinda Childs juxtaposing slow and almost static movements to Glass's fast and repetitive music (Obenhaus, 1985). Similarly, Anne Teresa De Keersmaeker was deeply influenced by Steve Reich's music structure, and choreographed repeated and contrapuntal movement variations for her work *Fase, Four Movements to The Music of Steve Reich* (1982) (Figure 1.23). However, De Keersmaeker explains that although Reich's music "supplied a number of principles of construction", her work "did not copy the musical structure" (De Keersmaeker and Cvejić, 2012: 25–27). As a more recent example, at the 2012 Dance Biennale, Forsythe explained that his dance company uses music like "film music"; music can "colour the perception of the event", but it is not necessary to organise a dance according to the structure of the music (Forsythe, 2012).

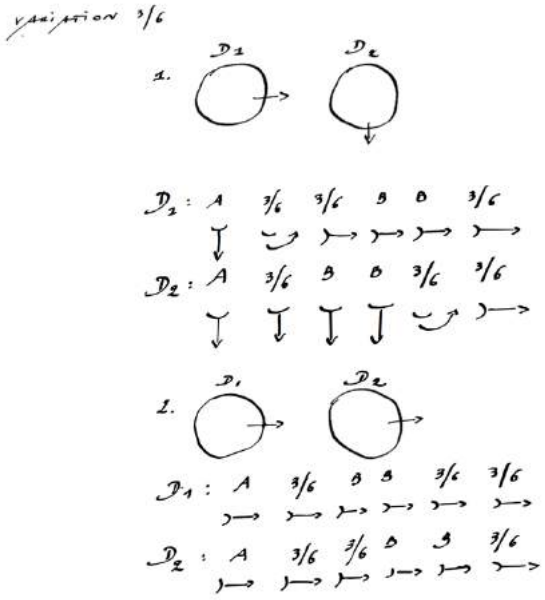


Figure 1.23: This is the choreographic score of the second movement in *Fase, Four Movements to The Music of Steve Reich* (1982). Two dancers' contrapuntal movement variation is created for Reich's *Come Out* (1966) (De Keersmaeker and Cvejić, 2012: 40).

It seems natural to have these constant changes in dance from the twentieth century in particular, since music has also actively changed into various unconventional and uncountable forms through the use of new materials and sound (Cunningham, 1968; Percival, 1971: 15). However, in gesture-driven music and dance research I feel these kinds of dialogues between music and dance have been neglected because "interactivity" is considered a crucial element that has to be demonstrated to the audience. This view can easily restrict interactive dance to the folly of mere demonstrations of technology, and fail to make use of it as choreographic tool. Furthermore, what I could see from the dance notations from the seventeenth century (Figure 1.22) and De Keersmaeker's score (Figure 1.23) was how these two media have changed from rather absolute and common code to abstract ideas. The dance notation from the seventeenth century indicates positions of feet and limbs related precisely to the musical notes, whereas De Keersmaeker's score is drawn with more abstract shapes, directional marks, and numbers. As I wrote in the Introduction to this commentary, at the beginning of my previous collaboration with contemporary dancers I mostly sought ways to orientate the dancers towards the interactive system to help them perform better "sound". However, I was aware of the irony in teaching the abstract ideas of music composition to dancers. Instead, I thought these abstract ideas could be bridged through a concrete medium – for me, it was what the restrictive motion-tracking technology could serve – to successfully conduct this interdisciplinary collaborative composition.

Nevertheless, in interactive sound and dance collaborations the dancers need time to try out the system to learn how their movement affects the sound composition. This learning process is unavoidable as reorienting and restructuring experience through interaction with the system is a significant part of the aesthetic in interactive art. However, I wanted to ease the learning curve and tried to integrate the Gametrak controllers into the choreographic movement tasks. I proposed using the Gametrak controllers as a visual stimulus and physical restriction (see Section 1.2) to my main collaborating dancer Katerina Foti. As she was aware of Forsythe's approach she was interested in the method. Yet, this was my first time composing an interactive music with physical restriction, and I thought the best way to find out the most suitable compositional method was simply to try them out.

Locus was my first composition, and contains four different sections of sound throughout time. I planned several steps to guide Foti and another dancer Natasha Pandermali to gradually construct a choreographic composition with my interactive sound synthesis. Video 1.1 demonstrates the composition process. First, I asked the two dancers to tether four cables each to their bodies and to

improvise to find out how to move within the restrictive conditions without sound. Second, once they got used to moving within the conditions, I then provided more specific choreographic tasks section by section depending on the structure of the sound composition. During this process, the dancers proposed how they would create choreography with my movement tasks and I selected good materials. Finally, we repeated the proposing, selecting, and modifying process several times until we completed the composition (more detailed composition process is explained in Section 2.1.2).

Video 1.1: The demonstration of composition process of *Locus* - https://vimeo.com/252392147/29e5af8932.

My dancers quickly adapted my composition process as they were trained with similar choreographic techniques. This way of proposing and selecting choreographic materials is the common approach in contemporary dance nowadays, as exemplified by the choreographers Forsythe and McGregor. While I was searching for the origin of this choreographic method, I found that some contemporary dance choreographers in the 1960s used the so-called problem-solving concept as research in information theory and artificial intelligence awakened around that time (Rosenberg, 2017: 185–186). This technique adopted improvisation as a choreographic compositional method. For example, the Judson Church group choreographer Trisha Brown first provides movement tasks to her dancers and the dancers create movement in response to them. Second, Brown “intervenes as a composer to select, edit, and reorganize this raw material as choreography” (Rosenberg, 2017: 185). The consulting historical scholar at Trisha Brown Dance

Company, Susan Rosenberg, writes that "Brown cast her dancers into what problem-solving theorists call a 'problem space' defined by an 'initial state, a goal state, and a set of operators that can be applied that will move the solver from one state to another'" (Rosenberg, 2017: 186). This algorithmic process is also apparent in Forsythe's choreographic procedure *Alphabet* (Figure 1.24) (Forsythe and Kaiser, 1999) and McGregor's "if, then, if, then" process[28] (McGregor, 2012).

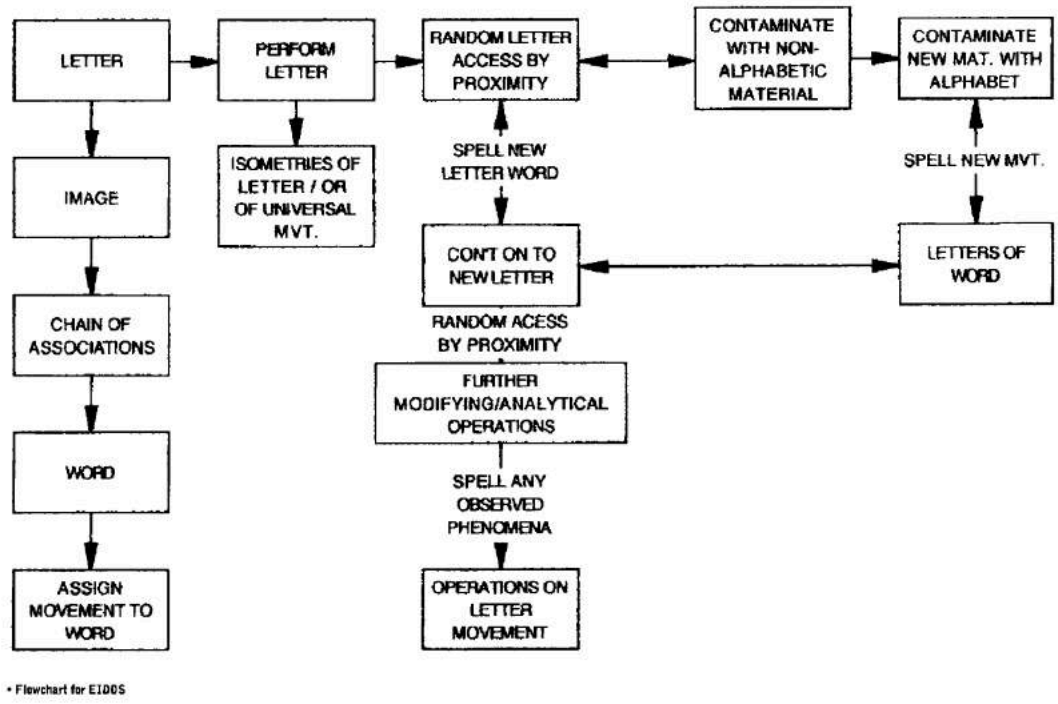


Figure 1.24: Forsythe's choreographic procedure *Alphabet* used for *Eidos : Telos* (Forsythe and Kaiser, 1999).

I also find similar algorithmic thinking in Simon Emmerson's model of compositional process. Since electroacoustic music does not use traditional musical notation systems and materials, Emmerson (1989) writes about composing strategies and pedagogy, and proposes a compositional model for contemporary music (Figure 1.25). The model consists of a cycle of actions: the composer does an action drawn from an action repertoire, which then has to be tested. After testing, accepted materials reinforce the action repertoire and rejected ones can be modified for the action or not. Emmerson explains that research begins when one "tests" the action, and new actions need to be fed into the action repertoire to evolve the research further (Emmerson, 1989: 136). Similar to Brown's technique,

[28] McGregor demonstrated how he transfer his movement idea to his dancers at the *TEDGlobal* 2012 with his problem-solving method. Available at: https://www.ted.com/talks/wayne_mcgregor_a_choreographer_s_creative_process_in_real_time - t-483415 (Accessed: 11th April 2018).

John Young (2015: 159) describes the process after testing in Emmerson's model, in which the composer decides whether to accept or reject materials, as a "problem-defining and problem-solving process".

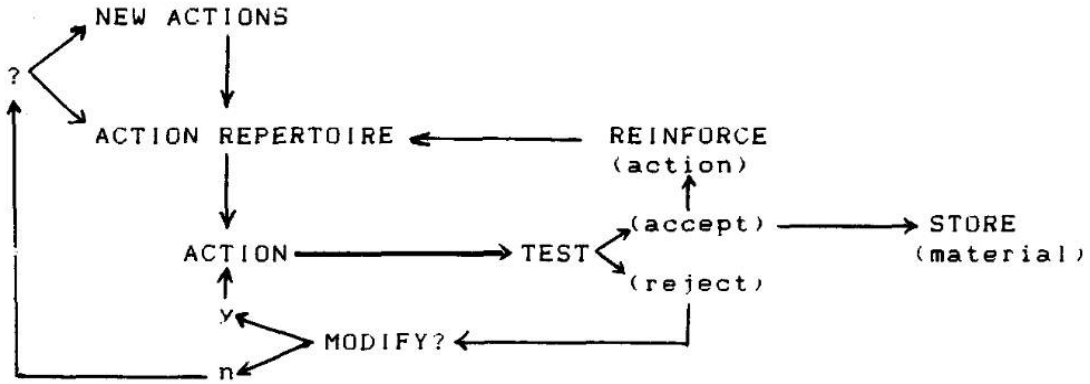


Figure 1.25: A model of composition process by Simon Emmerson (1989: 138).

The unique compositional feature of Emmerson's model is that there is the test procedure. Emmerson explains this in "the composer/listener chain": the test has to be done with a group of listeners – not any listeners, but a "community of interest whose views we trust and value" – since there is no common code for building the same expectation as there used to be in traditional (Western) music (Emmerson, 1989: 142). In my composition process my collaborating dancers are not only the performers, but also the primary listeners as they devise choreography that interacts with my sound system. We try a certain condition, explore our experience, and reflect on the next phase. Therefore, one composition is completed with multiple iterations of these actions; furthermore, my entire research is structured within this action cycle. For instance, some aesthetics tested during the pre-studies were reflected to the major works. Some experiments in my previous major works also affected my decision-making process with my collaborators during my next major work. Figure 1.26 is my adaptation of Emmerson's model of composition process to choreographic sound composition.

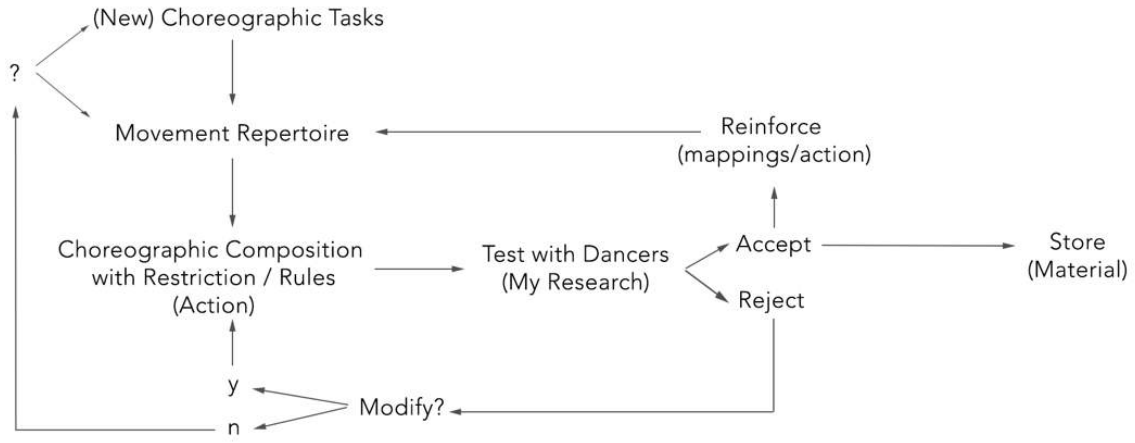
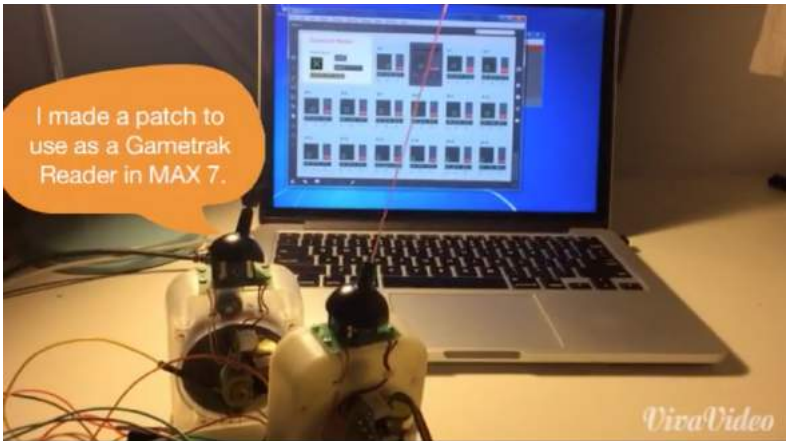


Figure 1.26: My adaptation of Emmerson's model of composition process to choreographic sound composition.

Here, I offer some examples to demonstrate how I mapped movement and my sound synthesis. To prevent the dancers from being too busy dealing with just the musical functions of the technology, I first reduced the number of sound parameters to be performed by the dancers. Mostly only the z (length) values of the Gametrak controllers were used to control the sound parameters; sometimes the x and y values were used to in support to detect more specific locations of the dancers in the performance space (in Video 1.2 I explain how the Gametrak controller works and programmed in Max to receive data). Although I simplified the number of sound parameters each controller could control, I provided different choreographic tasks strictly in order of the allocated time frames. I also wanted to have both direct and indirect interactions between movement and sound so that the dancers could have various conditions within which to devise choreography with differing amounts of freedom.



Video 1.2: The video explains how a Gametrak controller works and how movement data can be received in Max via Arduino – https://vimeo.com/130546962.

Video 1.3: Composition process of *Pen-Y-Pass* - https://vimeo.com/254723449/2f56001b94.

Video 1.3 demonstrates the compositional process of *Pen-Y-Pass* with different choreographic tasks throughout time. For the first section of the composition the dancers were asked to tether cables to their limbs, moving only one arm at first and then gradually use all their limbs. Movement and sound had a direct one-to-one relationship here, and the dancers had to be careful not to move their other limbs from the beginning. As a result, the silent space gradually filled with more and more sounds. For the second part, the dancers were asked to attach one part of their body as though their limbs were extended diagonal lines tethered like the cables as well as the projected visual work behind them. Then the dancers tried to extend their limbs towards the gaps between their bodies. In this section, the dancers' limbs only affected the volume of the sound files, allowing the dancers to focus more on devising choreography. For the third part, they were asked to detach the cables, leaving only one cable each. In this section, there were only two different sounds, one for each dancer, with one-to-one interaction. The dancers were asked to create a circle with their movements and then pause for a while, and repeat this movement. As a result, some silence was created in between. For the fourth section, the dancers were asked to attach one more cable to their limbs, making two for each dancer. One dancer was asked to perform solo, and then the other, and then duet until the end. For this section I programmed different sounds depending on the length of the cables. In return, the more the dancers moved towards the other side and crossed with each other, the louder and more dynamic became the sound.

Video 1.4: The second section of *Temporal* with random sound triggers – https://vimeo.com/247499380/46af82a55d.

Video 1.5: Composition process of *The Music Room* – https://vimeo.com/247731900/494d98e0ea.

For other works, I created more game-like tasks between movement and dance. For example, I attached the cables of Gametraks to two chairs in *Temporal* (Video 1.4). For the second section of the piece I mapped sounds to be randomly triggered at various locations in the performance space. The dancers were asked to move in response to what they heard. As a result, they moved around

the room holding chairs and sometimes even dragging them to make a scratching noise. Depending on the triggered sound, the dancers created dynamic movements from fast to slow. Another example is *The Music Room*, and here sound worked also as a restriction to control the dancer's movement (Video 1.5). I programmed some piano notes to be triggered when the cables were pulled to a certain length. The dancers were asked to stop moving once the piano notes were triggered, and to wait until the note had finished playing. As a consequence, the dancer moved very carefully and created cautious and slow movement variations.

1.4. The role of the composer and the choreographer (… and my role)

I had an opportunity to present my research at the *MSP PowerUser Symposium* with two of my collaborating dancers Katerina Foti and Natasha Pandermali, at the University of Huddersfield in 2016. During the Q&A session, one of the audience members asked whether my collaborative compositional way changed who the choreographer was in my work, as typically the composer made the music and the choreographer made the choreography. My dancers answered that making choreography was everyone's job, and explained our working process: "We try, we find ways, and we propose things … It's always this relationship and collaborative. But [Jung In] had the idea and her concept, but we had to propose things" (Audio 1.1, Listen 5:52–7:00). Next, another audience member asked, "I'm looking for a very simple answer. From the dancer's point of view, who is the 'true' composer? The dancers or the developer of the system?" (Audio 1.1, Listen 11:11–12:25). My dancers and I answered that composing was everyone's job. One audience member even asked whether a composer was needed in collaboration, and another said that like a jazz musician playing solos there was no single composer. It seemed quite obvious that this kind of compositional method still confused some in the audience who preferred to clarify the roles of composer, choreographer, and performer in the traditional sense.

Audio 1.1: Audio documentation of the Q&A session at *MSP PowerUser Symposium* 2016 at the University of Huddersfield – https://soundcloud.com/jung-in/msp-poweruser-symposium.

As previously discussed, the choreographic composition processes of Trisha Brown, William Forsythe, and Wayne McGregor, in which guided improvisation is combined with the problem-solving technique, has become the established method today for building choreography in collaboration. While Forsythe was the artistic director of the Frankfurt Ballet, because of this collaborative aspect he has often jointly credited his choreography to his dancers and himself so as "to break down the traditional hierarchy between choreographer and dancer"; he also presented the Frankfurt Ballet as a "choreographic ensemble" (Spier, 2011: 102). McGregor has also described this contemporary way of composing choreography as a "distributed cognitive process" (McGregor, 2012). Each individual's intuitive response to certain tasks in improvisation became crucial elements in completing a choreography. On the other hand, John Zorn (2008: 197) mentions that the word improvisation was not very welcomed in the 1960s in classical music, and instead composers "felt compelled to justify their work with intellectual systems and words such as aleatoric, intuitive, and indeterminate – music that the performers were making up as they went along – but music that was truly envisioned by a musical mind and then passed down to the performers". In experimental music, the performer's intelligence, initiative, and opinions are all required to perform experimental scores (Nyman, 2008: 214), but composition and realisation are substantially divided. Perhaps the reason for this is that universal music notations have survived whereas dance notations have not.[29] For me it seems that this 'objectification' of music has reappeared as new musical instruments or interactive systems. Yet what I would like to draw out in my research is not only the technological development as a compositional act, but also the holistic compositional cycle in collaboration as a composition.

Another possible reason why the audience can be confused is the interdisciplinary nature of mixed media in my work. In the 1960s the boundaries between different art forms began to blur as a counter-cultural artistic movement focused on "making processes" by disregarding the delineation of discrete disciplines (Cox, 2008: 207; Salter, 2010: 154; Rosenberg, 2017: 2). Foster writes how in the dance world "the terms choreography and choreographers have undergone yet another set of modifications due to the changing nature of dance composition and performance" since the 1960s (2011: 36). Daniel Nagrin and Anna Halprin, for instance, used improvisation in their choreography and referred to themselves as directors, rather than choreographers. In addition, artists from the London School of Contemporary Dance explored new sources for movement and arranged them

[29] The first printed notation was invented in the late seventeenth century by Pierre Beauchamps, Louis XIV's dancing master, but by the mid-eighteen century dance notation was no longer in use since the ballet conveyed drama through facial expressions and postures that could not be notated universally (Foster, 2010: 32–35).

with other art forms such as sculpture, film, or spoken and recorded text. This resulted in them crediting works as 'conceived by', 'directed by' or 'arranged by', instead of 'choreographed by' (Forster, 2011: 36). I find a similar concern in the composer Earle Brown's graphic score *December 1952* in which he writes that his predominant influences are the works of Alexander Calder and Jackson Pollock. Calder's works are carefully constructed but mobile, whereas Pollock's work is abstract but physical and direct (Brown, 2008: 189–190). Brown writes that:

> I felt that the realizable concepts of physical and conceptual "mobility" in relation to the graphic input by me was a practical and creatively ambiguous stimulus to performer involvement and sonic creativity. This is not an abandonment of composer responsibility but the musical result inherent in a provoked, multicreative, "synergistic" interaction of the composer's concept, the graphic score, the performer's realization, and the audience. Not one of them is independent of the others; there exists, rather, a truly collaborative, creative synergy. … What interests me is to find the degree of conditioning (of conception, of notation, and of realization) that will balance the work between the points of control and noncontrol. At that point, the work, the performer, and I will most clearly exist – both as entities and identities. (Brown, 2008: 190)

Reading Brown's statement, I can see his effort to combine two different ideas – constantly evolving abstract composition and physically concrete performative nature – that his graphic score bridges (Figure 1.27). Similarly, I wanted to provide "stimulus" to my collaborating dancers to draw our abstract creative ideas together into our corporeal dance and sound performance. My use of physical stimuli through Gametrak controllers and other physical elements such as chairs in *Temporal* and the unusual performance space in *The Music Room* was my attempt to look for a "balance of control and noncontrol" by which to devise abstract movement and sound art in collaboration.

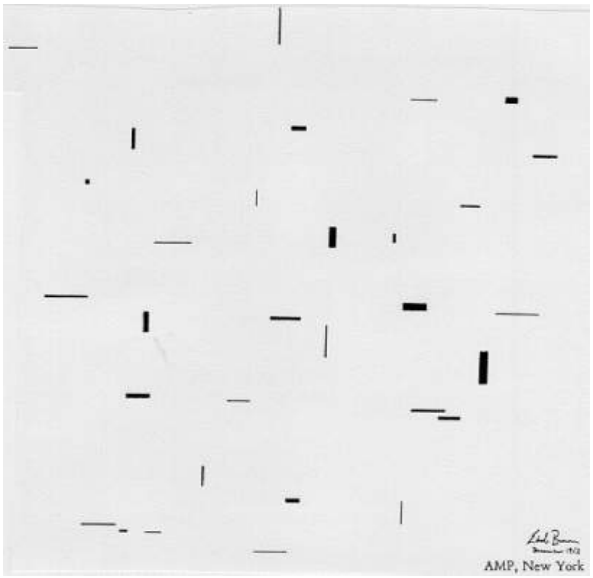


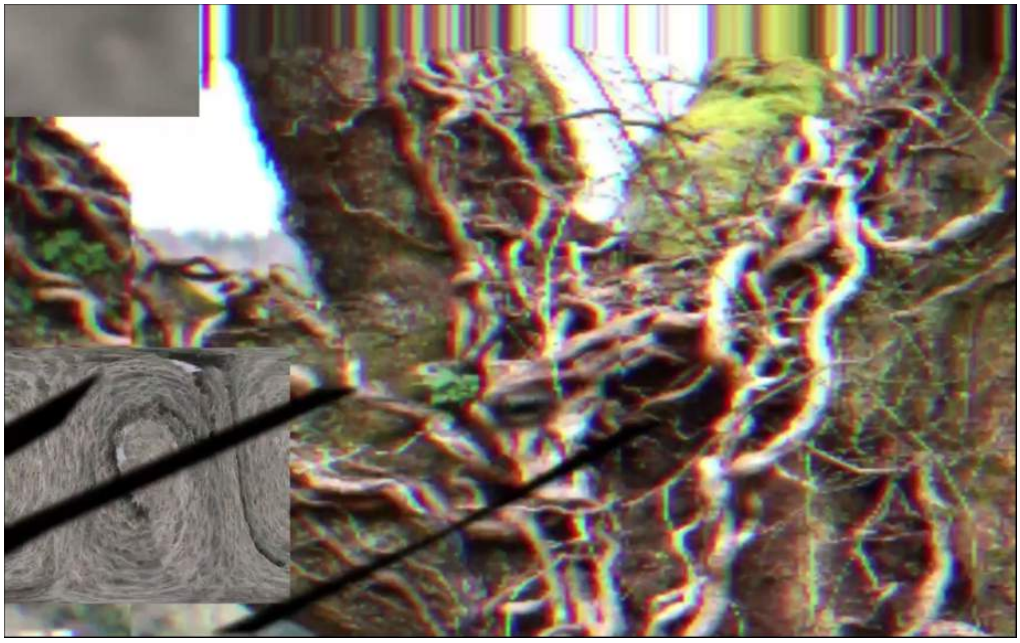
Figure 1.27: Earle Brown's graphic score for *December 1952*.

Still the terms choreographer and composer have been used in the traditional sense for the convenience of crediting someone's work to public. However, as the future form of music and dance performance has been predicted as more complex format as they have evolved with other media (Percival, 1971: 17–18), I find it hard to define the collaborative multi-creative nature of my role solely within the term 'composer'. It implies a hierarchical relationship with performers and a division of work between composer and choreographer that I do not identify with in my work. While I initiate the idea, establish parameters and intervene throughout in the development of the choreographic sound composition processes, I credit my role as 'concept and direction' throughout my portfolio to acknowledge the deliberate blurring of traditional roles in my work.

Chapter 2. Original Works

2.1. Project One

2.1.1. *Untitled 10* (pre-study)



Video 2.1: *Untitled 10* - https://vimeo.com/169480484.

I composed an audiovisual work *Untitled 10* (Video 2.1) as a pre-study for my first choreographic sound composition *Locus*. The work is composed with real-time video processing in vvvv and post-production sound in stereo.

While searching for case studies in dance and technology collaboration, I found that the choreographer Wayne McGregor worked with cognitive scientists to seek connections between creativity, choreography, and the scientific study of movement and the mind (deLahunta, 2006). The research developed from a 2001 workshop organised by Scott deLahunta by aiming to use motion-tracking technology to expand brainstorming for choreography. The scientists sought ways to design software as a "multimedia notebook that could be used in rehearsal for recording, notating, and playing back information, rather than an interface to trigger media on stage" (Salter, 2010: 266). They

observed how McGregor and his dancers developed choreography from mental imageries and other derived sensory stimuli over different projects. These observations and the recorded movement trajectories were used to help break conventional movement habits by shifting the perspectives by which these imageries were approached.[30] What interested me about this collaboration was that the choreography itself came about as the result of technological adaptation rather than a representational event such as a sound or image created with real-time movement data. One outcome to the collaboration was the choreographic composition tool *Mind and Movement* for choreographers and teachers, which includes image cards with related movement tasks to stimulate developing and structuring movement materials (Figure 2.1).

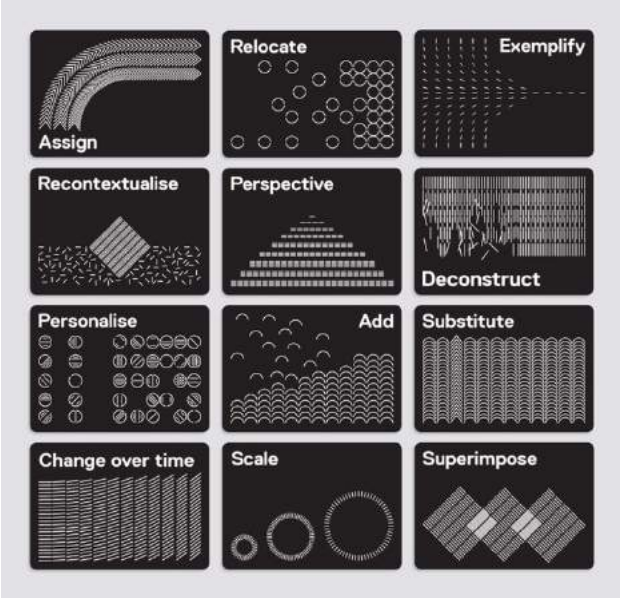


Figure 2.1: *Mind and Movement*, a practical resource for choreographic composition by Wayne McGregor and Random Dance Company.

Inspired by the usage of imagery for choreographic composition, I decided to create a real-time video composition that could be used as choreographic stimulus as well as a resource for an interactive performance. Because it was my first time creating a real-time video composition, instead of creating images from scratch I decided to use photographs or video recordings as source

[30] The collaborative process is explained with a series of videos from Wellcome Collection. Available at: https://www.youtube.com/watch?v=bd1nZDMLRgM and https://www.youtube.com/watch?v=ggjy7rNg4oY (Accessed 14 April 2018).

materials and to manipulate them within the graphical programming environment vvvv.[31] vvvv was the most approachable software for me to learn because of the similarity of its programming environment to Max. I went out to the Manchester city centre as well as towards north-west Wales to take photographs and videos of interesting shapes and patterns. When I returned, I sorted the pictures into similar shapes, textures, and colours, and thought about how the images could be transformed into one another (Figure 2.2).

Figure 2.2: Some of photographs taken in Manchester city centre and northwest Wales.

[31] https://vvvv.org/

In search of inspiration for a video composition using these photographs, I had an opportunity to meet the artist Patxi Araujo at the University of the Basque Country as a part of my Santander Study Visits scholarship programme in 2015. He showed me a sketch of his new project and explained that the computer-generated visual work, a complex moving mesh, was the result of his 'organic' system in vvvv (Figure 2.3). His work was not a representation of a real object, but a blurred dichotomy of analogue and digital aesthetics.

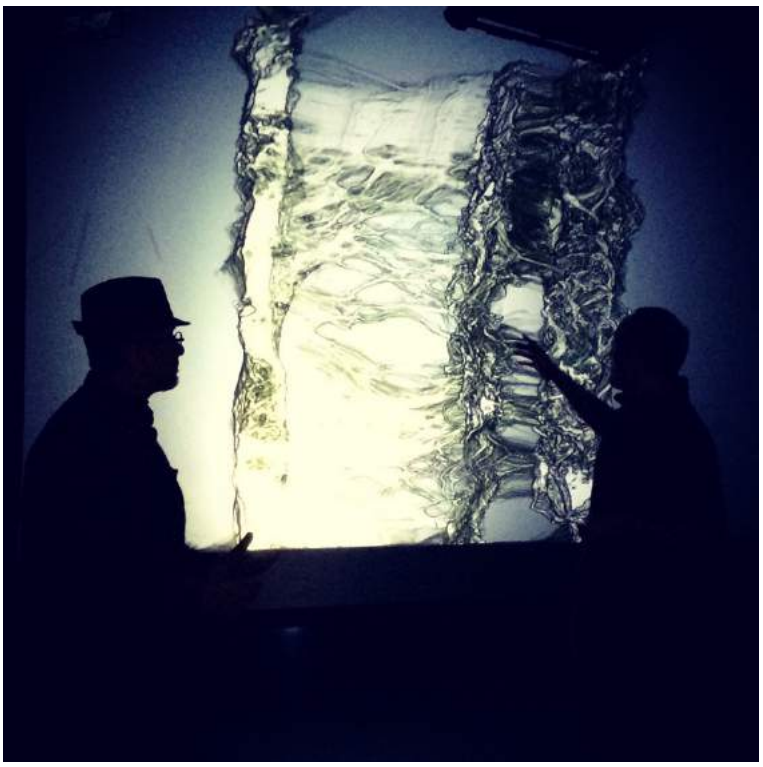


Figure 2.3: The artist Patxi Araujo presents a sketch of his new visual work created in vvvv.

I found a similar approach in the audiovisual artwork *Rheo: 5 Horizons* (2010)[32] by Ryoichi Kurokawa. This work is projected onto five aligned vertical plasma-displays and moves across them screens in time with a tightly synchronised sound composition. The visual work mixes visions of human and computer: high quality representational images of nature are juxtaposed with computer processing of these images in Euclidean space (Vandsø, 2014). In addition, Kurokawa's music used some organic sound materials, which in turn added another texture onto the digitally produced images. For

[32] An excerpt is available at: https://vimeo.com/31319154 (accessed 5 May 2018).

example, the sound of squeaking noises is juxtaposed with glitch-like flickering visuals, as if the flickering images were caused by the action of twisting something. When the visuals moved like a wave across the screens, he added field recordings that recall the sounds of wave, wind, and seagulls.

Similarly, the artist Herman Kolgen creates visual work with high quality images and glitches. At the event *Digital Québec* at the British Film Institute in London in 2015 he performed *Seismik* and *Aftershock* with live electronics. [33] Although Kolgen's visual works looked neat and slick, he used tactile and physical objects to create the noises for the sound performance. For instance, he created some spark-like noises by touching two wires together, and moved antennas around to receive "a cluster of seismic readings and terrestrial frequencies culled from a variety of locations" through the internet that "impact the live performance in random and unexpected ways" on the stage (Kolgen, n.a). Kolgen's live performance embodied his physical movement and the digitally produced images.

Kim Cascone (2000) explains that the use of glitch comes from an aesthetic of "failure" in contemporary computer music. Both Kurokawa and Kolgen use glitch in images and sounds in their post-digital approach. However, their glitches intentionally reveal an interplay between the realistic images and the high-end computer technology rather than arise as accidentally generated digital noise. This approach seemed similar to mine. Although I used the vintage game controller Gametrak in this project, I chose it to reveal intrinsic physicality through the controller itself rather than for its ability to retrieve real-time human body movement data. In other words, my approach was post-digital. Also, I did not see the lower specifications of the Gametrak as a technological failure in comparison to the newest motion-tracking devices; I wanted to combine its tactile appearance and body movement with my digital audiovisual compositions. [34]

Motivated by these works, I decided to manipulate my photographs digitally, but preserve their organic textures. First of all, I named the sorted photographs (see Figure 2.2) as *Untitled 1*, *Untitled 2*

[33] The preview of *Seismik* is available at: https://vimeo.com/90652292 (Accessed 5 May 2018).

[34] Later, this idea led me to curate an art and technology exhibition *Artificial Retirement* on the related theme of 'failure'. I also published an article on the subject, "Redefining Failure in a Technologically Aided Era" in *Clot Magazine* [online]. Available at: http://www.clotmag.com/redefining-failure (Accessed: 8 June 2018).

and so on, and sent them to my collaborating dancer Katerina Foti to see whether any of them inspired her choreographically. She chose a series of photographs named *Untitled 10*. In fact, I later used these photographs for *Locus*, but I retained the name *Untitled 10* for this project since it was a pre-study for *Locus*. I tried various methods in vvvv for processing my photographs, primarily so as to find the most suitable aesthetic direction for *Locus*.

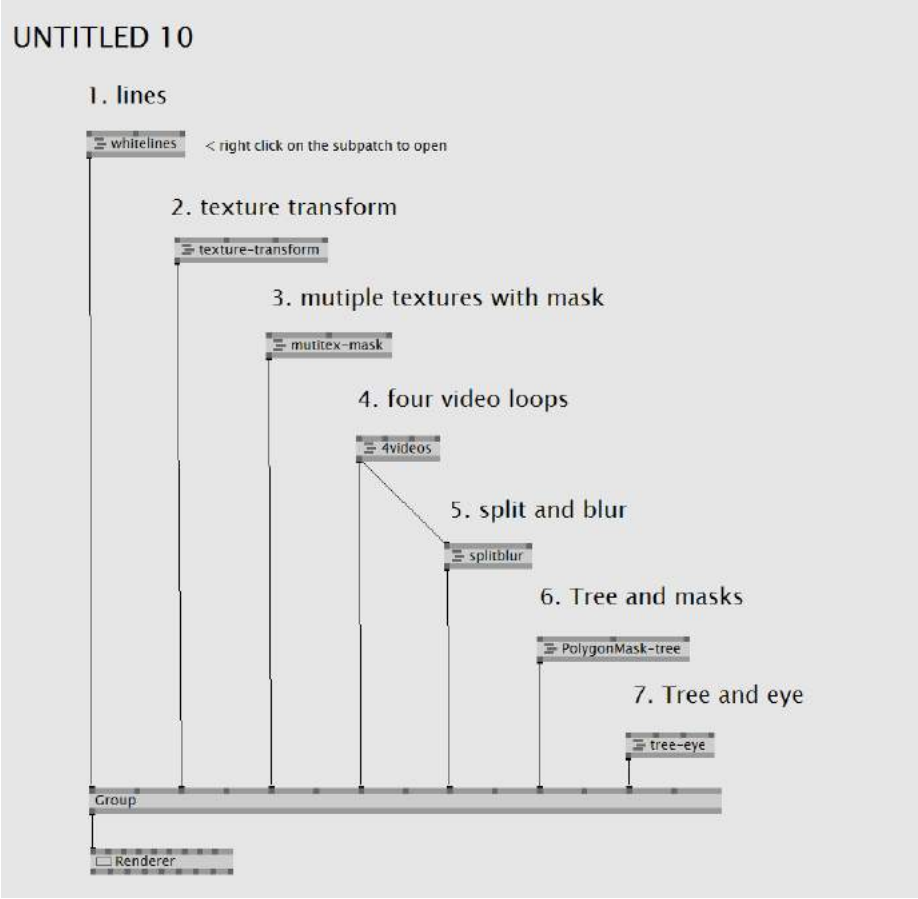


Figure 2.4: The seven subsections of *Untitled 10* in vvvv.

The composition *Untitled 10* is divided into seven sections (Figure 2.4).[35] The first was a simple study in generating multiple vertical lines using spread and LFO objects (see Video 2.1 from 00:00 to 01:00). These were the most basic and crucial objects to learn to generate real-time visuals in vvvv. Several spread objects were used such as LinearSpread and RandomSpread. These multiply an

[35] A detailed explanation of the sub-patches in vvvv is given in Appendix A.

image with either linear values or random values. LFO used signal data to add movement to these generated images. For the second section, I programmed the three photographs in Figure 2.5 to transition from one to the next and added the circular movement (Figure 2.6). The manipulated image was no longer a realistic image of nature. Yet the fluid movement added another texture onto the static image and abstracted its representational reality (see Video 2.1 from 1:00 to 3:00). For the third section I used a mask to overlap the video recording of a mountain in Wales to show the contrast between the static image of the metal structure and the moving image of the mountain as a texture (see Video 2.1 from 3:00 to 03:19). For the fourth section, I divided the screen into four parts and played the same video recording of the mountain at different loop speeds (see Video 2.1 from 03:20 to 03:41). For the fifth section I added a glitch effect onto the renderer which added another movement onto the image; it divided the screen into vertical sections and moved each section up and down (see Video 2.1 from 03:42 to 04:00). For the sixth section, I used masks to overlap two video recordings of some rocks that were covered with colourful mosses in interesting patterns (see Video 2.1 from 04:00 to 04:30). Although the videos showed my struggle to hold the camera still to capture the details of these patterns with a zoom lens without a tripod in strong windy weather, it provided interesting movement when these videos were overlapped onto the masks' tree shape. It looked like the surface of the tree started moving. For the seventh section, I used a mask again to overlap a goat's eye onto a tree (see Video 2.1 from 04:30 to 05:03). I took a picture of that tree because the winding tree branches were grown over another big tree, creating a contrast of vibrant and static feelings (Figure 2.7). The winding branches looked very alive compared to the big old tree behind them, and I wondered how it would look if I overlapped a partial image of another living creature onto this one. I added a wavy movement onto the background texture to make the winding branches look more vibrant. I also made a list of photographs whose background texture I would change to see how the wavy movement worked with the other images (see Video 2.1 from 05:03 to 05:27). Finally, I connected my MIDI controller to control these effects in real-time and captured my performance as a video. This was in order to see how this video composition would work in vvvv when I received the input data from the Gametrak controllers.

Figure 2.5: Three photographs used for the second part of *Untitled 10*.

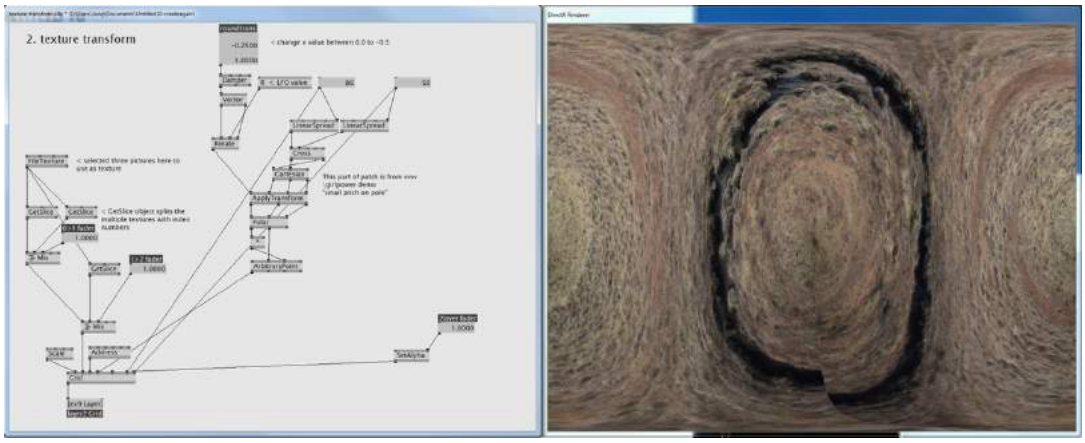


Figure 2.6: Addition of a circular movement in vvvv.

Figure 2.7: Several trees grown over each other creating a complex entanglement.

While performing with the MIDI controller, my vvvv project froze because of my poor skills at programming graphics according to the capacity of my graphic card. Although I was no longer able to control the patch with the MIDI controller at this moment, my vvvv project created glitches and very fast transitions between the different photographs and layers by itself that went beyond my imagination (Figure 2.8). It resized some of the photographs, masked some areas that I had not intended, and applied some effects with unpredictable patterns. It reminded me of Anette Vandsø's analysis of Kurokawa's work *Rheo: 5 Horizons*, which insists that the work "combines or connects human experiences" using computer (Vandsø, 2014: 143):

> [When watching *Rheo: 5 Horizons*] our attention is being swirled around in a roller-coaster ride: from the imagery to the processuality of software codings, from the represented space in the image to movements on the screen, to movements in the actual space in which the large panels are exhibited. (Vandsø, 2014: 144)

Figure 2.8: My vvvv patch started creating glitches by itself and froze my computer because of my poor usage of the graphic card's capacity. [36]

[36] I also recorded the movement with my mobile phone video camera. Available at: https://vimeo.com/267820495/0a73a02344.

This moment made me realise that what made something appear digital was not only its digitally processed look but also its movements, which could not be recreated with analogue tools. As a consequence, the fast transitions and the glitch movement seemed, ironically, 'organic' to the computer. I thus decided to include this glitch movement as a part of my composition. In fact, the glitch-like transitions of the final part of *Untitled 10* were not entirely genuine glitches. I was no longer able to run my vvvv patch as it had been because it froze the entire operating system of my computer. I had to recreate my patch more efficiently. But inspired its patterns I decided to recreate the glitch-like moment with an automated quick transition control between different sections of the composition. The recreated patch was more stable than the previous one but still it produced clunky and incorrect transitional moments with the fast transition control.

I created the sound composition in Logic Pro X[37] for the captured video as a way to think about what kind of interactive sound synthesis I would need to create in Max for the next project. I had originally practiced film sound design and theorization for my undergraduate degree, and this had led me to work with individual filmmakers and some architecture companies who used video content in their exhibitions or research projects. For this reason, I feel more comfortable sketching sound composition ideas using sound editing software that allows me to watch the image I am going to work on before creating sound synthesis in Max. It is crucial for me when I create a sound composition to have a visual stimulus.

I wanted to use sound materials related to the image to create a cinematic audio experience. My purpose was not to create a realistic representation of the objects shown in the captured video but to provide aural abstractions of the texture or the movement of the images. This kind of relationship between sound and image was also shown in *Rheo: 5 Horizons*. For instance, when some complex grids and grains of an image moved like a wave in a slow motion, it reminded an image of an approaching wave because of Kurokawa's use of grainy white noise-like sound moving from left to right. Also, Kolgen's use of physical action to create spark-like noises (described above) and the accompanying shaking images created an abstract cinematic experience. Kolgen calls himself an "audiocinematic sculptor", as his purpose is to create an intimate relationship between the image and the live sound performance on stage that blends "the real and the virtual" (Palop, 2013).

[37] www.apple.com/lae/logic-pro/

For the first part of my visual composition, I used 60Hz hums and other electric noises, and syncronised them with the movement of the white vertical lines. As the next image faded in and moved in the circular motion, I added a field recording of a water stream in the background as the image reminded me of the fluid movement of water. I also used the sound of squeezing a woven basket and syncronised it with the circular movement. For the footage of the snowy mountain, I wanted to use the sound originally recorded with the camera as it already had the vibrant feeling of the windy mountain. I processed this sound with various effects just to take away the abstract feeling of the movement of the camera. For the video footage of mosses overlapped with the tree image, I used some grainy electric noise because the video's movement reminded me of white noise on TV. I then changed it to the sound of cicadas, which continued until the next scene of the overlapped images of the trees and the goat eye.

I used the sound of cicadas to create an abstract drama based on a bizarre experience I had when visiting a botanical garden in Trang in Thailand. Compared to other places in Thailand, Trang is not a touristic town, and I stayed there for two nights in transit between Bangkok and Koh Muk island. When I arrived at the botanical garden, I did not see any tourists other than my partner. The garden was huge and preserved the wildness of nature with very tall trees like a jungle, and because of that it was hard to see what was ahead of me. There was a moment that I sensed a high-pitched almost electrical noise surrounding me, which made me wonder whether it really was cicadas rather than electrical noise coming from nearby telephone poles. I listened carefully and found that the cicadas were making different pitches, like a low-cut filtered white noise and then a unified sharp high-pitched sound in oscillation (Audio 2.1). This was a very different sound to that of the cicadas I heard in Korea in my childhood. The deeper we walked into the garden, following a very narrow path between huge plants, the more the sound of cicadas built up a tension in my mind. Suddenly my partner got stung by a bee and we saw a sign for the swamp forest with the warning 'Beware of poisonous animals'. I was afraid to go deeper into the forest since there was no one else around besides us, and we turned back to where we came from. The sound of cicadas made me imagine more dangerous things than could possibly be waiting for me after the warning sign in this artificial garden. Based on this memory I wanted to recreate the strange and almost surreal moment with the image of the tree and the goat eye.

Audio 2.1: Sound of cicadas recorded at the botanic garden in Trang in Thailand – https://soundcloud.com/jung-in/trang-botanic-garden/s-YwuxY.

As the background image changed, I made a sound like being under water. Because I added an effect that moved the image like the surface of wavy water, the photographs of rocks seemed blurred as if they were under the water. Finally, for the glitch part I added some sound I had used sporadically in the previous sections as well as the sound of swirling for the fast transition movements on screen.

2.1.2. *Locus*

Video 2.2: *Locus* - https://vimeo.com/141275226.

Locus (Video 2.2) is a choreographic sound composition with interactive visuals in which dancers can trigger and manipulate the audiovisual work created in Max and vvvv. With *Locus* I wanted to

combine my previous investigations with the intrinsic physicality of the Gametrak controllers (see pages 30–31) and my audiovisual composition practice in *Untitled 10*. During the composition process, the dancers Katerina Foti and Natasha Pandermali primarily interacted with my choreographic sound composition by executing my choreographic rules using the Gametrak controllers. The visual work was a consequence of the triggered sound; for instance, the structure of the visual composition changed depending on the number of triggered sounds. I projected the visual work onto the wall behind the dancers as well as onto the dancers' bodies as they crossed the projection. This was in order to merge the dancers into the audiovisual scene rather than to treat dance and visual composition separately. The interaction cycle in this piece is described in Figure 2.9.

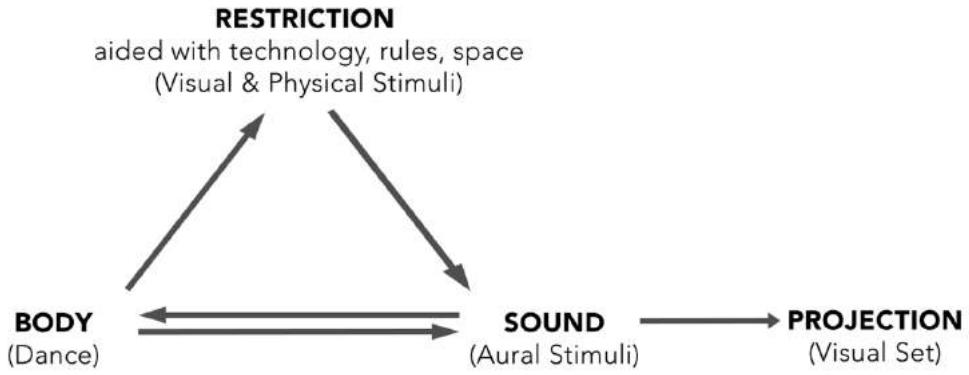


Figure 2.9: The interaction cycle in *Locus*.

I composed this work based on three photographs I took in Manchester city centre (Figure 2.10). They were chosen because my collaborating dancer Foti was interested in creating choreography inspired by the captured geometric shapes and lines in these photographs in particular. I decided to place eight hacked Gametrak controllers in a cube shape – four above and four below – as shown in Figure 2.11, and locate the dancers in the middle so that the Gametrak cables could also create geometric lines when they were connected to the dancers' bodies. As a consequence, the cables of Gametrak controllers contributed to the visual scenery of the performance when overlapped onto the projected images. Figure 2.12 was my sketch of two dancers tethered with Gametrak controllers when looking down from above.

Figure 2.10: Three photographs used for *Locus*.

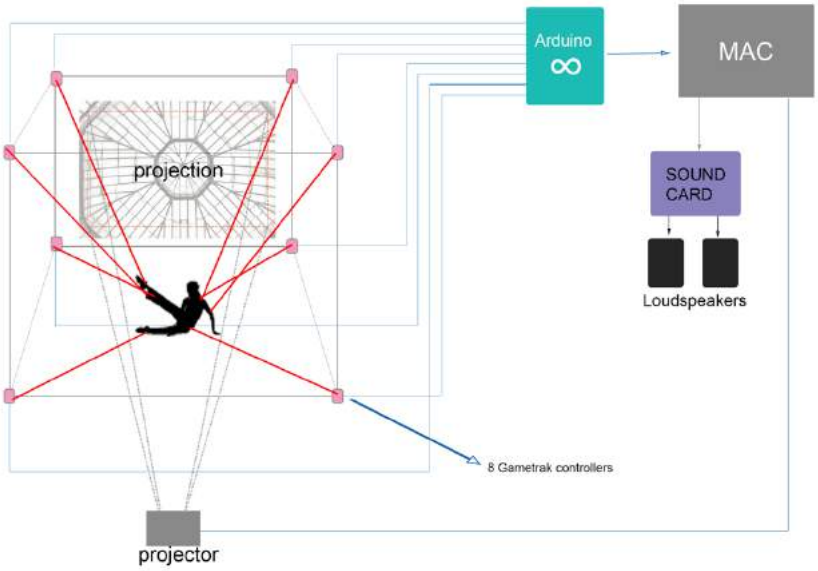


Figure 2.11: Technical set-up for *Locus*.

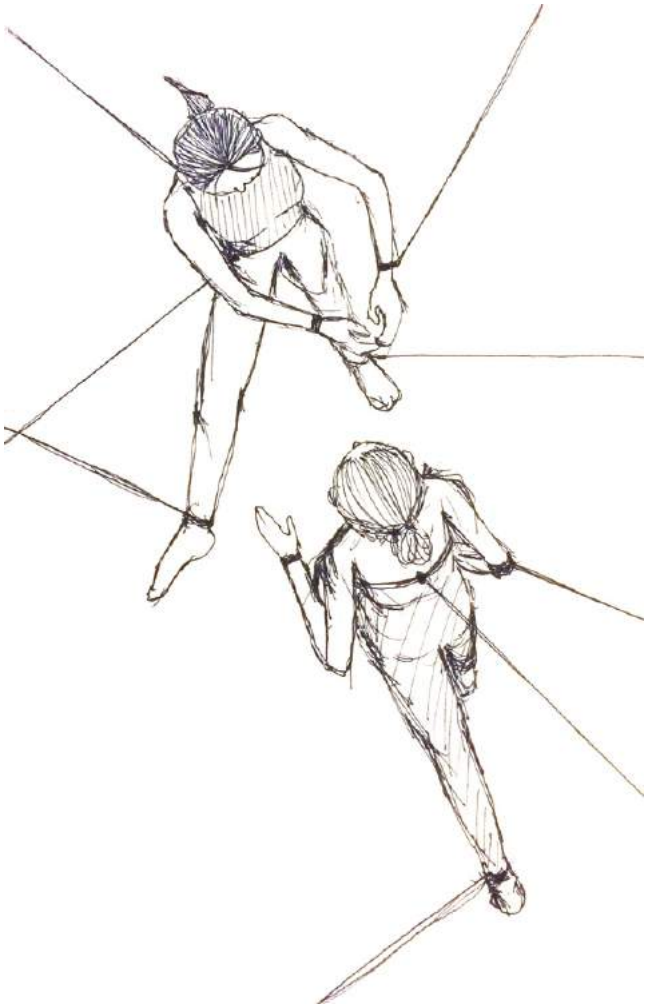
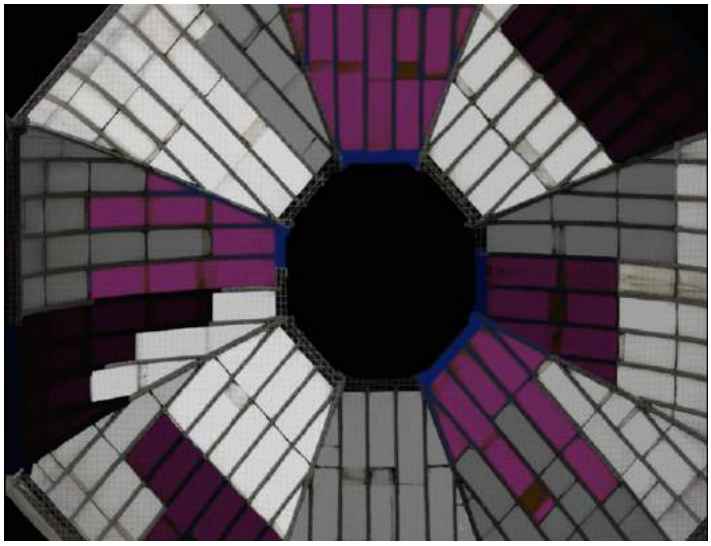


Figure 2.12: My sketch of two dancers within the technical setting in Figure 2.11.

To begin the collaboration, I first created the interactive audiovisual work in three different parts. I fixed the overall framework of the piece but left the inner structures to be completed by the dancers. Different choreographic tasks were set for each part, and each part was constructed as the dancers executed the tasks. The tasks indicated what to do with the Gametrak controller, as well as the duration and speed of movement, but the detailed body movements in response to these tasks was up to the dancers. I did not aim to deliver a specific storyline with my audiovisual work, but I let the given materials be processed through my real-time synthesis engine so as to see what would be evoked during the composition process with the dancers.

The compositional ideas for the audiovisual work and the choreographic tasks came at once when I saw the three pictures in Figure 2.10. I wanted to start the piece with simple movement tasks as well as simple manipulations in sound and visuals so that the audience could sense that the piece was interactive. Soon after I wanted to make the interaction rather abstract. For me 'interaction' meant having an immediate responsive environment associated with dance movement during the composition process no matter whether it was easy or hard to recognise. The interaction was the medium through which to deliver my abstract choreographic ideas, and therefore I wanted to show the total work as a composition rather than a dance performance presented alongside an interactive audiovisual composition.



Video 2.3: The first part of *Locus* – https://vimeo.com/265386400/50db385b1b.

The first part of the composition consists of three different variations of the picture of the glass dome[38] (Video 2.3). For the first variation (see also Video 2.2 from 00:00 to 02:50), I programmed the glass windows to appear as the Gametrak controllers were pulled. The more the cables were pulled, the brighter the image of the windows became. When the end of the cables was reached, the colour of the windows changed to purple. I imagined how I see an afterimage, which is usually purple to my eyes, after I see a bright flash of light. I used the ringing sound of wine glasses in different pitches and a short gong sound to accompany the purple image. Here, my choreographic task for the two

[38] The detailed explanation of my vvvv and Max patches for this composition is in Appendix B.

dancers was: ***Tether the cables one by one slowly (total four each). Continue this act until you hear the sound of 'gong' thirty times so that the next part starts.*** For the first part of the composition, my choreographic tasks were mostly aimed at letting the dancers get used to moving around gradually with the tethered controllers. With this movement task, when a dancer pulled the cable until the end, the dancer realized that the tethered part of the body was no longer free. This provoked them to move the rest of the body while isolating the tethered part.

For the second variation (see Video 2.2 from 02:50 to 04:50), I kept almost the same effect for the visuals, only changing the brightness of each glass window piece when the cables were pulled. For the grainy and glassy sounds the length of the cables changed only their volume. The range of volume change was subtle and this was the moment where the abstract interaction started. Although the interaction was very subtle in the second variation, I intentionally made a sudden transition in sound between the first and the second variation so that the dancers could notice that the second variation was started by sound. By this moment, the dancers were tethered with four cables each, and my choreographic task was: ***Improvise as duet for 2 minutes. Explore the movable space between and around each other's body.*** This movement task was intended to get the dancers used to moving with their tethered bodies and also with each other within the performance space.

For the third variation (see Video 2.2 from 04:50 to 06:50), I added a blurring effect to the visual when the cables were pulled. Similarly, I added some reverb effects to the grainy and glassy sounds. The choreographic task for this part was: ***Perform as solo for 1 minute each. When the solo is finished, move to the side and detach three cables.*** This movement task was intended to give each dancer some free solo improvisational moments.

The second part of the composition consists of two variations on the picture of Manchester central railway station (Video 2.4). I wanted to transform the picture into a completely different object so that it lost the sense of being an image from a building. I created a sphere in vvvv and used the picture as its texture. I added a rotating but glitch-like irregular movement to the sphere. I programmed so that one sphere would appear for 15 seconds when the second part started, and then more spheres would be populated subsequently depending on the length of the pulled cables. I synchronised the

sound of clicks with the glitch-like rotating movement so that the movement of the sphere would abruptly trigger the clicking sound as though there was a playback error. For this part (see Video 2.2 from 06:50 to 07:50), the dancers were tethered with only one cable each so that they were able to move more freely. The choreographic task was: ***Improvise freely inspired by the projected visual for 1 minute. At the end of the improvisation connect the rest of the Gametrak cables to each other's body (three more each).*** Foti suggested creating a round shape with her arms and spinning around the space and Pandermali followed.

Video 2.4: The second part of *Locus* – https://vimeo.com/136386942/d6cf69b9d0.

For the next variation (see Video 2.2 from 07:50 to 09:33), I mapped the spheres to move according to the x and y values of the Gametrak controllers, with lines drawn between the spheres. I also programmed the spheres to disappear and only show the lines when all the Gametrak controllers were pulled more than a certain length.[39] I used the sound of cicadas again but cicadas from different regions, singing at a lower frequency than those I heard in Thailand. When I chopped the sound of cicadas to a very short length, they sounded like an electric buzz and I wanted to use this sound for the odd movement of the spheres. When all the spheres disappeared, I programmed the ambience of a rain forest to play. In order to move on to the next part of the composition, the dancers had to trigger the rain forest sound ten times. The choreographic task here was: ***Improvise as a***

[39] The range of x, y, z values of Gametrak controllers are from 0 to 1023. For this section, I programmed the spheres to disappear when all the z values were over 400. For more detailed information with Max and vvvv patches, see Appendix B.

duet at a fast speed and trigger the rain forest sound ten times. By this point, the dancers were used to moving with the tethered controllers, so they could speed up their improvised movements.

Video 2.5: The third part of *Locus* – https://vimeo.com/269924795/2dd8b94af4.

The third part of the composition consists of two variations (Video 2.5). First, I made the picture of the door appear and then create another cube with the same picture of the door whenever the cables were pulled beyond a certain length (see Video 2.2 from 9:33 to 11:33). Secondly, I synchronised some sounds of clicks and a highly processed sound of flipping book pages in different pitches with the movement of the cubes. The choreographic task was: ***One of the dancers to slowly detach all the cables from their body and attach them to the other dancer one by one. Do this task for 2 minutes.*** As a result, Foti detached all the cables from her body and attached them to Pandermali. Whenever Foti attached another cable onto Pandermali's body, Pandermali checked how the tethered part could be moved.

For the next variation, I made the cubes change their textures randomly with the pictures I used for all three parts. From this moment, the interactive sound and visual synthesis was disabled (see Video 2.2 from 11:33 to 14:20). I wanted to recreate the glitch moment I had during the creation of *Untitled 10* with the entangled and glitch-like repetitive movement I had discovered in the previous experiment with the Gametrak controllers (see page 31). The choreographic task here was: ***The freed dancer and the entangled dancer freely improvise. Show the contrast of movements with***

your different physical circumstances. As a result, Foti moved around Pandermali at a fast speed, and Pandermali moved very fast with the tethered controllers.

As shown in Figure 2.9, the Gametrak controllers were used not only to stimulate the dancers visually, but also to 'restrict' the size and shape of the dancers' kinesphere. The reason that I decided to provoke the dancers to improvise with this special condition was in order to encourage them to resist their habitual movements. This is my method for employing directed improvisation, using a problem-solving technique as a compositional strategy as well as to discover new ways of moving. Notoriously, Merce Cunningham rejected improvisation because he resisted his instinctive preferences to create more innovative choreography (Copeland, 2004: 80). However, I did not want to eliminate intuitive decisions from my dancers. My intention was to let the dancers contribute their movement knowledge and skills to the choreography beyond their own habits. In other words, this was my way of provoking a "physical thinking process" as Wayne McGregor calls it (2012). As a consequence, the restriction made the dancers more aware of their physical bodies and they resolved the problems in response to my choreographic tasks. The resulting movements would be what had been processed through the dancers' movement repertoire with my new inputs (see my composition process in Figure 1.26).

Audio 2.2: interview with Katerina Foti and Natasha Pandermali – https://soundcloud.com/jung-in/interview-with-katerina-foti-and-natasha-pandermali-after-practicing-locus/s-09Csc.

After the first rehearsal of *Locus*, I interviewed Foti and Pandermali briefly to ask about their experience working with my method (Audio 2.2). Before we started the rehearsal, I did not explain details of my audiovisual work because I wanted the dancers to reveal it for themselves through trying out the interactive system. Also, I did not explain why I created this system because I did not want to give them any specific ideas before they had even tried it. Nevertheless, Foti surprisingly noticed my idea, and mentioned that the tethered controllers limited her but also made her 'create'

movement because of the restrictions (Audio 2.2 from 00:00 to 00:11). Pandermali agreed and explained further about the restrictions: “We may put some restrictions to ourselves [when we dance], but it is like more mental. […] But this time we were physically restricted. […] it is more … true. The movement comes from what we are allowed to do with the wires. […] Now [the restriction] was strict, but at the same time, there was a completely new world to explore”, says Pandermali (Audio 2.2 from 00:45 to 02:14). I also found that the dancers were able to realise how they moved by listening to the sounds they created, and that also affected how they moved between themselves (Audio 2.2 from 4:29 to 05:52).

My solution was to guide the dancers primarily with movement language rather than to tell them how to control my interactive system. I fixed the overall pace of the movements, durations, and number of active dancers (e.g. solo or duet) for each section in my choreographic tasks because these determine the overall structure of audiovisual composition, but the detailed choreographic work was given to my collaborating dancers. The dancers were free to decide which cables to tether from whichever directions they preferred or in the best way to work out between two of them. Nevertheless, I intervened time to time when the dancers were not aware of the instructed pace of movement. For instance, while we were devising the first part of *Locus*, the dancers were asked to tether the cables one by one at a slow pace (see pages 68–69). My idea was to give the dancers long enough time to explore how their physical conditions changed as they were gradually tethered with more and more cables. This would also result in a gradual triggering of more sounds mapped onto each Gametrak controller. However, there was a moment when the interaction prompted Foti to activate the system and begin tethering the next cable too soon, rather than carefully try out the given task (see Video 1.1 from 00:40 to 01:34). This would result in the gong sound being triggered too quickly and a move on to the next part, while the other dancer may have not finished their task yet. Also, it may not give the audience enough time to perceive this part of composition. Therefore, I had to remind Foti that her pace was too fast and that she had not explored the possible movements for long enough with each controller. The purpose of devising this process was not only to reveal the interactive audiovisual composition, but also to offer improvisational stimuli to create choreography by interacting with it.

This compositional approach came about because I had been thinking about how to create a collaboration in which each collaborator could contribute their expertise to the creative process, rather than one medium determining the other. Therefore, the Gametrak controllers were used not only as an interface but also as a common medium in which to think and work on the compositional process. My challenge with the Gametrak controllers was to map sounds onto the controllers' intrinsic physicality. Because of its appearance, the Gametrak provoked dancers to pull and twist the cables. Therefore, I tried to map continuous or sustaining sounds with volume controls so that the dancers could feel that their physical action was related to the sound they played. Furthermore, I mapped different functions depending on how much the cables were pulled out in order to stimulate the dancers to think how to move with the controllers as well as with the performance space. For example, for the first part of the composition, I mapped the gong sound to trigger when the dancers pulled the cables to the end of their length. First, Foti tried to trigger the sound by pulling more and more with her hands and Pandermali twisted the cable around their chests (see Video 1.1 from 00:40 to 01:05). Later, they started moving around the space to achieve the same sound; they pulled the cables and walked across each other in diagonal directions. After hearing the gong sound, they connected the cables to their chests (see Video 1.1 from 01:36 to 02:00). We decided to store these choreographic materials and use them as the very first act of the performance (see how this choreography is included in the finished work in Video 2.2 from 00:00 to 01:15). Similarly, for the second part of the composition, I mapped rainforest sounds to be triggered when all the Gametrak controllers were pulled more than a certain length (see pages 70–71). To achieve this the dancers knelt down or lay down while they were tethered with all the cables (see Video 2.2 from 08:20 to 09:33). I also readjusted the parameter values to trigger the rainforest sound depending on the size of the performance space during the rehearsals so that it would not be played too often or be too hard to trigger.

My audiovisual work and choreographic tasks were neutral in terms of not directing any narrative or emotions. As explained above, I created some geometric shapes from the photographs and also used sound materials related to the visual materials. I used abstract and neutral forms because I did not want the dancers to play any specific roles, but to freely interpret and express the images through their own movements. After creating *Locus*, I searched for other choreographic works that used abstraction to better reflect and understand my own, and found the works by choreographer

Alwin Nikolais such as *Tower* (1965) and *Tent* (1968). I found his compositional approach, which is often called 'total theatre', very similar to mine. His focus was on creating interdisciplinary work using motion, light, sound, and colour, rather than creating just movement phrases. His abstract dance performances were sometimes accused of "neglecting the element of drama", but Nikolais insisted that "abstraction does not eliminate emotion" (Au, 2002: 160). His intention was to get away from Freudian-style storytelling, particularly in the sexual sense, which was common in traditional early modern dance. Instead, he was focused on motion as he believed that "motion is the art of dance" just as "sound is the art of music" (Nikolais, 1974). He used abstract electronic music because he thought instrumental music would activate another sense association with the performer of the instrument rather than only its sound (Nikolais, 1974). The same kind of abstraction was adapted to dancers, whom he asked to be free from their appearance and gender of their body, as he described on the television programme *Day at Night* in 1974:

> [His abstraction] is a feeling. A feeling of life doesn't have to necessarily be a representational story thing. You listen to Bach and you get a feeling for something, but you don't describe. […] I don't feel that we need necessarily to have the glamour boy or girl up there to identify with because this is rather the star. I think this is a little bit of a cheap thrill in a way. I think we've come into a period of that ecology of environment where let's say we have to learn to live with grace, not only with each other, but with nature. […] I like the idea of man behaving in grace with his environment and with his fellow man, and not being the constant star. […] I didn't want always to have the look about the figure. I thought "well, relax! There are other values to humans". You see, I was anti-Freudian so I tried to prove to myself. And I think I did. But I wanted the medium to become the message and this meant that the dancer as an egocentric narcissistic figure had to give that up, decentralize himself, and give you the motion as the meaningful thing, not the fact of his doing it. […] No, it isn't [about the loss of individualism]. Because you see then the mind takes over. The beauty of the mind becomes the power and the thing and the wonderment of it. This is what's so beautiful about it. And, also, it's freedom because you become free that the body transcends itself and freely becomes a metaphoric thing. (Nikolais, 1974)

Nikolais encouraged his dancers to use their mind rather than trying to play a role. For instance, in his work *Tower*, the dancers construct a tower by stepping on or hanging onto a metal structure without a storyline, "yet, their motion helps build images that are fraught with emotional connotations" (Au, 2002: 160). I believe this approach is connected to McGregor's "physical thinking process" (McGregor, 2012); both of them make dancers create movements consciously with certain conditions and let dramaturgy be evolved with this action.

Similarly, during the composition process of *Locus*, my collaborating dancers naturally developed a drama between themselves and the restrictive performance environment as they improvised more and more. In particular, when Pandermali was tethered with eight cables in the last part of the composition, I suggested tethering one of the cables to her neck rather than to her limbs so as to

increase the challenge for her. The non-controllable audiovisual set and Foti's contrasting free and fast movements provoked Pandermali to express struggle with her movement within the extremely restrictive conditions compared to other parts of the composition. Also, Pandermali confessed to me that she sometimes made more of a struggling gesture than the actual physical situation demanded. Foti explained that although the choreographic task was functional, the dramaturgy could evolve by way of the restrictions not letting them move in familiar ways. "By searching the unfamiliarity, we ended up having our own special vocabulary for our movement which connoted an untold story" (K Foti 2018, personal communication, 15 October).

I decided to title the piece *Locus*, meaning 'room' in Latin, because of the way that my dancers evolved the dramaturgy. This recalled my original reason for using the Gametrak controllers rather than higher-quality motion-tracking technology; The Gametrak controllers led me to think about how we moved in very limited ways when using high technology such as smartphones. Computer technology seemed like it would free us from many tasks but in fact it has made us move in very limited ways in order to execute more tasks efficiently. However, dance does not seek such a reduction in movement in order to be 'economic'. Furthermore, I knew from previous experience that whatever kinds of controllers or sensors I used, they needed to be calibrated in order to be better adapted to human movement. When there was too much retrievable movement data, I also had to reduce the number of inputs to map onto my sound synthesis so that the dancers could manage to perform. During the composition process of *Locus* I felt we were put in a room (or that I had placed the dancers in a room) which could not be exceeded. But within this room we were eventually able to focus on the Gametrak controller's already 'limited' functions in order to create something new instead of reducing a complicated functionality from a higher quality technology.

As *Locus* was the first practical work in which I could experiment with my theoretical framework, it became crucial to constructing my aesthetic directions for further works. After opportunities to perform *Locus* with my collaborating dancers at *La Escucha Errante Festival* 2015 in Bilbao and *Electric Spring* 2016 in Huddersfield, I felt I needed to create my work as a dance film that went beyond a mere documentation of live performance so as to articulate my aesthetic intention better. For both festivals, we had different technical conditions for the projection. In Bilbao, the projection screen was above the dancers, so the movement and the projection were shown completely

separated. In addition, to preserve the light of the projection, the stage was almost dark and the dancers were almost invisible. In Huddersfield, the lighting condition for the stage was well adjusted to present both the projection and the dancers to the audience. In fact, the projection screen size was overwhelmingly large. It was nice to see and hear my audiovisual work through such high-quality projection and speakers, but there was no longer an intimate relationship that I could capture in the documentation (Video 2.2) between the dancers and my audiovisual work (compare Figures 2.13 and 2.14). I wanted to show both the audiovisual work and the dance movement in almost equal proportions as I considered them a total work – an interactive environment in which dancers devised movements with audiovisual stimuli. Therefore, for my next project I decided to create a dance film so as to articulate the holistic interactive cycle between the dancers and my interactive environment as a whole.

Figure 2.13: *Locus* at *Electric Spring* 2016 in Huddersfield, UK.

Figure 2.14: A screen capture from the documentation film of *Locus*.

2.2. Project Two

2.2.1. *NEON* (pre-study)

Video 2.6: *NEON* - https://vimeo.com/169430091.

NEON (Video 2.6) is an interactive audiovisual dance performance with live music. It was created in collaboration with students from the University of British Columbia (UBC). Due to the distance involved I was not able to create a piece that could be developed gradually with my collaborating dancers as I usually do. Instead, I decided to create a piece that was improvisable and could be quickly learnt while the students from UBC were visiting Huddersfield. I thought this would be a good opportunity to create a pre-study for my next project.

One review of *Locus* said that my work was too abstract, and that it was hard to know how the dance and my audiovisual work were connected interactively. Although it had been my intention not to show a very clear interaction, for my next project I sought a better way to demonstrate the interactivity between the components of my audiovisual synthesis. As a consequence, I decided to create geometric grids in vvvv rather than add effects to photographs, so that it could demonstrate how I

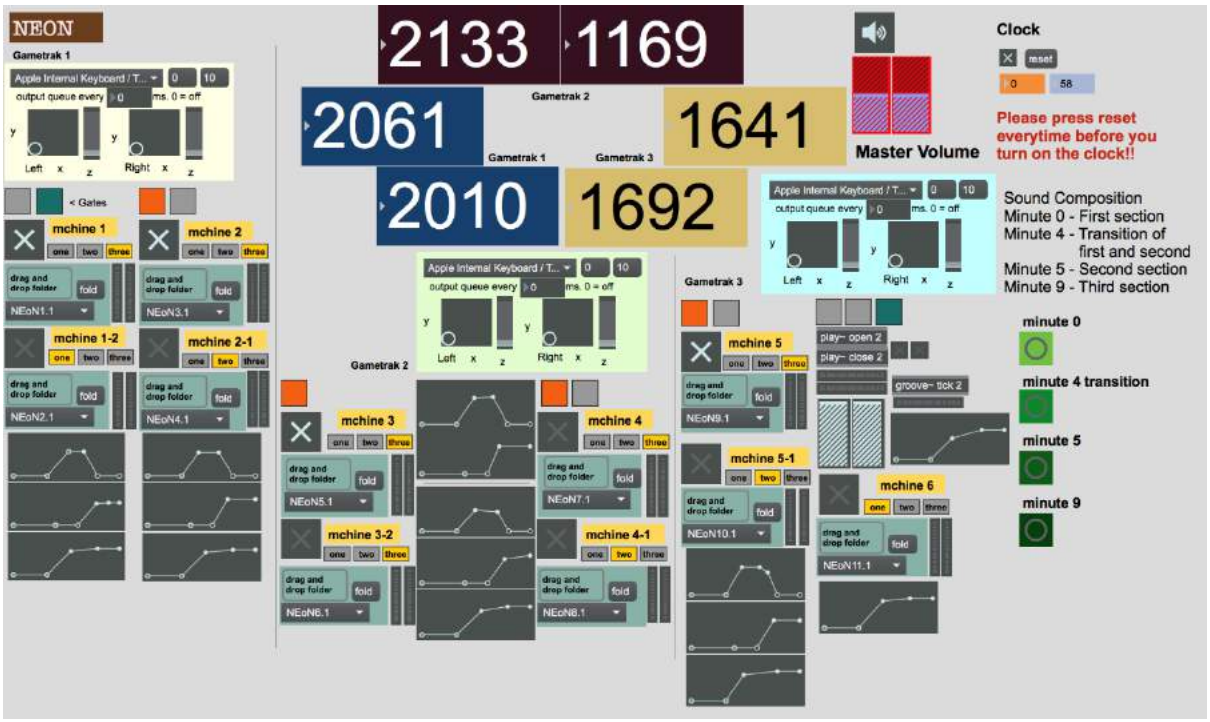
had tried to relate the shape of geometric visuals with the symmetrical lines created by the cables of the Gametrak controllers.

The sound composition of *NEON* was a remade version of my previous work *Oblique Theorem* (2012). This had originally been composed for two dancers using three Gametrak controllers, who would perform with my interactive sound synthesis on the theme of 'steampunk'. For *NEON*, I asked some brass instrument players to join the improvisation because the metallic materials of my sound composition (such as screws and copper pipes) would sound well alongside the brass instruments. The unique setting of *Oblique Theorem* was an arrangement of the three Gametrak controllers[40] on the floor in a triangle shape (Figure 2.15). For *NEON,* I decided to keep this setting and create a real-time video processing related to its shape. I planned for the dancers to perform inside the triangle, with the brass players standing next to it.

Figure 2.15: Three Gametrak controllers placed on the floor in a triangle shape (marked with the white lines).

[40] These were unhacked Gametrak controllers. One Gametrak controller has a pair of cables to pull out for both hands. See Figure 1.8.

Video 2.7 demonstrates the main Max patch for *NEON*. For the remade composition I rearranged the sound files I already had and added some new ones. The composition is divided into three sections, each one activated by the clock inside the patch. The first section contains some grainy and high-pitched metallic sounds processed with some effects. I mapped two different sound files onto each cable of the Gametrak controller, to be triggered depending on how much the cables were pulled. The second section of the composition contains harmonic notes made from sound recordings of ringing wine glasses. I created a slow, one-minute-long transition between the first and second sections. The third section of the composition contains dramatic, louder sounds with lower frequencies to build up to a climax. Initially I composed the work to last a total of 12 minutes but during the rehearsal we decided to reduce it to 7 minutes. I programmed the composition to go back to the first section when it reached the end of the third section, and trigger a high-pitched 'ping'. The performers would notice the ping sound as a signal to finish the performance.



Video 2.7: *NEON* Max patch demonstration – https://vimeo.com/271683773/1c9faf9b17.

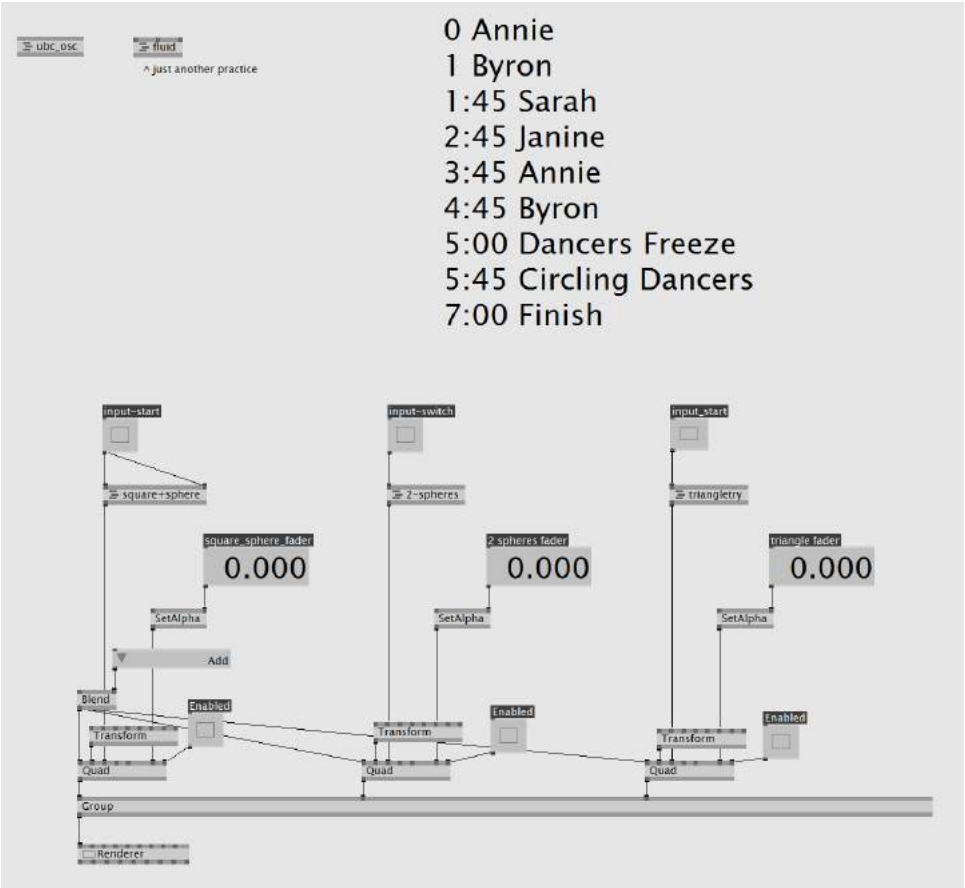


Figure 2.16: The main vvvv patch for *NEON*.

For the visual composition, I also created three different variations that would be played alongside the three sections of the sound composition (see Figure 2.16). [41] For *NEON*, I did not use the movement data to manipulate the visual composition, but instead I took the sound levels of the French horn and trombone, using the small microphones attached to the instruments. For the first section, I created one rectangle and one diamond shape. These shapes could be filled with grids, and I programmed these grids to be denser when the brass instruments were played. We decided that the dancer Annie Wang would start a solo improvisation and then the French horn player Byron Carr would start to improvise after one minute. Carr listened and responded to the sound performed by Wang. I synchronised the sound level of the French horn with the density of the grids in the rectangle. When Carr played, the grids of the rectangle got denser. After 01:45 I activated the slow transition between the first and the second sections of the sound composition, and the dancer Sarah

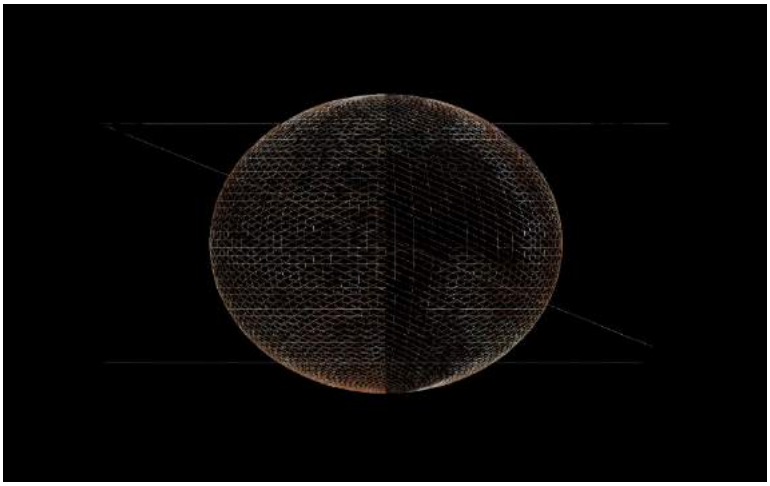
[41] The detailed information of the vvvv patches for *NEON* is explained in Appendix C.

Wasik started her solo improvisation. At about 02:20 I faded in the next visual variation, which contained two rotating spheres. From 02:45 the trombone player Janine King started to improvise. I added angles to the diamond shape such that it would become a circle when the trombone was played. The density of the grids also increased as the sound level of the trombone increased. At 03:45 Wang rejoined the improvisation. From here, I synchronised the size of the rotating spheres with the sound level of the trombone. At 04:45 Carr rejoined the improvisation. At 05:00 the two dancers stopped moving and sat inside the triangle. At 05:45 the two dancers started to improvise again with the third section of the sound composition in Max. The two brass players moved in a circle around the dancers while improvising to build up the climax together. I faded in the third variation of the visual composition (Figure 2.17) and two of the spheres changed their sizes in relation to the sound levels of the French horn and trombone. The dancers slowly finished their improvisation and the brass players followed them.

Figure 2.17: The third variation in vvvv contains three spheres in a triangle position.

Because of the limited amount of time I had with the UBC students, I did not set detailed choreographic tasks or programme more sophisticated interaction in Max and vvvv. However, this was a good opportunity for me to improve my vvvv programming skills in generating real-time visual work, beyond just adding effects to already existing images. I used three video clips I recorded at Pen-y-Pass as textures for the grids, and I liked how the video footage was revealed as the grids got

denser (Video 2.8). This inspired me to use a similar technique for my next project with some video recordings from Pen-y-Pass.



Video 2.8: The first part of the visual composition in vvvv demonstrates how the video texture is revealed as the grids get denser - https://vimeo.com/271632750/6b32ae5e44.

2.2.2. *Pen-Y-Pass*

Video 2.9: *Pen-Y-Pass* - https://vimeo.com/254862000/3114942d6b.

Figure 2.18: Small LED lights were attached to the end of the Gametrak controllers' cables for the live performance at *La Escucha Errante Festival* 2015 in Bilbao.

Pen-Y-Pass (Video 2.9) is a choreographic sound composition with interactive visuals and two dancers. In this composition, I drew on a feeling of complete isolation I had experienced in Snowdonia in wintertime. I kept exactly the same technical setup as *Locus* (see Figure 2.11), but this time I decided to make a dance film. This was because sometimes I found it difficult to present the intimate relationship between body movement and audiovisual composition that I pictured in my head in live performance settings because of the technical conditions of the performance venue (as explained above on pages 76–78). For instance, when I performed *Locus* at *La Escucha Errante Festival* 2015 in Bilbao, the projection screen was above the dancers. To keep the projection clear, the stage had to be almost completely darkened, which made the dancers almost invisible to the audience. I decided to attach small LED lights to the end of the cables of the Gametrak controllers so that the audience could see where the cables were tethered to the dancers (Figure 2.18). This was my quick solution to presenting the dancers' live performance at least vaguely to the audience. However, the moving LED lights in the darkness recalled mocap suits used for 3D animation; they simplified the dancers' sophisticated movements and disguised the dramaturgy created by the dancers. Also, the separated projection screen made the audience busy with looking for the interactivity between the captured movement and the audiovisual work – what triggered what – rather than perceiving the overall aesthetics. I felt that the dancers' body movements turned into mere data

in service of the interactive audiovisual work. Therefore, to prevent this in future, I invited the filmmaker Lucas Chih Peng Kao to film *Pen-Y-Pass* so that I could articulate my aesthetic intention better with the form of fixed media.[42]

Pen-y-Pass is a mountain pass in Snowdonia in north west Wales. I was too unprepared when I went hiking there by myself in February to take some photographs without proper equipment or enough prior research about the place. The wind was stronger than I expected and sometimes my whole body was pushed by the wind. It was very hard to walk even though I chose the easiest route. My phone had no reception and I remembered the sign posted on the wall at the hostel where I had checked in earlier that said that, due to a lack of phone reception, they would send the rescue team to search for their guests if they were not back before some time without prior notice. This made me worry a little in case anything should happen to me because I had not told anyone that I would be in Snowdonia before I had set out. It was not the main season for hiking so I rarely saw people on the path. As I walked deeper into the mountain, the scenery was tranquil. I looked at the view through different lenses and took lots of photographs and some brief video footage. When I left the hostel, it was already afternoon, so I tried not to get lost in the excitement of the scenery and to return to the hostel before it got too dark. I literally had nothing other than my phone with which to check the time, and I had to save the battery in case I needed to use the built-in flashlight if the day got dark earlier than I expected.

When I saw the snowstorm approaching at the far end of the path, I gave up going further and returned to the hostel. The sun had set very early and I was the only one using the dormitory room. I had brought my laptop but there was no WIFI. I wondered why I had not brought a book to read. I looked outside the window but it was pitch-dark night as if there was a black curtain blocking it. The weather got worse as the night went on. I went downstairs where the bar was, and some people seemed to be enjoying the night with drinks. I wondered why they were not so worried about the severe weather. During my sleep, I heard the thunderstorm and the hail hitting the window harshly. Even though I opened my eyes to check outside, I could not see anything for myself. I felt it was almost surreal that I was suddenly in this context. I was not even sure whether I was awake or asleep

[42] I invited Kao because we collaborated for my previous work *Oblique Theorem*, and our dance film was successfully screened at international festivals.

because of the darkness. When the morning came, I saw a clear view of the snowy mountain as though nothing had happened during the night. I decided to make an audiovisual work based on this trip using some video footage I had made on Snowdon.

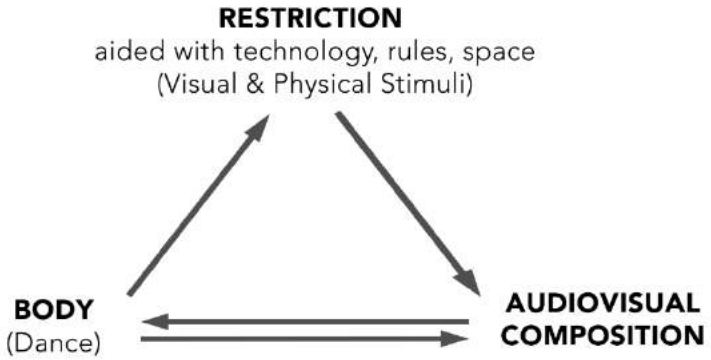


Figure 2.19: The interaction map in *Pen-Y-Pass*.

Following reviews that I had received of my previous project *Locus*, I sought more obvious narrative and interactivity between the dancers and the audiovisual work in *Pen-Y-Pass.* I also tried to employ the visual composition as a choreographic stimulus, not merely as visual scenery (Figure 2.19). The same dancers who performed *Locus* collaborated with me again for *Pen-Y-Pass*. Since they had already experienced dancing with the restrictive condition using the Gametrak controllers, I decided this time to provide choreographic tasks that were more related to the audiovisual composition. I numbered each Gametrak controller so that I could quickly know which controller's data flow should be redirected in my Max patch. During the rehearsal, the dancers decided which Gametrak controllers they wanted to use for each section, and I wrote down the numbers of the controllers with some brief plans for choreographic tasks in my head (Figure 2.20).

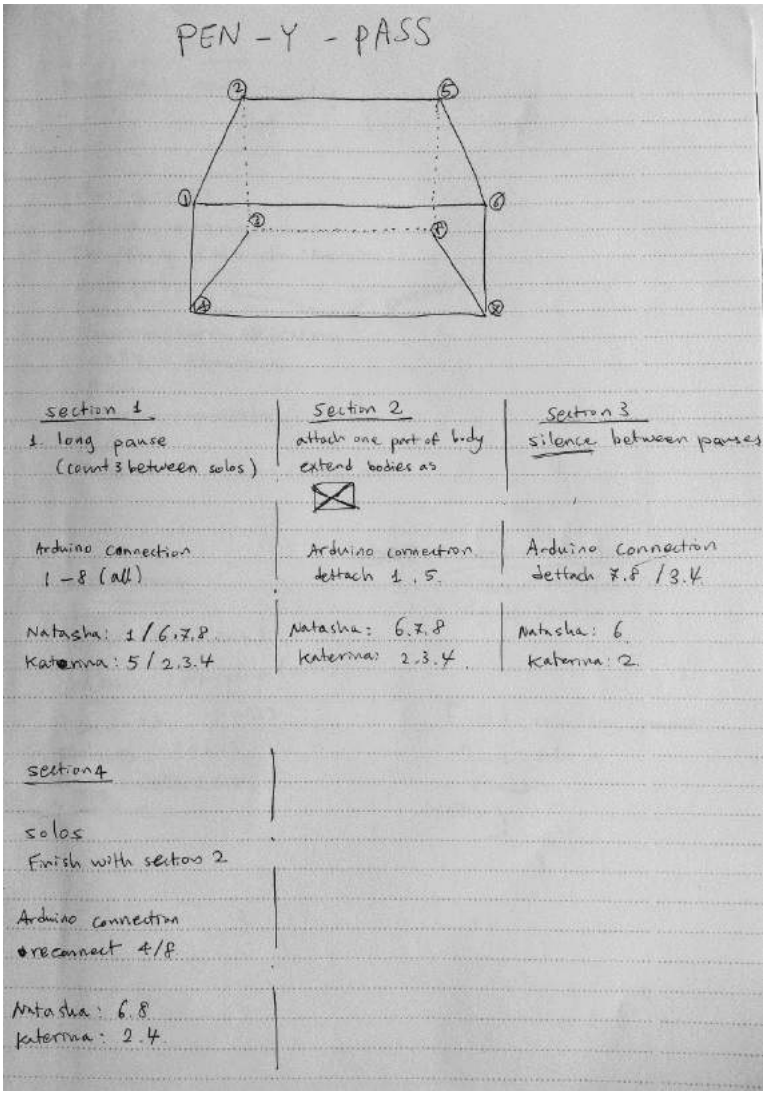
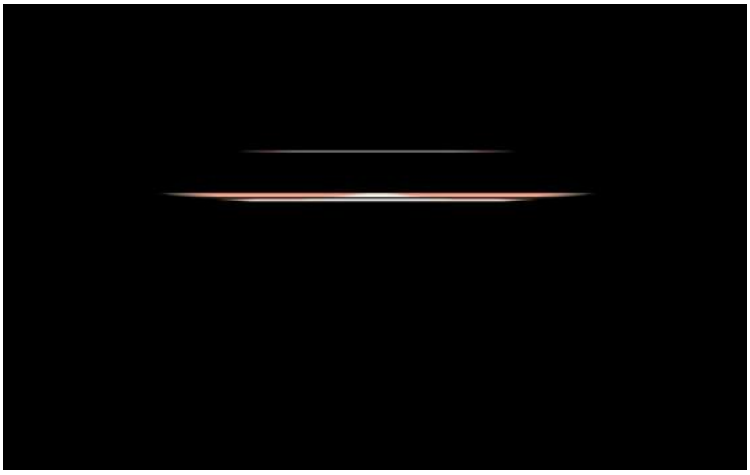


Figure 2.20: The plan for *Pen-Y-Pass*.

The composition is divided into four sections. The first section illustrates the moment of encountering the windy and snowy mountain (see Video 2.9 from 00:00 to 02:56). I programmed horizontal lines to be triggered when the cables of the Gametrak controllers were pulled (Video 2.10). I used the oscillator object in vvvv to create this effect, and mapped it to create thicker lines when the cables were pulled more.[43] I planned the visual composition to overlap with the diagonal lines created by the cables of the Gametrak controllers so that the performance space would fill with symmetrical lines (Figure 2.21).

[43] For more detailed explanation on mapping in vvvv and Max, see Appendix D.



Video 2.10: The first part of the audiovisual composition in *Pen-Y-Pass* - https://vimeo.com/181346715/eea523cf9a.

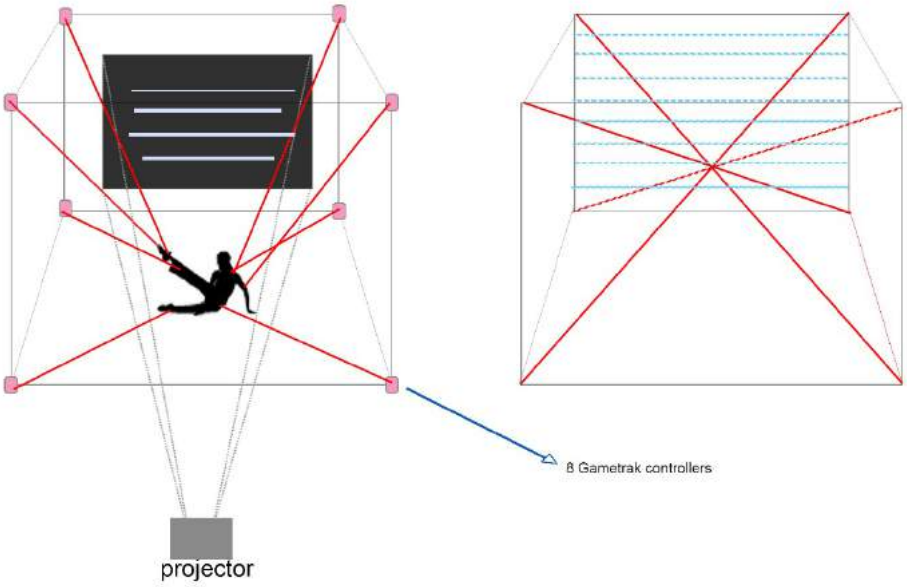


Figure 2.21: The relationship of the visual composition and the dancer in the performance space for the first part of *Pen-Y-Pass.*

For the sound composition, I filtered white noise with eight different frequency bandpass filters in Max to create a wind sound. Once the horizontal line in the visual composition was triggered, it rebounded in oscillation until it disappeared completely, and I wanted to give the same kind of effect to the sound as well. Therefore, after the bandpass filter, I sent the signal through additive synthesis and limited the amplitude with a triangle shape envelope (Figure 2.22).

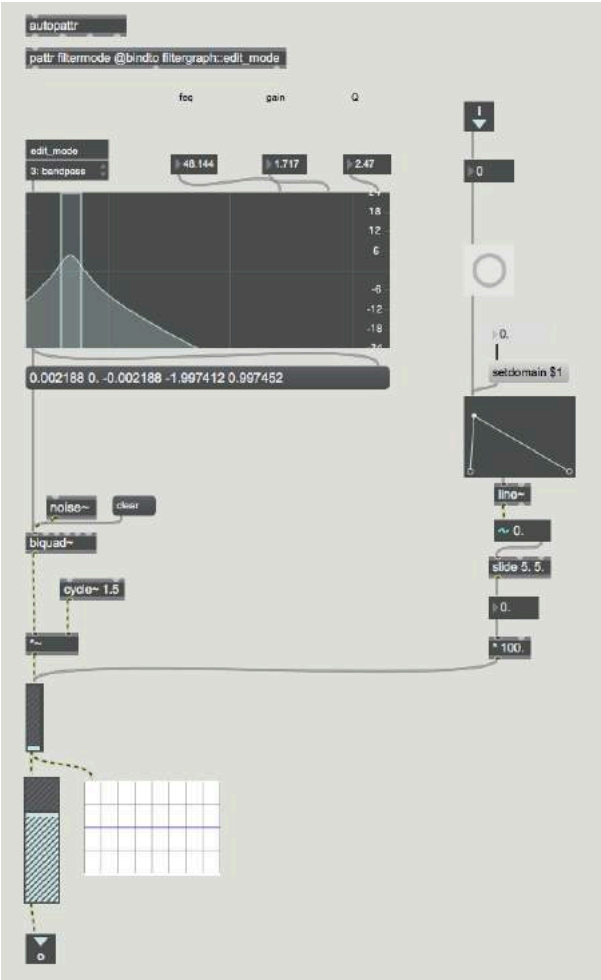
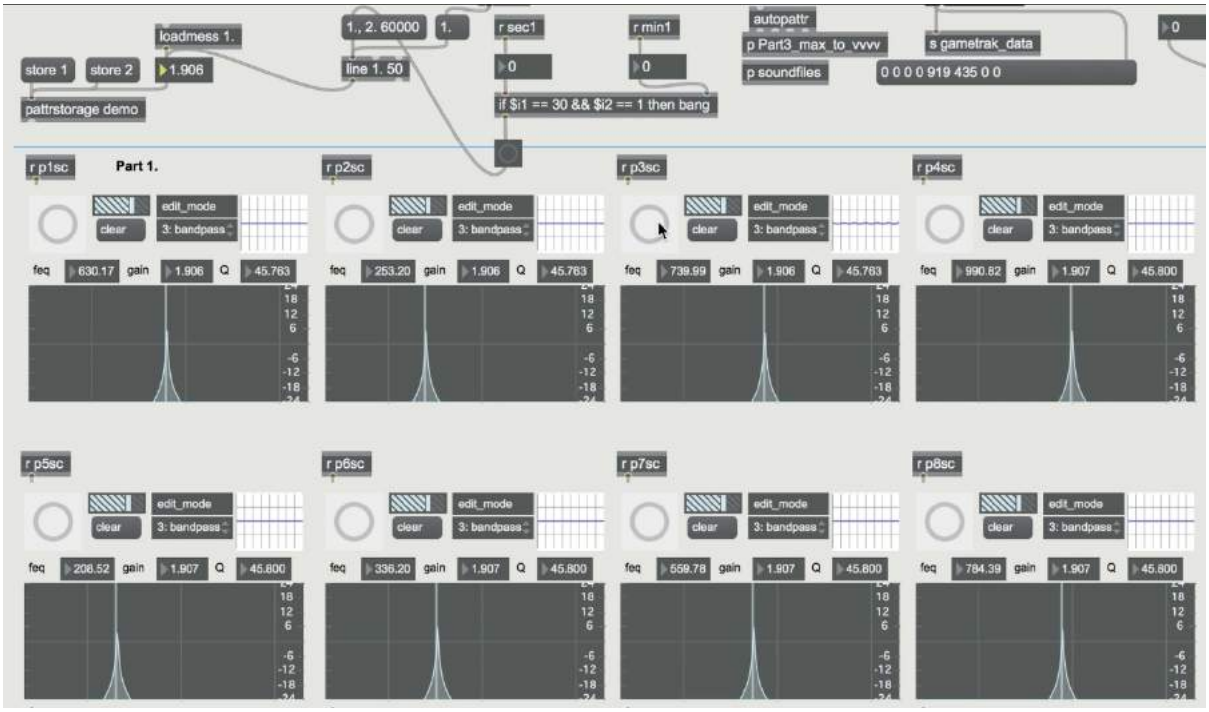


Figure 2.22: The additive synthesis with a triangle shape envelope.

This was the original sound composition of the first part of the piece and I made it last for three minutes. However, when I was editing the film takes, I felt that the sound composition of the first part was too repetitive and tedious. I therefore decided to make a variation after 01:30. I added an automation to narrow the bandpass filters so that they would produce pitched tones. The transition from non-pitched filtered noise to pitched tones created some strange disharmonious tones that built up the tension of the narrative (Video 2.11). I performed this variation part in the post-production stage with a MIDI controller while watching the dance performance.

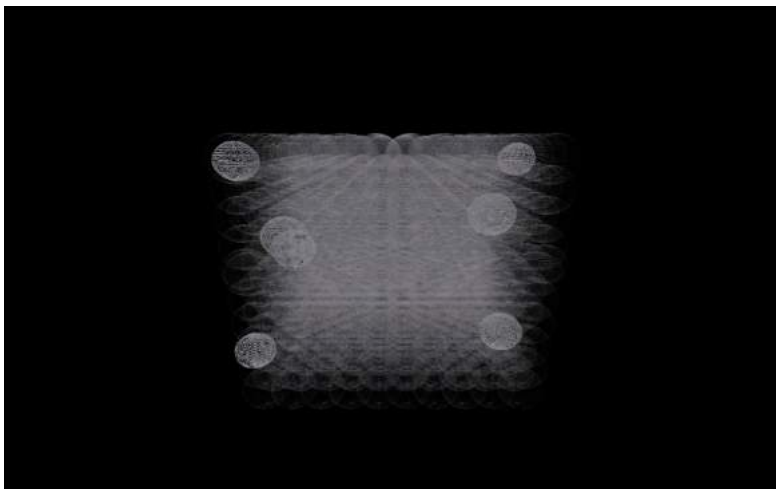


Video 2.11: The variation in the first part of *Pen-Y-Pass* – https://vimeo.com/181342684/ad2748aa7b.

The movement and audiovisual work had a direct one-to-one relationship in order to show viewers how the tethered controllers triggered the audiovisual composition by tracking the motion of the dancers. The choreographic task here was: ***Each dancer tethers four cables. One person improvises as solo moving only one tethered part of the body. Once the improvisation is finished, pause for 3 seconds. The next person improvises as solo moving only one tethered part of the body as well, and pause for 3 seconds. Do this one more time. And then both of them move all tethered parts of their bodies one by one.*** This task was intended to make the dancers aware of which parts of their bodies were moving so that they did not trigger any unwanted sounds. Each dancer tethered three cables to her limbs and one to her chest and executed the task. As a consequence, the silent space gradually filled with more and more sounds.

The second part of the composition illustrates the labyrinth of the mountain path (see Video 2.9 from 02:56 to 04:59). I created a complex white cube-shape mesh in vvvv and overlapped the diagonal lines created by the cables of the Gametrak controllers (see Video 2.12 and Figure 2.23). Although the mountain path was not difficult to follow, it was hard to predict how much further I had to walk to

reach its end because I did not have a map and because the weather changed very frequently. For this part, six controllers were tethered to the dancers' bodies and mapped to move the white spheres between the mesh in vvvv. While creating *NEON*, I practised generating shapes filled with grids and adding video textures onto them. I used the same technique for the spheres with the footage in Video 2.13. Whenever the spheres were moving, I programmed the volume of the different varieties of tingling sounds to change as though these spheres were bouncing in and out of a metal mesh.



Video 2.12: The second part of the audiovisual composition in *Pen-Y-Pass* – https://vimeo.com/181346798/7c06fa08e2.

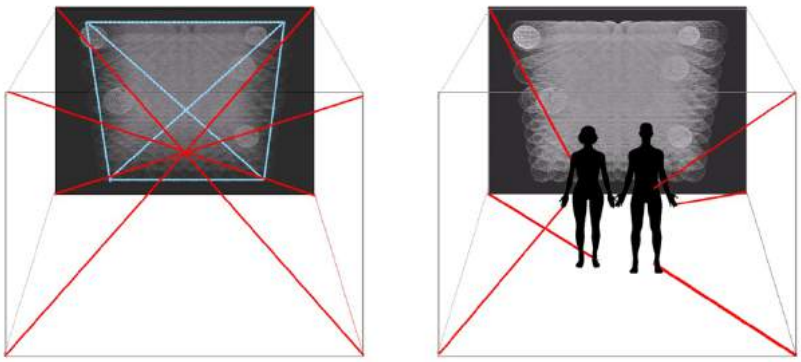


Figure 2.23: The relationship of the visual composition and the dancers in the performance space for the second part of *Pen-Y-Pass*.

Video 2.13: The footage I used for the second part of the visual composition in *Pen-Y-Pass* – https://vimeo.com/181352054/b3850f1493.

For the second part of the composition, the dancers were only affecting the volume of each tingling sound and the range of volume change was subtle. It was my intention to create a moment where the dancers could have more freedom to focus on creating choreography, and not worry too much about contributing to the sound composition. The choreographic task was: ***Detach one of the cables from your body. Improvise for 2 minutes as if your limbs were extended diagonal lines, created by the cables of Gametrak controllers and the white cube-shape mesh.*** For this choreographic task, I asked the dancers whether it would be possible to improvise holding hands and to create symmetrical lines with their other hands. But the dancers suggested attaching one part of their bodies and leaning onto each other instead of holding hands, and moving their limbs towards the gaps between their bodies as if creating extended symmetrical lines (see Video 2.14 from 00:00 to 01:03).[44] Initially, I set this part of composition to last 3 minutes. However, after my dancers tried it out for this long, we decided to change it to 2 minutes (see Video 2.14 from 1:04 to 05:01). We felt it was unnecessarily long because the audiovisual composition had only subtle changes and the

[44] The dancers said my idea of holding hands was too '60s style! And indeed, their solution was much more interesting than what I suggested. I mentioned this episode also during the *MSP PowerUser Symposium* (Audio 1.1 from 5:30 to 6:00).

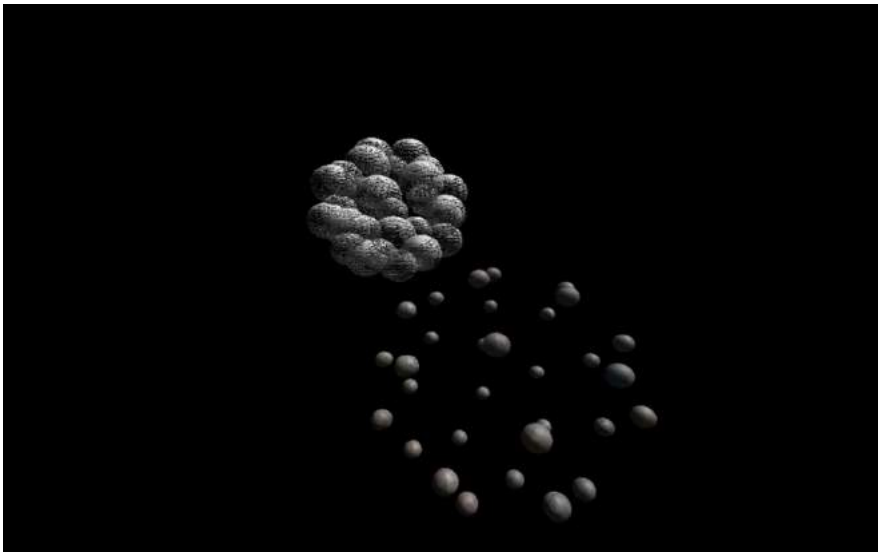
dancers' choreographic ideas could be perceived within a shorter period. Instead, I extended the next part of composition by 1 minute because it had more audiovisual content, which would be better unfolded over a longer period of time.

Video 2.14: We discussed how to create choreography for the second part of *Pen-Y-Pass* during the rehearsal – https://vimeo.com/180830841/bd8690aa29.

Video 2.15: The first part of *Pen-Y-Pass* from the third (left) and fourth (right) film takes - https://vimeo.com/296963236/d738b71074.

As explained in Section 2.1.2, I preset the durations for each part of composition before trying out my choreographic tasks with the dancers. However, this did not mean that these rules were not flexible. During rehearsals, I readjusted durations for some parts of compositions in this portfolio depending on how the dancers executed my choreographic tasks. Once the dancers had tried out my tasks, I could understand better whether the prefixed durations were of a reasonable length to deliver the overall idea of the piece to the audience. Another advantage of setting the durations in advance was

not only that I could picture the overall structure of the composition, but also that I could guide the improvisation more efficiently. Since both music and dance are time-based arts, I found that the dancers trained themselves to memorise the duration by organising their movement phrases. For example, I measured time while the dancers were improvising on a choreographic task for a prefixed duration and let them know when the time was up (this compositional process during rehearsals may be seen on Video 2.17 from 04:07 to 06:40 and Video 2.20 from 04:50 to 08:58). Then, the dancers remembered the duration through the number of movement phrases they performed for within that amount of time. If their choreography did not fit the given time, I either adjusted the duration or they removed or added some movements for the next rehearsals. In this way, we evolved the composition together with each take. For instance, the first part of *Pen-Y-Pass* from the third and fourth film takes shown in Video 2.15 did not completely correspond as the dancers tried out different movement materials for each new take. Yet, it was clear that each dancer was aware that they were organising their movement phrases within the given time as they spent almost the same time on their solo and duet movements for both takes.



Video 2.16: The third part of the audiovisual composition in *Pen-Y-Pass* – https://vimeo.com/181346716/a83ad88c26.

In the third part of the composition I wanted to illustrate the almost surreally pitch-dark night I had experienced in the hostel room (see Video 2.9 from 04:59 to 08:40). I created two spheres to rotate at a slow pace in vvvv (Video 2.16). For this part, each dancer was tethered with only one Gametrak cable (Figure 2.24). I programmed more spheres to populate when the cables were pulled. For the

first half minute, I intentionally deactivated the interactive system to show the two rotating spheres with randomly triggered high pitched tones. After the dancers improvised for 2 and half minutes, the interactive system was deactivated again and the sphere mesh gradually grew to a gigantic size for 1 minute. I wanted to express the overwhelming darkness I felt during that night with the gigantic mesh and to create a break from the dancing. I then abruptly changed the scene to the fourth part of composition as if I was waking from a dream. I presented this part of the audiovisual composition to the dancers to explain the pace of the movement and the mood (see Video 2.17 from 00:00 to 04:05).

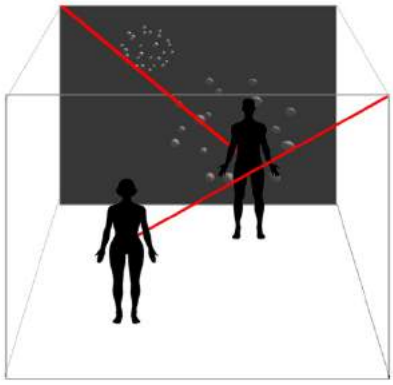
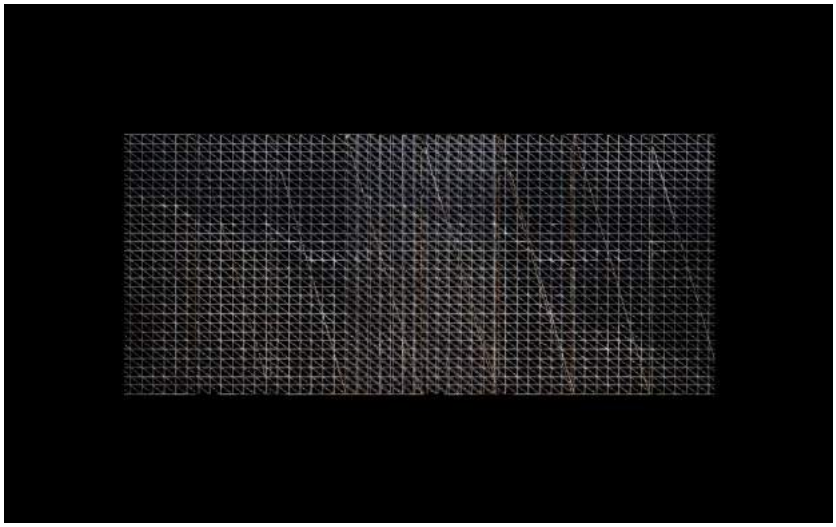


Figure 2.24: The relationship of the visual composition and the dancer in the performance space for the third part of *Pen-Y-Pass*.

Video 2.17: Rehearsing the third part of *Pen-Y-Pass* – https://vimeo.com/180830843/f76676da74.

The choreographic task for this part was: ***Detach two cables from your body (so each dancer is tethered with only one cable now), and move in a circle as the two spheres are rotating in the visual composition. Move forward in a circle and pause. And move backward and pause.*** I suggested that the dancers detach the cables from their limbs and leave one tethered cable on their chests. As a consequence, they could move their limbs freely and their change of location in the performance space would trigger the audiovisual work. Although this was the part in which they had the least restriction from the Gametrak controllers, the direct one-to-one interaction with the audiovisual work guided the dancers to move carefully at the right speed and take the right length of pauses so as not to trigger too much sound (Video 2.17). In the completed dance film Kao and I captured some moments when the dancers even held their tethered cables to create complete silence when they were not moving (see Video 2.9 at 7:18 and at 7:43).



Video 2.18: The fourth part of the audiovisual composition in *Pen-Y-Pass* – https://vimeo.com/181346717/3a07e5ed8f.

The fourth section shows the morning the next day, revealing a clear sight of the snowy mountain after the dark night (see Video 2.9 from 08:40 to 13:05). For this part, each dancer was tethered with two Gametrak cables, and I programmed denser horizontal and vertical grids to be generated when these cables were pulled (Video 2.18). One of the items of video footage I used as a texture was the video recording of the snowy mountain that I had also used for *Untitled 10* (Video 2.19). With this technique, I felt that I could show a sense of the movement and colour of the video footage in abstraction.

Video 2.19: The video footage of the snowy mountain – https://vimeo.com/181352053/a1d76c6a49.

Video 2.20: The dancers were listening to the sound composition of the fourth part of *Pen-Y-Pass*. Kao and I discussed how to film the work in the meantime – https://vimeo.com/180830840/06c1c0f386.

The sound composition represents the snowy mountain in the unpredictable weather. Video 2.20 shows me explaining what kind of sound I composed for each dancer during the rehearsal. I programmed Pandermali to play grainy, hail-like sound when she pulled the cables and Foti to play wind sound and a dramatic low frequency sound. This section was the most narrative one and I wanted to give different sonic personalities to the two dancers. As a result, Pandermali created light movements, which Foti contrasted with bigger and heavier movements. Figure 2.25 shows how the Gametrak controllers were tethered to the dancers' hands and feet for this section. The choreographic task was: ***Detach the cable from your chest and attach it to one of your limbs. Attach another cable to another limb. Now, you are tethered with two cables each. Improvise***

as solo one by one and then duet. After 3 and a half minutes, slowly finish the performance. To finish the composition, the dancers suggested meeting in the middle of the stage leaning one of their shoulders as similar to the second part of the composition and lowering their bodies to the floor (see Video 2.20 from 3:48 to 04:48). I agreed on this as a way to finish because this movement pulled all the cables and generated denser grids to reveal the image of the snowy mountain.

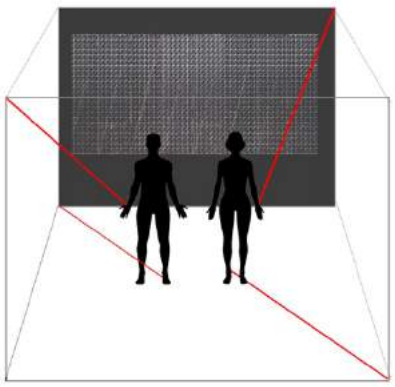


Figure 2.25: The relationship of the visual composition and the dancers in the performance space for the fourth part of *Pen-Y-Pass*.

Figure 2.26: The grips installing the skateboard dolly.

The challenging part of the filming was capturing the projected visuals and the dancers' bodies together, and I needed help from experts who could set up the shooting lights properly for such conditions. Kao stayed with us during the rehearsals to take some photos and to plan how to set up cameras and lights. For the day of the filming, the cinematographer Kirstin McMahon also joined with her grips Doug Newton and Dylan Newton to operate the camera on a dolly (Figure 2.26).

The advantage of showing my work as a film was that I could pick the best moments from it. For the third part of the composition in particular, I chose only those takes with close-up shots so as not to show the video projection too much. Although it was my intention to compose more obvious interactions for this piece, the one-to-one interaction with the audiovisual composition seemed too obvious and tedious by the end.

My aim of creating *Pen-Y-Pass* was to improve my real-time audiovisual composition skills compared to the previous project, and to produce the work as a high-quality film. Although the quality of the film had definitely improved, I felt that I had fixed too many elements before the collaborative composition process for my 'ideal' scenario. When I had finished the composition, I realised that my choreographic tasks were no longer exploring the 'restrictive' side of the Gametrak controllers, but were indicating how to create the audiovisual components to make a better film. Because I had kept the same technical setting as *Locus*, the dancers were used to that kind of restrictive setting, and this resulted in a loss of the fresh excitement and genuine exploration of possible movement materials within the restrictive environment. In addition, the dancers followed my directions in representing the narrative I had set in advance, rather than evoking their own dramaturgy with the restrictive condition during the composition process. In the end there was no longer originality in our collaborative process. However, it became an opportunity for me to realise what Brown calls the balance of control and non-control (see page 51). For the next project I therefore felt the need to set up completely different conditions with the Gametrak controllers in order to create a new challenge rather than settle for what I had already discovered.

2.3. Project Three

2.3.1. *UnoChair* (pre-study)

Video 2.21: The public presentation of the workshop *UnoChair* – https://vimeo.com/270739002/b0ee5b3e13.

I was invited to Universidad Carlos III Madrid (UC3M) to take part in an interactive scenography workshop with the PhD student Javier Aparicio (Video 2.21).[45] For this workshop, I wanted to tether some objects to the Gametrak controllers rather than directly tether the controllers onto a performer's body. While Aparicio and I were planning the workshop, we decided to turn very ordinary objects into interactive instruments to trigger sound. As a consequence, the objects could play different roles from their everyday interactions and could also become core choreographic stimuli to evoke dramaturgy. I suggested using chairs because they trigger a habitual physical interaction: the immediate temptation to sit down. Furthermore, because the workshop participants did not have any prior experience of performing with interactive systems, I thought chairs, with their familiar appearance, would make a good medium in which to invite them to experiment.

[45] The official documentation video of the workshop from UC3M is available at: https://www.youtube.com/watch?time_continue=37&v=yfP9ssdFgZI (Accessed 27 May 2018).

Aparicio's original background is painting, and now he works on audiovisual scenography. When I told him about my idea of using chairs, he immediately recalled how chairs contain different meanings and roles in historical paintings. For example, in Paul Cézanne's final version of *The Card Players* (1894–1895) the chair of the left-hand card player is drawn out of perspective. Later, this painting was rediscovered by the Cubists as a significant work showing "a new way of seeing" (Saltz, 2011). In George Grosz's *The Poet Max Herrmann-Neisse* (1927), the chair seems to provide a place where Herrmann-Neisse could contemplate. In *Study after Velázquez's Portrait of Pope Innocent X* (1953), Francis Bacon exaggerated the "isolated position of the dignitary" in Velázquez's portrait of the Pope sitting on the Pope's chair (Bayne, 2012).

I thought about how chairs were used in dance works to create different dramaturgy. In Pina Bausch's *Café Müller* [46] (Figure 2.27), premiered in 1978, chairs are placed on the stage randomly. A female dancer constantly stumbles over them while walking around with her eyes closed. A male dancer observes and chases another male dancer, taking away some chairs so that the other dancer can move without obstruction. Sometimes he throws and pushes the chairs away as the other dancer moves around at fast speed. I felt that the sound of heaving and dragging wooden chairs built up a tension in the piece, although the work does not tell any specific story.[47] Another example is the second movement of *Fase, Four Movements to The Music of Steve Reich* (1982)[48] by Anne Teresa De Keersmaeker, which choreographs Reich's *Come Out* (1966) (Figure 2.28). In the dance film, two dancers sit on stools and repeat minimal and abstract gestural movements using only their hands and arms. They start moving looking towards the front and then gradually rotate their positions in different directions while sitting on their stools (see the score of the piece in Figure 1.23). The stools here restrain their lower body movement.

[46] Available at: https://www.youtube.com/watch?v=WZd2SkydIXA (Accessed 27 May 2018).

[47] I find Pina Bausch's approach to creating dramaturgy very similar to Alwin Nikolais' (see the quotation on pages 72–73). Bausch says "if we avoid [trying to put explicit meanings] and if the audience are open to experience or feel things, I think there is the possibility of another kind of language. It's not only choreography, but for me the stage is important, the space, the time, the music, the personalities; everything has to be brought together. It is not only a question of 'Why do you not dance? Why do you do this?' Actually the reason is, I am interested in a certain feeling that I want to express, something there is no word for" (quoted in Climenhaga, 2009: 62).

[48] Available at: https://www.youtube.com/watch?v=ouYiTiiY3vg (Accessed 27 May 2018).

Figure 2.27: *Café Müller* by Pina Bausch.

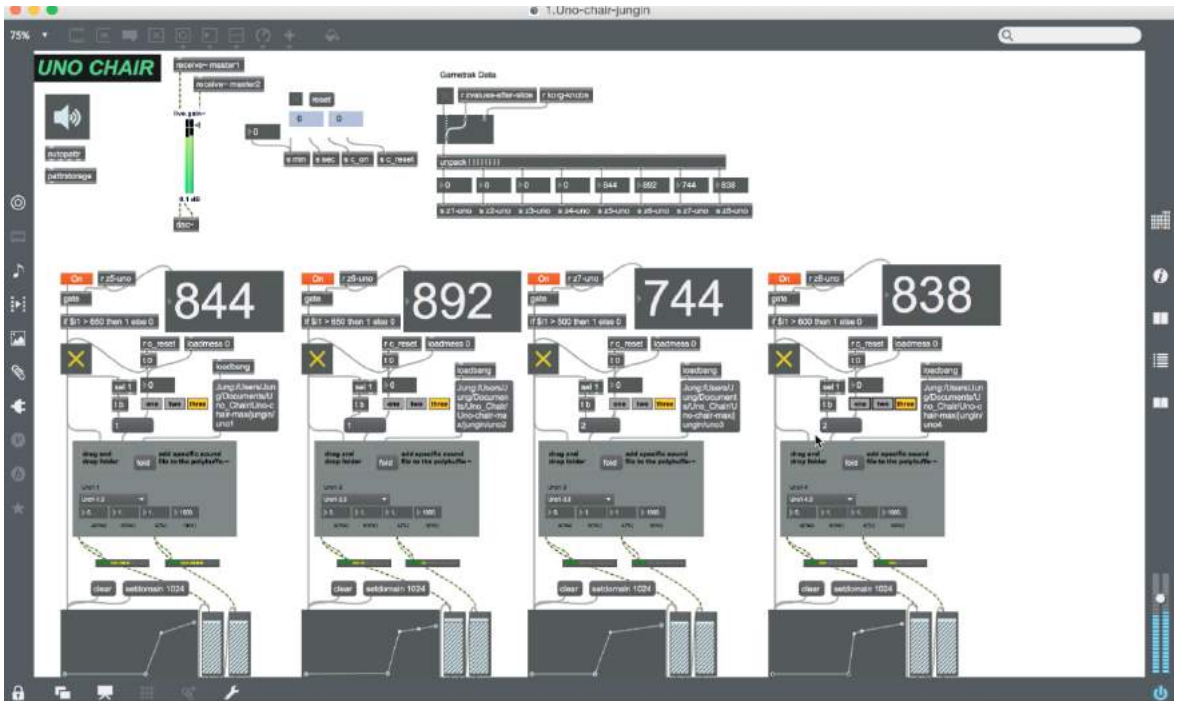
Figure 2.28: The second movement of *Fase, Four Movements to The Music of Steve Reich* (1982) by Anne Teresa De Keersmaeker.

After Aparicio and I shared our inspirations with the image of chairs as explained above, we initially thought about recreating the scene of Cézanne's *The Card Players*. However, instead of producing a representation of a famous painting, we decided to simply place two chairs facing each other without a table and playing cards and let the participants evolve the dramaturgy from that condition. We titled the workshop *UnoChair,* a portmanteau for 'unordinary chair', and decided to tether four Gametrak controllers to each chair (Figure 2.29).

Figure 2.29: Setting up chairs for *UnoChair* workshop.

Aparicio prepared some melodic sound loops that were played with a synthesizer. I created a Max patch using these files so that these files could be triggered and manipulated by the tethered controllers on the left-hand chair. I created three variations that would play different sound files. For the first variation, I mapped one controller to change the playback speed of a sound file consisting of a short melodic musical box sound. The second controller added a delay effect to the same sound file. The third controller was mapped to sweep the frequency range of a melodic bass sound, which played two notes in loops, with a bandpass filter. The fourth controller added a granular delay effect

using the plugin ++bubbler from Soundhack. I mapped different sound files for the second and third variations in similar ways.[49]



Video 2.22: The demo of the sound synthesis for the right-side chair in *UnoChair*[50] - https://vimeo.com/272186145/72925ed1e1.

I prepared some metallic, rough, and granular sounds as a contrast to Aparicio's melodic sound loops (Video 2.22). I wanted to provide somewhat abstract sounds so that the participants were not predominantly directed by the melodic sounds. I mapped my sound files so that they would be triggered by the tethered controllers on the right-hand chair. I used the same poly~ player that I had created for *NEON*, and assigned three different combinations of sounds to each variation. I added reverb and ++bubbler effects and manually controlled their parameters during the performance.

We had nine participants, from several different backgrounds: one student in performing arts from UC3M, four students in contemporary dance from the Royal Conservatory of Dance Mariemma, two

[49] The detailed explanation of each variation in my Max patch for *UnoChair* is in Appendix E.

[50] I prepared three different sound files for each poly~ sound player but later I realised that by mistake I only played one of the sound files with the first player all the way through during the workshop. There was a false connection between the on/off toggle of the first player and the buttons to control the variations. This video demo shows how it would have sounded if there had been no false connection.

street dancers, one theatre teacher at a school, and one exchange student in linguistics. For the purposes of my research, it was an interesting group of people because I could observe how my interactive Gametrak system would be interpreted by people from various backgrounds.

Figure 2.30: I explain my choreographic method at the *UnoChair* workshop.

Firstly, I explained my choreographic method to the participants and why had I decided to use the Gametrak controllers and chairs for this workshop (Figure 2.30). Secondly, I let the participants freely explore the chairs with the tethered Gametrak controllers. For this part I did not activate the interactive sound system so that the participants could think about movement materials at this stage and not worry about sound. Lastly, I activated the interactive sound system and the participants improvised with the chairs by listening to the sound. The participants could not only move the chairs around, but also detach the controllers from the chairs and tether them onto their bodies.

I did not explain in advance to the participants what kind of sound they would trigger so that they would naturally reveal the sound composition and move accordingly.[51] However, when there were lots of people trying to move the chairs and rearrange the Gametrak controllers, the participants

[51] This is my usual way of working with my collaborating dancers as I explain in Audio 2.2. Listen from 5:53.

became too distracted by each other and no longer cared about how and what kind of sound they were triggering. I therefore decided to set some rules for the number of people that could be on stage at once, and also the number of people who could rearrange the Gametrak controllers. We decided to have a maximum of three participants on the stage, at least one of whom should be in a passive position. That passive participant was not allowed to rearrange the Gametrak controllers, only respond to the other participants.

Video 2.23: Improvisation with the chairs at *UnoChair* workshop. Example 1 – https://vimeo.com/271632930/1846a4a840.

Depending on the mood of the sound composition and the mix of people, several different dramaturgies were evoked. Video 2.23 shows an improvisation by three participants using the first variation of sound composition. They all came from different backgrounds – a theatre teacher, a linguistics student, and a contemporary dance student. While the contemporary dance student carefully checked how far he could move with the cables of the controllers, the two non-dancers quickly adapted to the situation and created a drama as if they were chasing each other. They played with the chairs a lot by dragging them away or by placing them onto each other's body.

Video 2.24 shows a mixed group of one performing arts student, one contemporary dance student and one street dancer improvising with the second sound composition variation. While the street dancer moved the chairs to check what kind of sounds he could trigger, the contemporary dance students created possible movement materials with the chairs. For example, the male student lifted the female student onto the chair, and then the female student approached the street dancer and

interacted with his movements of the chair. Eventually, the street dancer joined the dramaturgy created by the other students as though there was a triangular relationship between them.

Video 2.24: Free improvisation with the chairs at *UnoChair* workshop. Example 2 – https://vimeo.com/271632969/5783a33295.

Video 2.25: Improvisation with the chairs at *UnoChair* workshop. Example 3 – https://vimeo.com/271633008/53744955ac.

Video 2.25 shows a mixed group of two contemporary dance students and one performing arts student improvising with the third variation of sound. In this variation, Aparicio's melodic sound stood out with a wave-like frequency sweeping effect. Together with my high-pitched bird-like sound it seemed to provoke the participants emotionally, compared to the other sound variations. While the

two contemporary dance students were improvising with the chairs, the performing arts student decided to just lean on the wall and speak words that came into his mind as he watched the other two participants.

Video 2.26 shows a group of two street dancers improvising with the first sound variation. At the beginning of the workshop these two had tried to figure out how to do their street dance routines such as windmill while tethered to the cables, rather than improvise with the sound. As they watched and improvised with the other dancers, they gradually started to interact with the chairs differently.

Video 2.26: Improvisation with the chairs at *UnoChair* workshop. Example 4 – https://vimeo.com/271633024/ec9813194f.

On the day of public presentation, two of the participants and Aparicio decided to perform to the public. We also invited one of the audience members to be in the performance. I manually faded in and out different sound variations and the changes of sound became cues for each performer to go onto the stage. The performance started with a solo improvisation by the contemporary dance student and then gradually the other performers joined one by one. Even though the transitions between different variations of sound were not always smooth, it was a good exercise for me to think about my next project. Some interesting movement materials were performed with my sound composition during the presentation. For example, the moment when the performing art student lingered on the chair by pulling one cable of the Gametrak controllers with his hand, and the other two followed his posture on the other chair (see Video 2.21 from 10:10 to 13:00). The most interesting

moment was when the invited audience member joined as a passive participant for the last part of the performance (see Video 2.21 from 15:30 to 19:28). I faded in the third sound composition variation and the passive participant sat on the right-hand chair. The remaining performers carefully tethered cables onto her body and moved her tethered body parts to create different postures. This moment made the rest of the performers more aware of the entire performance environment rather than busily focused on playing the interactive system.

After the workshop, I asked the participants about their experience. I found that my method worked as 'restriction' for those people who were trained as dancers, whereas the non-trained dancers felt it was an additional element to play with on the stage. One of the students from the conservatory even felt that the chairs and my interactive system with the Gametrak controllers limited the freedom of bodily movement too much. The student thought my method almost obstructed the beauty of the body itself. Although I may have made the student almost upset, I could at least assure them that my restrictive method worked effectively as a challenge for trained dancers.

2.3.2. *Temporal*

Video 2.27: *Temporal* - https://vimeo.com/272092156.

In summer 2016 I had an opportunity to curate the dance performance event *Shaping Time.Space* at the art organisation Flux Factory in New York City. Aparicio and I decided to elaborate the choreographic ideas we had developed through the *UnoChair* workshop to present at the event. We composed two separate works with related themes, again using two chairs. Aparicio observed how we usually interact with chairs in our everyday life. He found that when sitting in a chair we usually think about either the past or the future, but we are not fully aware of the present. As a consequence, he composed a non-interactive solo dance performance *Pres-sitting* with the dancer Fumihiro Kikuchi. Inspired by Aparicio's observation, I thought about the chair as an object in which we have a dream or daydream. And these dream-like images are situated nowhere in the past, the present, or future. They are just temporal thoughts. Based on this idea, I composed *Temporal* (Video 2.27) and performed with Kikuchi and another dancer Valerie Green.[52]

Figure 2.31: A waking-up scene in *Inception* (2010).

The idea of composing sound for temporal moments reminded me of a scene from the movie *Inception* (2010). This is the moment when the main character sitting on a chair dreaming, and the other character pushes him towards a bath filled with water to wake him up (Figure 2.31). While the chair is falling, the main character sees his dream start to fill with water and wakes up. I was

[52] I curated three dance performances for the event in total. After *Pres-sitting* and *Temporal*, Green presented her choreographed work *Impermanent Landscape* with her dance company, Valerie Green Dance Entropy. She does not perform as a dancer anymore, but she specially performed my piece for the event. The artworks hanging in the performance space were created by Keren Anavy for Green's performance. The excerpts for the three performances are available at: https://vimeo.com/186462750. For more information about the event, visit: http://www.fluxfactory.org/projects/shaping-time-space/.

fascinated by this scene because in reality the falling time of the chair is almost instant, but the main character experiences it as quite a long process in his dream. I was interested in the structure of the movie as well because I dream almost every day in vivid colour with strange plots. Like the entire plot of the movie, I have also had an experience of dreaming inside of my dream. There was one moment when I woke up from a dream and then I realised that I was still in another dream. In those endless dreams time felt so long, but in reality, it was merely less than twenty minutes. Inspired by these images I tried to create a dreamy and surreal choreographic sound composition for *Temporal*.

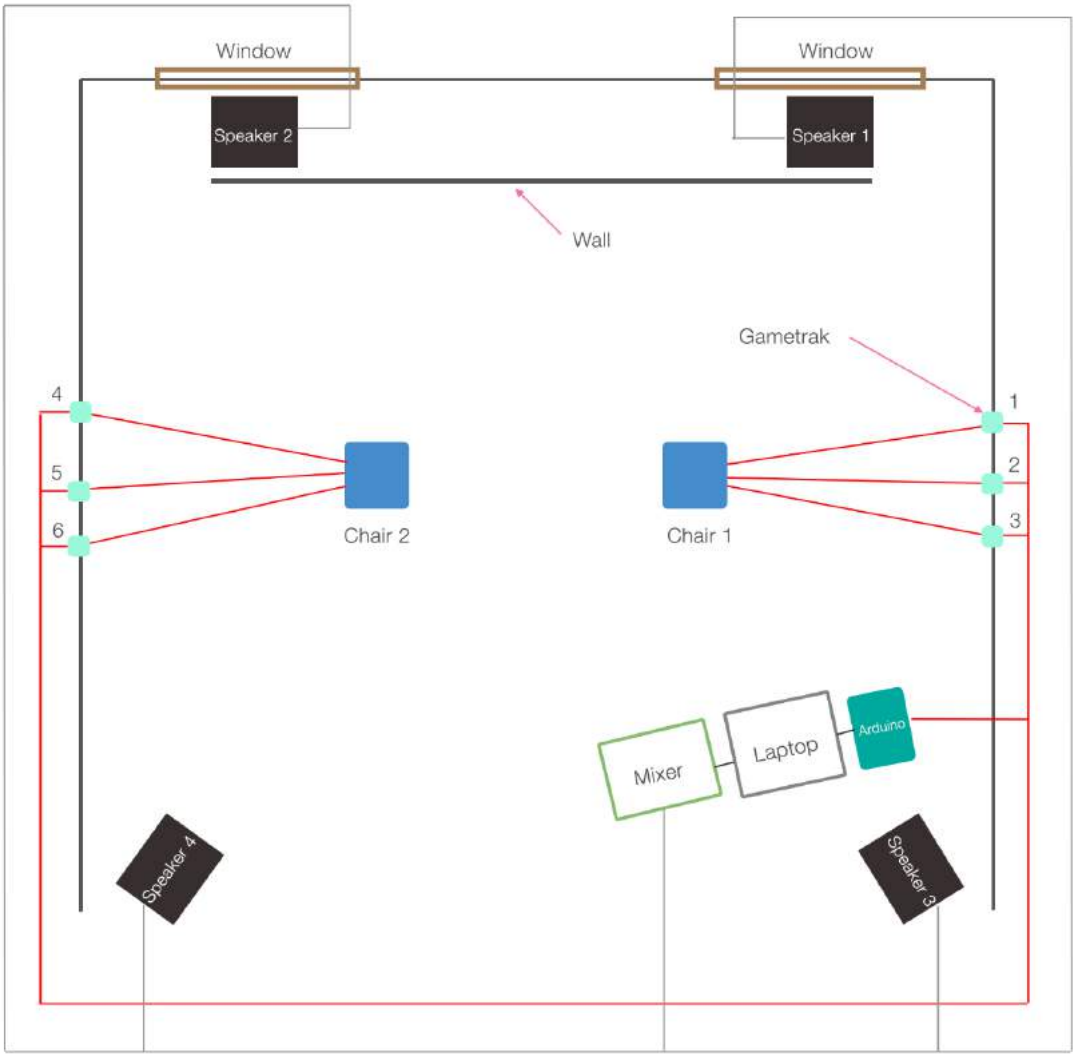


Figure 2.32: Technical set-up for *Temporal*.

I decided to place two chairs facing each other as I had for *UnoChair* and tethered three Gametrak controllers to each chair (Figure 2.32). With this condition, the chairs could not be moved completely to the other side of the gallery as the movable distance was restricted. Based on my observation during the *UnoChair* workshop, this setting of barely reachable distance between the chairs seemed to trigger the dancers to evolve the dramaturgy. I therefore decided to keep the same setting, but elaborate my choreographic tasks and sound composition in greater relation to the possible interactions with the chairs. The most distinctive change in my choreographic tasks between *UnoChair* and *Temporal* was that I did not allow dancers to rearrange the cables throughout my choreographic tasks so that the dancers could focus on developing choreography with the tethered chairs. This was because when the performers were free to rearrange the Gametrak controllers during the *UnoChair* workshop, they became busy attaching and detaching the cables to and from their bodies rather than developing choreography with the restrictive environment or with the sounds they were triggering. However, I did not predetermine any narrative so the dancers could approach the given conditions neutrally. This had proved to be the right balance of control and non-control for my collaborative composition on the basis of my previous experience with *Pen-Y-Pass*.

I kept my role as someone who could direct and guide during the composition process because the dancers cannot see what they are doing during the improvisation. As Murray Louis and Alwin Nikolais (2005: 65–66) point out in their book *The Nikolais/Louis Dance Technique: A Philosophy and Method of Modern Dance*; "If he is watching himself in the mirror, he is not improvising the movement fully. He must therefore call on other sensibilities to direct and guide him as he improvises." Similarly to what Nikolais said in the interview for *Day at Night* (see page 75), they write that when guiding an improvisation, "the major obstacle to overcome is the dancer's ego. 'That's what I wanted to do, that's what I felt,' dancers will say in defense. […] The teacher must constantly remind the dancers of the premise, if it is not a free improvisation, and if possible make them aware of any opportunities they may have missed" (Louis and Nikolais, 2005: 66). Louis and Nikolais use the word 'ego' here, which I understood to mean the dancers' habitual movements. The primary challenge in my collaboration with my dancers was to find new movement materials by trying out unfamiliar tasks beyond their habits (see also page 72). My direction did not therefore tell them how to dance, but reminded them when were not properly engaging with the provided choreographic stimuli such as

the tethered chairs and sound composition. After every rehearsal, the dancers and I discussed the improvisation we had just finished, and the evaluation was applied to the next takes.

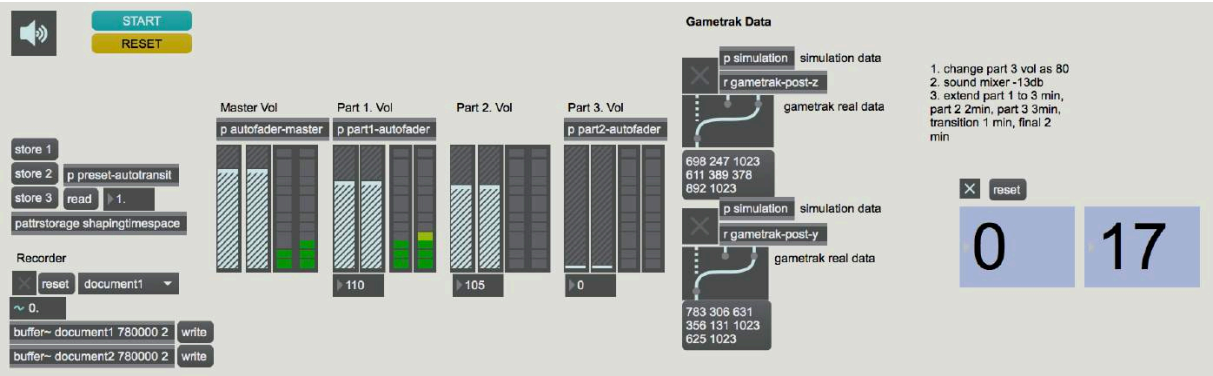


Figure 2.33: Automation created to fade in and out of the three parts of the composition in Max.

The composition was divided into three parts and I created an automation to fade in and out different parts with the clock in Max (Figure 2.33).[53] I decided to perform *Temporal* right after *Pres-sitting* without a break, and directed Kikuchi to wait where he had finished the previous performance until Green walked on the stage. I asked Green to walk onto the stage in pedestrian style and to tether the chairs with the Gametrak controllers. Kikuchi was not allowed to rearrange the cables but was only able to observe Green's movement. When Green had finished tethering, the two dancers sat on the chairs, and then I faded in the first part of the composition. This opening act was not part of the main composition but a quick solution I suggested to bridge the previous performance and *Temporal*.

For the first part of the composition I mapped different sets of notes to be played depending on whether the chairs were moved forwards or backwards (see Video 2.27 from 00:00 to 4:30). I filtered white noise with very narrow bandpass filters with the frequency ranges of certain notes. The three Gametrak controllers tethered to Chair 1 played E4, C5, and A4 when the chair moved forwards and F4, E5, and A4 when it moved backwards. The remaining Gametrak controllers tethered to Chair 2 played D3, E3, and G3 when the chair moved forwards and F3, B♭3, and D4 backwards (Figure 2.34).

[53] The detailed explanation of loading the Max patch with audio files is in Appendix F.

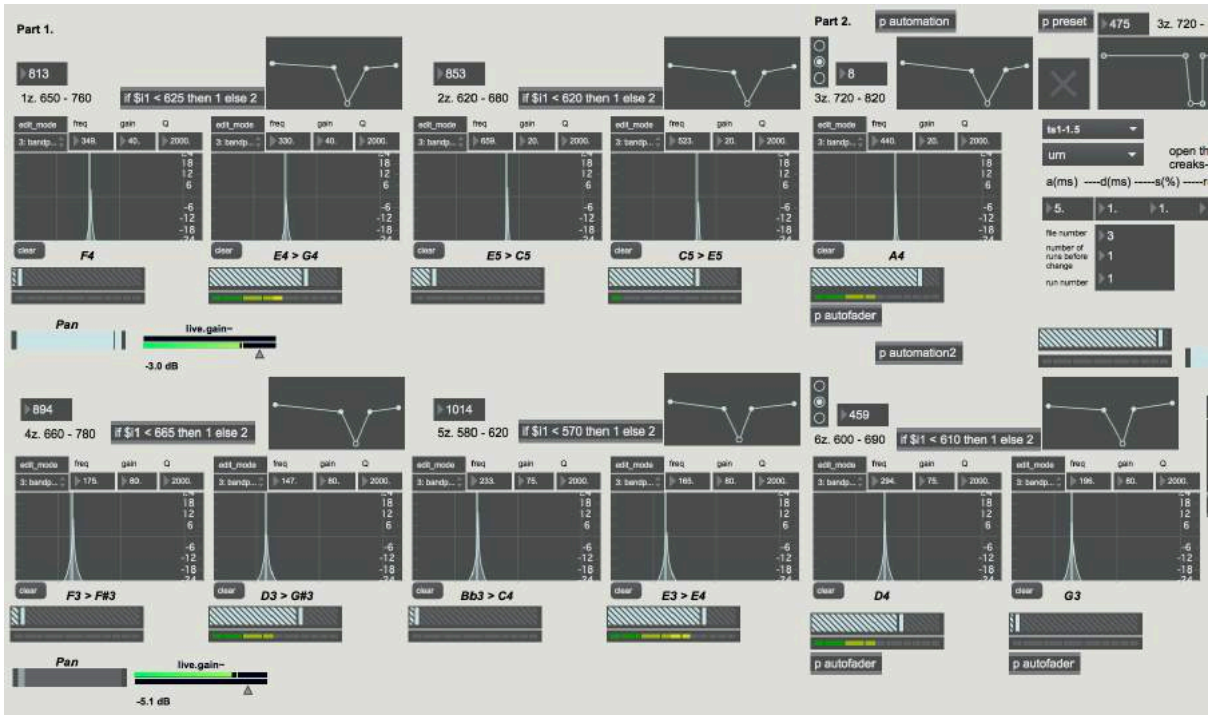
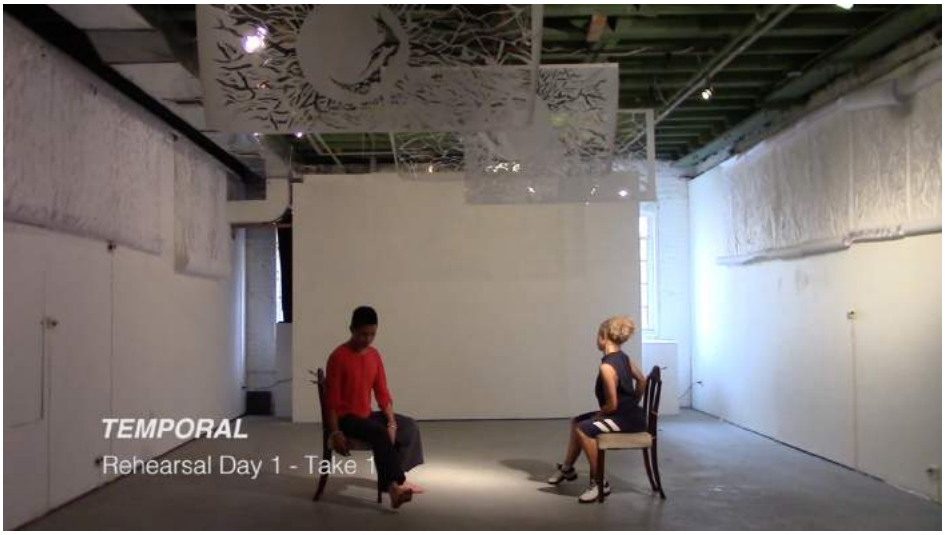


Figure 2.34: The first part of the composition in Max for *Temporal*.

The choreographic task for the first part was: ***Be attached closely to the chairs all the time and explore the sound composition by moving slowly with the chairs.*** It was my intention to let the dancers reveal the harmonic notes by moving the chairs. I wanted to create the feeling that the sound was lingering in the space with subtle changes in movement. When the dancers first tried this part of the composition, they felt extremely restricted because their bodies had to move with the chairs all the time. Video 2.28 (from 00:00 to 02:55) shows the very first rehearsal of the first part of composition. In this take, the dancers were mostly busy finding possible ways to move very closely with the chairs individually, and to discover what happened with the sound composition as they moved the chairs. After the first take, I explained my observations from the first improvisation and directed them to engage each other as well once they had become familiar with moving with the tethered chairs (see Video 2.28 from 02:56 to 07:30). In the second take, the dancers seemed much more confident moving around with the chairs and started developing choreography through thinking about the space between each other as well. For instance, they held the chairs with one hand and leaned forwards to cross each other (see Video 2.28 from 07:31 to 10:27). As a consequence, the dramaturgy seemed evolved with this act.



Video 2.28: The first part of the composition process of *Temporal* – https://vimeo.com/272380575/532a8a2be3.

For the second part of the composition, I mapped the frequency ranges of the bandpass filters for Gametraks 1, 2, 4, and 5 to transition to different frequencies for one minute (see Video 2.27 from 4:30 to 06:40). This slow transition created a surreal feeling with strange discords.[54] When the transition finished, Gametraks 1 and 2 played G4 and E5 when the chair was moved forwards, and F4 and C5 backwards. Gametraks 4 and 5 played G♯3 and E4 when the chair was moved forwards, and F♯3 and C4 backwards. Because the transition was very subtle and slow, I mapped distinctive sounds to be triggered by Gametraks 3 and 6 so that the dancers could notice that the second part of the composition had started. Inspired by the appearance of the classic and domestic wooden chairs I used for the performance, I prepared some creaking and squeaking sounds made by wooden materials and triggered randomly with poly~ objects when the cables of Gametrak 3 and 6 were moved forwards and backwards (Figure 2.35).

[54] I used the same technique in *Pen-Y-Pass*. See Video 2.11.

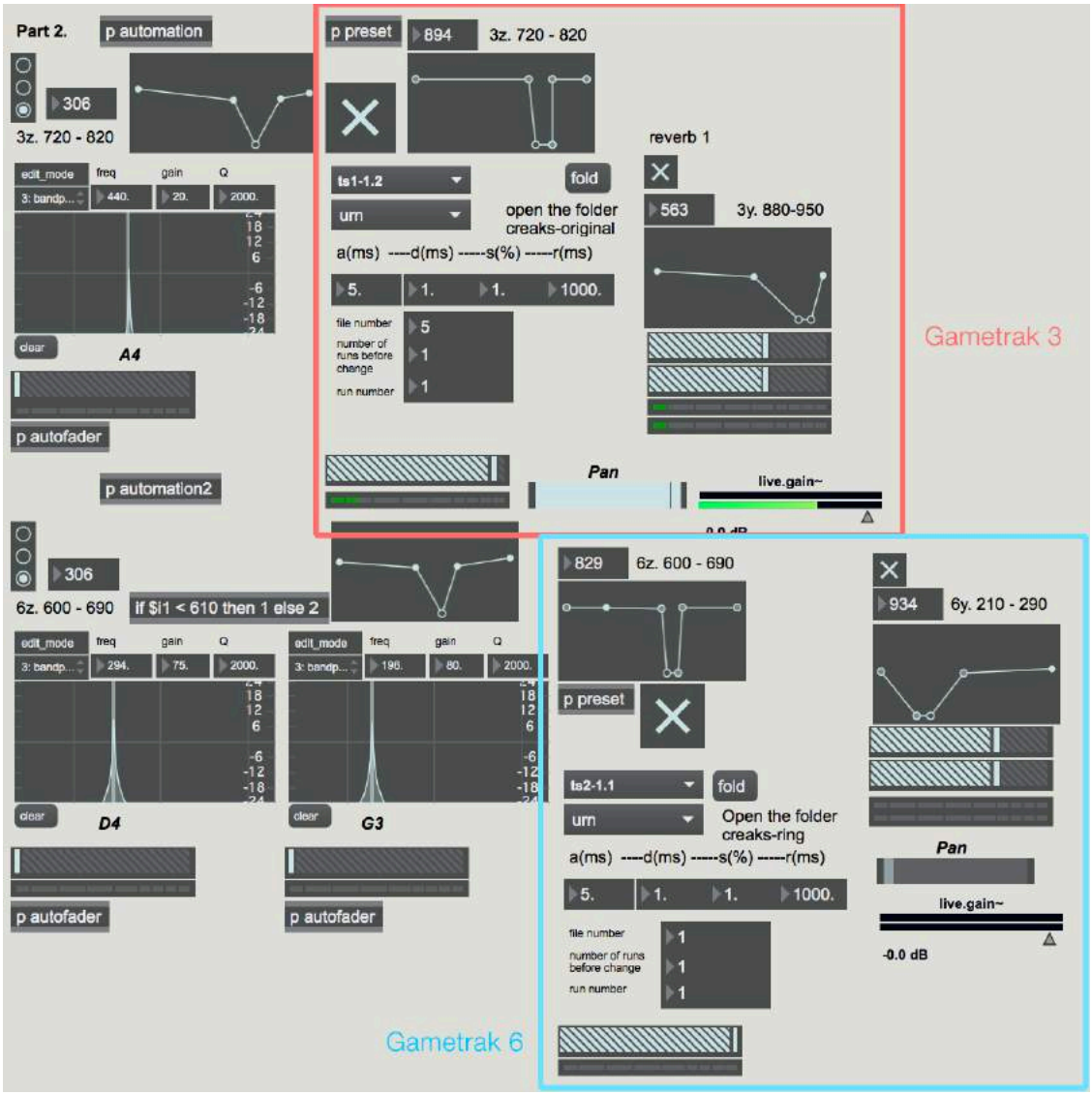


Figure 2.35: The poly~ sound players mapped for Gametrak 3 and 6 in Max.

The choreographic task for the second part was: ***Move around with the chair freely. You can only rearrange the chairs not the cables of the controllers.*** In this part, the dancers no longer had to sit or attach their body closely to the chairs all the time, but still had to improvise using the chairs. As soon as the dancers could hear the sound of creaking they started moving around actively; they walked around holding the chairs or lifted the chairs to swing them (see Video 2.29 from 00:00 to 01:00). During the third take of the improvisation, there was a moment when Green crawled and pushed her chair from the back towards Kikuchi. Kikuchi put his chair in front of Green's chair and sat. And then Kikuchi put his feet on Green's chair and Green tried to take her chair away while

Kikuchi was lingering with his feet (see Video 2.29 from 01:00 to 02:00). This movement worked very well with my sound composition as I wanted to create the feeling of lingering and surreal sustaining notes with the bandpass filters (see Figure 2.34). We decided to keep this movement for the live performance.

Video 2.29: The composition process of *Temporal* – https://vimeo.com/298645885/fb4ddc466b.

There was another interesting moment during the third take of the improvisation. Kikuchi started pulling the chair towards him and letting it go so that made a sound of hitting the floor. When he heard a creaking sound, he suddenly started dragging the chairs around to make a scratching noise against the floor at fast speed (see Video 2.29 from 01:45 to 04:15). The dragging noise he created naturally added to my sound composition. This movement also created more vibrant energy into the performance as a contrast to the first part of the composition. During the evaluation, I asked Kikuchi to include this movement for the live performance as well. We also all agreed that we found the most interesting interactions between the dancers and the choreographic stimuli I provided during the third take of the improvisation as the dancers became confident enough to move around with the chairs and also responded better to the sound composition (see Video 2.29 from 04:15 to 05:22). At the end of the first rehearsal day, the dancers asked me to share the video recording of the third improvisation take so that they could watch what worked very well before they came in for the next day's rehearsal. On the second day of rehearsal the dancers tried to recreate the moment when Kikuchi put his feet on Green's chair (see Video 2.29 from 05:23 to 06:39).

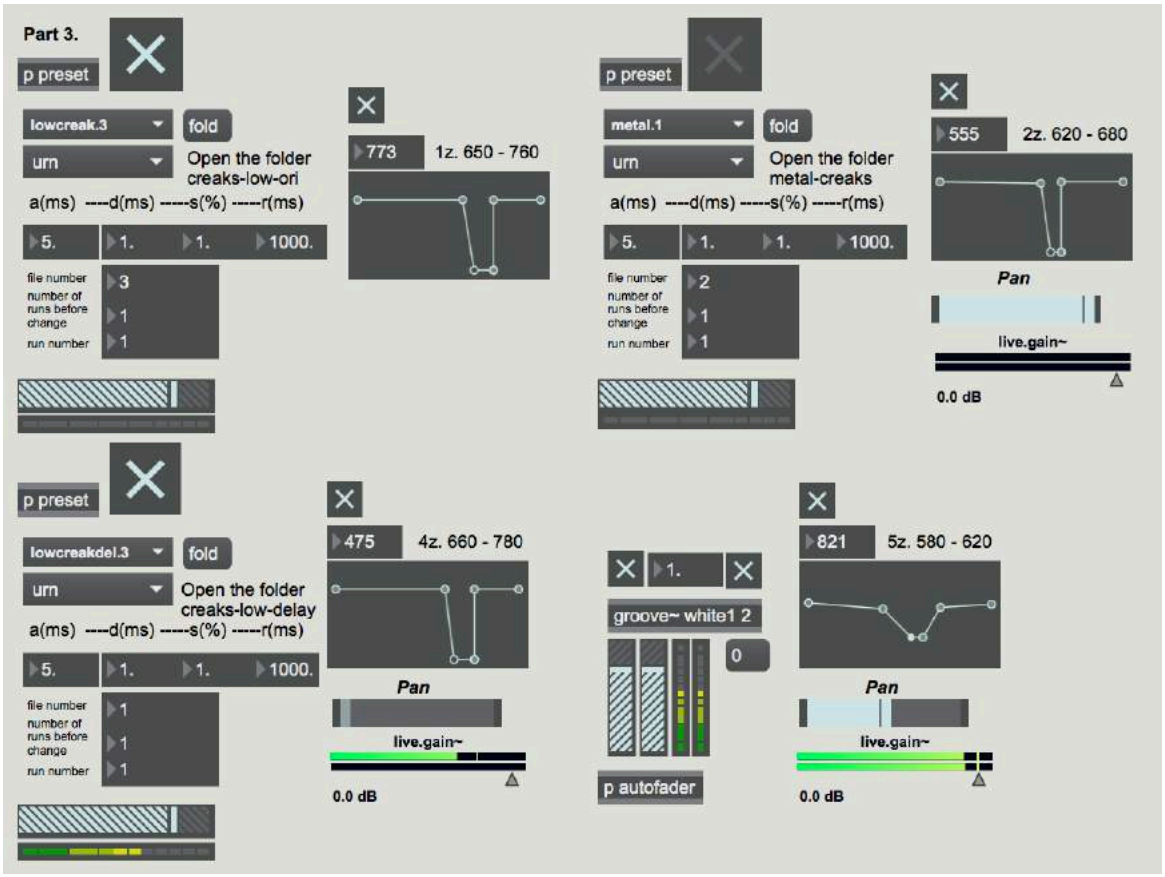
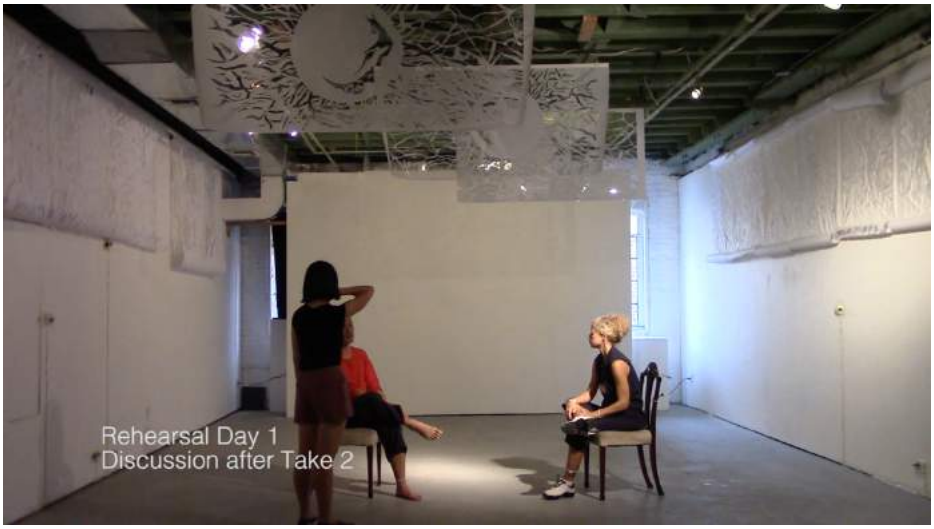


Figure 2.36: The third part of the composition in Max for *Temporal*.

While I was composing the third part of the composition, the image of a sinking boat came into my mind. When a boat (or something as heavy as a boat) is sinking in the water, it takes a while to be completely submerged. For me the process of submerging was like a 'lingering' moment from one point to another. Perhaps the creaking sound I had previously used led me to think about this image as well. Based on this idea, I prepared some heavier creaking and squeaking sounds, some metallic creaking sounds, high-pitched eerie sounds, and some rumbles. I mapped Gametraks 1, 2, 4, and 5 to trigger these sounds randomly using poly~ objects when the chairs were moved to various locations (Figure 2.36). The choreographic task for the third part was: ***Now you can freely rearrange the cables of the controllers and also tether onto your bodies.*** The dancers tethered some cables onto their bodies one by one and also moved the chairs around in the performance space to find out where the sounds triggered were mapped to (see Video 2.27 from 6:40 to 10:30). While tethered to the cables, the dancers stretched their arms forwards as if creating extended

symmetrical lines of the cables. They also tried to reach each other, which created a physical tension between them (see Video 2.30 from 02:34 to 03:14).



Video 2.30: The discussion about the transition between the second and third part of composition - https://vimeo.com/298673130/118eae5068.

In previous works such as *Pen-Y-Pass*, I had created sudden transitions between different parts of composition as if changing scenes in a film. But in *Temporal*, I wanted to create an elusive feeling with the sound composition by blurring the transitions between different parts of the composition. For the transition between the first and the second part, the frequencies for the sustaining notes generated with the bandpass filters changed from one to another gradually (see page 116). For the transition between the second and third parts, I automated the sustaining notes from the second part to gradually fade out over 40 seconds. However, the dancers had a hard time noticing when the third part started in particular. I mapped different sounds to each chair and assigned the sounds triggered by chair 1 to speakers 1 and 3, and by chair 2 to speakers 2 and 4 (see Figure 2.32). The initial idea behind assigning the chairs to different speakers was to help the dancers monitor the sounds they were triggering, but this did not work as they moved around the space a lot on all sides. Instead the dancers asked me to prompt them by lifting up a piece of paper when the third section started (see Video 2.30 from 00:00 to 02:33). In the third take of the improvisation, even though I lifted up a piece of paper for them to notice, the dancers missed the transition again. However, I decided not to stop the improvisation because the dancers seemed fully immersed in the improvisation and very focused on listening and responding to the sounds they were triggering (see

Video 2.30 from 03:16 to 07:04). In the fourth improvisation, although the dancers did not miss my signal and successfully moved on to the third part of the composition (see Video 2.30 from 07:05 to 10:58), the choreographic task seemed to break the dramaturgy the dancers had developed for the previous parts. Because the choreographic task no longer asked them to improvise with the chairs, I felt it created a sudden disconnection of the relationship between the chairs and the dancers. I suggested getting rid of this choreographic task, but the dancers wanted to keep it as it offered them different physical interactions with the cables. As a compromise, I asked them to continue thinking about moving with the chairs while executing this choreographic task as well (see Video 2.30 from 11:00 to 11:55).

For the final part of the composition, I programmed the first part to be faded in again and the third part of the composition to be faded out. I asked the dancers to detach all the cables from their bodies and reattach them to the chairs once they could hear the harmonic notes from the first part. I then asked them to sit facing each other to finish the performance so that they were recreating the very opening scene.

After the composition process, I had an opportunity to discuss my choreographic sound composition method with Kikuchi in depth over email. He explained that keeping a constant awareness of kinaesthetic, auditory, and visual sensations was very important for him in improvisations. Therefore, his primary interest was being aware of the space, the connection with my interactive sound composition, and the relationship with Green rather than trying to build a choreography immediately (F Kikuchi 2018, personal communication, 22 October). He also explained that he sometimes struggled to move within the restrictive conditions of the cables so as not to repeat the same movement over and over, but the interaction with Green and my sound composition helped him to solve that problem (F Kikuchi 2018, personal communication, 29 October).

For the public presentation, as shown in Video 2.27, I encouraged some audience members to sit around the performance space rather than sit only on the chairs arranged outside of the stage. I wanted the audience to feel the physical effort the dancers were creating by moving with the chairs, and also to see more closely how the tethered controllers affected the dancers' movement. Based on

this experience, I decided to create a dance film again, but to try to capture the intimate physical relationship between the dancers and the restrictive elements.

2.4 Project Four

2.4.1. *The Music Room*

Video 2.31: *The Music Room* – https://vimeo.com/273755878/26dcf4a5c3.

The Music Room (Video 2.31) is a choreographic sound composition performed by solo dancer using Gametrak controllers in an unusual performance space. In order to capture the intimate relationship between the dancer and the restrictive conditions with my choreographic rules, I produced it as a dance film.

Inspired by Rudolf Laban's notion of kinesphere (see pages 28–29, 32–33), I wanted to create with my interactive system a work that dealt with the size and shape of the space of the kinesphere. In my previous works I used Gametrak controllers to make the dancers more aware of the space of the kinesphere. For example, when a dancer was no longer able to move one part of his or her tethered body, he or she was provoked to think about and move other body parts. In other words, the tethered parts of the kinesphere were restrained. As a consequence, how the dancers solved my choreographic tasks became the ways in which the sound compositions were triggered and

manipulated. However, I wanted to create a new work that somehow more clearly demonstrated the invisible kinesphere around the body.

Based on his choreutic theory, Laban created life-sized icosahedral scaffoldings to demonstrate the kinesphere (Figure 2.37). Figure 2.38 shows how an icosahedral shape can elaborate in detail the points where the limbs can touch within the kinesphere and how it can be adapted to Laban's dance notation. I looked at the possible movement trace-forms in the book *Choreutics* and planned how to map my sound composition using Laban's dance notation. I also recreated the trace-forms in 3D space in vvvv (Video 2.32). However, the more I worked in this direction, the more I felt that it was a mere representation of Laban's drawings of movement theory, rather than an attempt to contextualise Laban's idea to create my own original work. I therefore ended up discarding this idea and sought another way, in which my collaborating dancers could physically practice moving within the space of kinesphere. Eventually, the space could organise a sound and dance composition.

Figure 2.37: Photograph of Rudolf Laban's pupil Lisa Ullmann working in a life-sized icosahedron during a summer school at Ashridge in 1955.

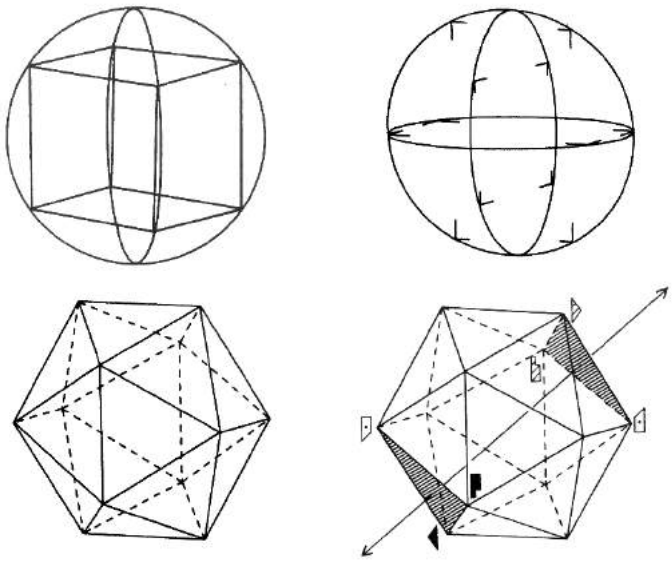
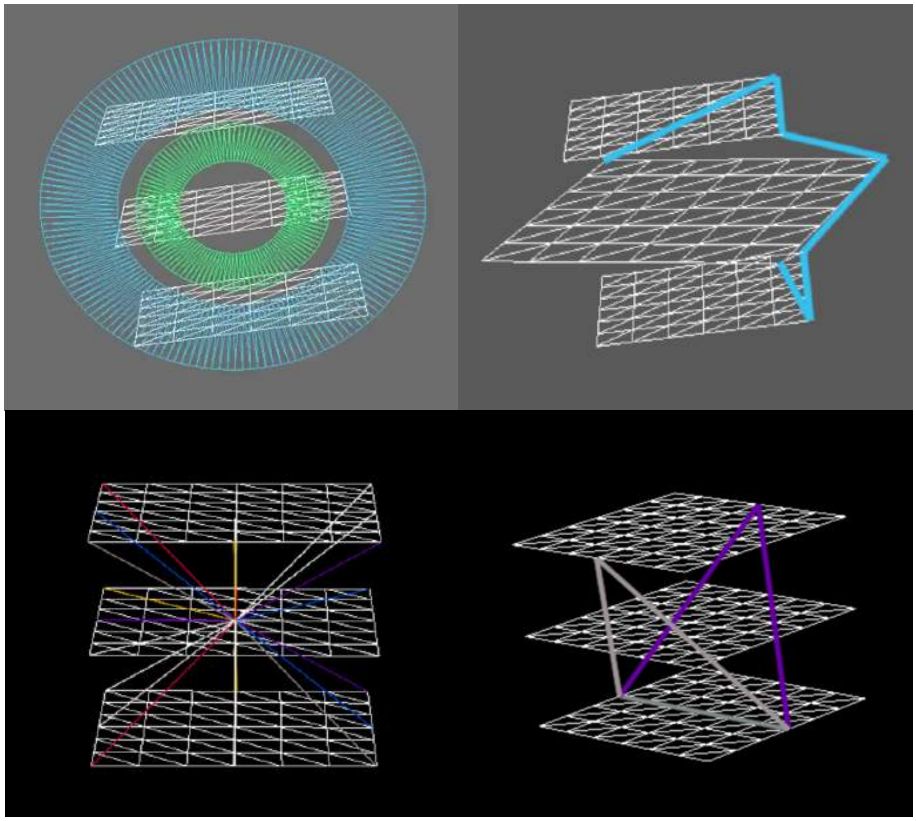


Figure 2.38: The sphere around the body can be demonstrated with an icosahedron (Ullmann, 2011: 142–143).



Video 2.32: Possible movement trace-forms created in vvvv based on choreutic theory – https://vimeo.com/270708176/54e6987d02.

When I composed *Temporal*, I liked the idea of having an object tether the Gametrak controllers. The chairs and controllers together had worked as a double enforcement for the dancers executing my choreographic tasks, and represented a new challenge to their performance. For my new composition, I decided to recreate this double enforcement by restricting the size of the performance space alongside the use of the Gametrak controllers. Since the kinesphere is a 360° space, I wondered how it would affect a dancer's perspective when it was cut into quarters (Figure 2.39). This led me to create a piece that had to be performed at the corner of a room.

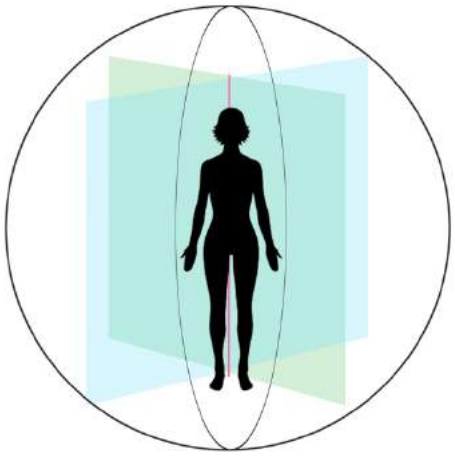


Figure 2.39: The kinesphere is cut into quarters.

I read Laban's book *A Life for Dance,* which was originally published in 1935 in German. The book consisted of his commentaries on his works, and each chapter was named after the titles of his works. I wanted to know his background so that I could understand why he created such a movement theory. In the chapters "The Fool's Mirror" and "The Sorcerer's Apprentice", he wrote about how much he was against machines as he could see that human movement had changed to serve them. He was also afraid of the fact that movement could be captured as still images with a camera and lose its physical quality. He wrote about why he turned down the offer from someone in the film business in Hollywood:

> Now, the art of dance is unfortunately – or thank heaven – an art which cannot be caught and canned by a machine. The dancer has only to do a big jump and he has given the camera the slip; or a few rapid whirls and the stupid screen will register a shapeless cloud. Dancing needs the whole, living person and plenty of space into which he can project his happiness and sadness. He must also be able to control the element of time, for breath-taking speed may alternate with an

> almost unending stillness of reflection. For these reasons I have not let my Fool's Mirror be filmed. (Laban, 1975: 3)

Perhaps this was behind the basic idea of his choreutic theory as seeing movement as constant "flux" (see pages 28–29). However, when I looked at Laban's movement theory only through cold and codified notation systems, it was hard to relate to such a background.

In the chapter "Illusions", Laban wrote about how he had struggled to lead his dance troupe while they were moving from one inn to another during the post-war period without enough financial support and food. I was impressed by this episode below in particular:

> One autumn evening, returning from my rounds at dusk, I noticed some strange large birds sitting in the tree-tops of an orchard. They did not stir. As I drew nearer I had a suspicion that they were one of my dance-groups, out on a fruit-raid. I always wondered at these young people who, having grown up in war-time, had lost all respect for property. After getting them down and giving them a piece of my mind there was an imposition of extra training in the damp meadows. Then we assessed the amount of fruit eaten and reimbursed the owner for a good hundredweight. On many of my lonely walks over the bleak rain-drenched countryside I kept on thinking how to give stability and form to my pupils' youthful enthusiasm for movement. (Laban, 1975: 100)

Although Laban did not have a hall for rehearsals and had to use meadows instead, this was the period when he further developed the idea of pure movement art with his pupils by dancing in silence without music (see page 40). While I was reading about choreutic theory, I often wondered why Laban had been obsessed with creating 'unity' or 'harmony' in movement, which sounded like another way of 'controlling' his dancers rather than freeing them from tradition. However, the more I got to know about his experience in the community with his pupils, the more I came to understand that his theory was not to teach a unified style of dance, but to introduce the most basic principles of human body movement. Therefore, anyone could perform with any kind of movement style. I find how Mark Jarecke introduced Laban's movement theory in his lecture helps to understand this approach; Laban looked at dance outside traditions as Kandinsky and Schoenberg did to art and music (Jarecke, 2012).

I feel dance by looking primarily at the 'effort' of movement, not only its outline. As a consequence, that effort provokes or relates to certain emotions, which I find to be quite a different way of expression from acting. This is why Laban's movement theory is interesting because it explores the

quality of movement depending on how it flows within a kinesphere.[55] However, his notation system as it was became outdated in terms of possible outcomes of movement styles,[56] so I tried to find a way to draw on the essence of his ideas. I came up with the idea of using the corner of a room to lead the dancer to make an effort to move within the altered size and shape of kinesphere by exploring possible movement materials evolved within this space.

For *The Music Room*, I wanted to recreate a specific scene I had read in the chapter "The Earth" in *A Life for Dance*, not as a literal translation but trying to take an excerpt of the story. Laban's story recounted joyful moments of his childhood as he adventured in the mountains, feeling the majestic earth, and how he incubated his creative ideas inspired by these adventures in the music room of his grandparents' house. Laban described how he spent time playing a grand piano until his own melodies came to his mind. And then he almost felt a soft sound coming from the life-sized marble figure holding a lyre next to him. One day the soft sound turned into a roar like some animal sounds he heard while he was exploring the mountains. But when he looked at the marble figure again, he realised that it had not made any sound but silence.[57]

I was drawn to the story in particular because it reminded me of childhood vacations at my own grandparents' house in the mountains. There was a stream right next to my grandparents' house, and I swam every summer with my cousins. My grandfather would make a temporary shower by piercing some holes in a hose at the entrance of the house so that we could wash off the stream water and soil before getting into the house. We would be so excited about the shower that we wouldn't be sad to stop playing in the stream. I remember the winter when I walked over the frozen stream with my favourite cousin and followed it upstream to find where it started. Later, when the day got darker, we realised that the surrounding scenery was no longer familiar to us. We had come too far from the house. Then we suddenly got so scared and rushed back home. Visiting my grandparents' house and playing in nature was definitely one of the most joyful memories from my

[55] Similarly, Alwin Nikolais explained that he believed "motion" to be the art of dance, distinguishing motion from movement. In his own terms, movement is about something moved from one position to another, whereas the term motion implies the manner in which something occurred and the detailed itinerary of the movement (Nikolais, 1974).

[56] Laban wrote about the theory in the early 1900s, just as modern dance started to established as a form. He thus used the centre of the body as the axis in his notation system which related to the traditional ballet principles. I wrote about an episode related to this issue while I was developing *The Music Room* with my collaborating dancer on page 132.

[57] Most of stories in Laban's autobiography are very poetic and it is sometimes hard to know exact time and place where all the episodes happened without the annotations of his editor and translator, Lisa Ullmann. This is how I understood the specific scene I read in the story. I included the original text in Appendix G.

childhood. It may sound banal or primitive, but it was no doubt simple and true happiness. In *The Music Room*, therefore, I wanted to create a piece with the most basic principles for creating sound and movement of all my works so far.

I used a piano sound because of the story from Laban, although I do not usually use musical instruments in my sound compositions. I do not feel it is right for me to mess around with musical instruments since I am not a player. I did at least learn the piano when I was very young, but that did not last that long. I liked the sound of the instrument but I got bored of practicing Czerny after the introductory level. While hesitating to use piano, I remembered what Morton Feldman said:

> My concern is: what is its scale when prolonged, and what is the best method to arrive at it? My past experience was not to "meddle" with the material, but use my concentration as a guide to what might transpire. I mentioned this to Stockhausen once when he had asked me what my secret was. "I don't push the sounds around." (Feldman, 2000: 142–143).

I looked up interviews with Feldman and his own writings to understand his compositional approach towards creating music for paintings, just as I tried to look at my own sound palette through another visual medium – choreography. I also liked Feldman's acceptance of limitations and how he let his intuition structure his work (Feldman, 1967). Why not, therefore, select some piano notes that sound good to my ears and simply play them, without worrying about my own piano skills? This inspired me to set the core choreographic task for this piece: ***Once you trigger sound, let the sound be played out until it lasts before you move again.*** In other words, the dancer needed to concentrate on when to move according to the length of sound she had triggered, and the triggered sounds unfolded by themselves according to the intervals created by the dancers. Based on this idea I played some chords I liked on a piano at a medium velocity and listened to the overtones and lengths of resonance. I then recorded each note from the chords until the sound naturally decayed.

I set up four Gametrak controllers – two on the ceiling and two on the floor (Figure 2.40). I then loaded the recorded piano notes in Max using poly~ objects to be triggered randomly. In my previous work *Temporal*, I also mapped the sound files to trigger in a random order at various lengths of the pulled cables for the third part of the composition (see page 119). In that composition, the dancers had to move around the space to find spots in which to trigger random sounds and immediately respond to them. Although there were some interesting moments in which the dancers

moved around the space and interacted with the sound by continuously building up the dramaturgy, most of times the dancers were rather confused by my technical setting and became too busy finding the spots where they could trigger sounds. However, in *The Music Room* the relationship between the random piano notes and the dancer was very different. The dancer was not attempting to respond emotionally, but had to think about creating stillness until the note decayed. Here, the sound composition also worked as another restriction for the dancer. As a consequence, this relationship evolved the dramaturgy through a tension between the dancer and the piano notes.

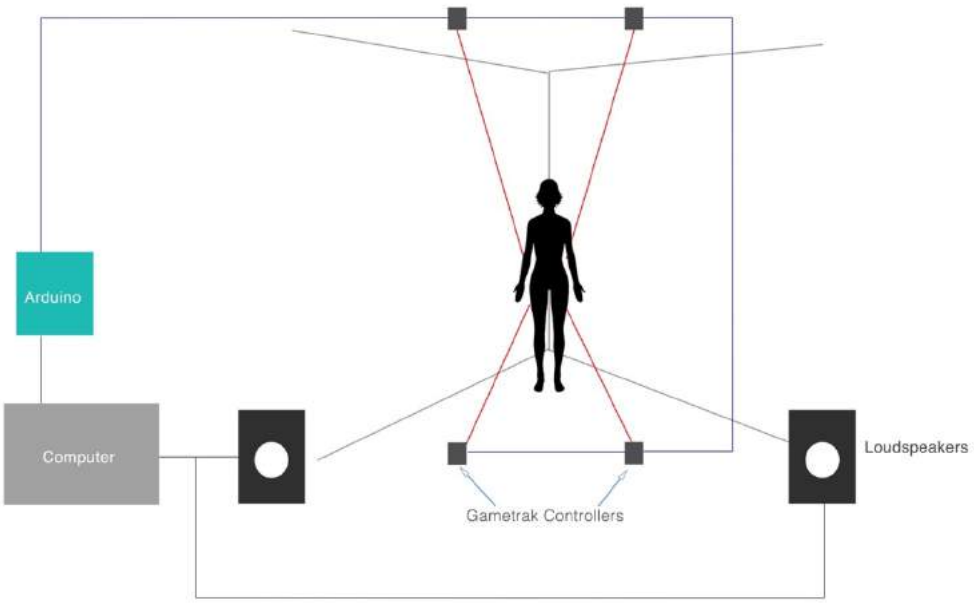


Figure 2.40: The technical set-up for *The Music Room*.

The composition was divided into three parts, each lasting 3 minutes for a total of 9 minutes.[58] For the first part of composition, I set the piano notes I had recorded to be triggered as Foti devised her choreography. I also added narrow bandpass filters with white noise to play some subtle sustained notes as background. The core choreographic task of this piece was as follows: ***Once you trigger sound, let the sound to be played out until it ends before you move again.*** This led Foti to move very carefully so as not to accidentally trigger sounds all the time. Some lower frequency notes had a

[58] A full take of the performance is included in Appendix I.

longer resonance and created longer intervals between movements. The choreographic task and the space also inspired Foti to rest on her hands, leaning against the wall.

For the second part of the composition, I loaded the reverbed piano notes to be triggered. I recorded the reverbed notes with the same piano instead of adding a reverb effect in Max because I wanted to preserve the natural reverb length of the piano I had used. I made an automation to change the frequency ranges for the bandpass filters that created strange disharmonies during the transition. This was the same technique used for *Pen-Y-Pass* and *Temporal*. The disharmony indicated to the dancer that the second part of the composition had started. The choreographic task here was: ***Continue devising choreography following the previous task, but you can move with little bit more freedom. Tether the Gametrak controllers to different parts of your body.*** Foti decided to tether all the cables to her left ankle so that she could trigger multiple notes at once and free the rest of her limbs.

For the third part of the composition, I wanted to recreate the scene in his story where Laban imagined the roars and groans of animals. For this part Foti was allowed to improvise freely but still had to be close to the walls. She detached one Gametrak controller from her ankle and tethered it to her left wrist. She created faster spinning movements as the soundscape became dynamic. She finished the performance by collapsing her body towards the corner.

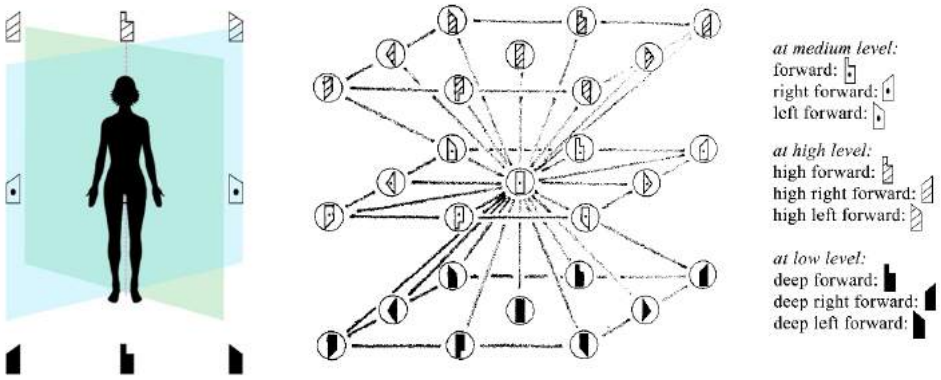


Figure 2.41: (Left) Six possible directions of movement while standing at the corner of a room based on Laban's theory. (Right) Laban's notation system from *Choreutics* is based on the first point of view.

Video 2.33: The first rehearsal of *The Music Room* – https://vimeo.com/299112357/bde4f812f1.

Based on Laban's notation system within the kinesphere I initially mapped the sound to be triggered when the dancer held her limbs towards forward, right forward, left forward, high forward, high right forward, high left forward, deep forward, deep right forward, and deep left forward, because these were the possible directions of movement while standing at the corner of a room (Figure 2.41). For the first rehearsal, I explained to my collaborating dancer Katerina Foti how I had mapped sound following Laban's theory and the overall structure of the composition. To begin the first part of the composition, I asked her to stand in the corner of the room and to tether the cables of the Gametrak controllers onto each of her limbs. Then I asked her to move her limbs one by one. I thought this would be an effective introduction for the audience to explain the fact that each of her limbs were triggering sound as she moved. However, while trying out this choreographic task, the dancer said that where I had mapped the sounds was not natural for her dance style. When Laban started writing his choreutics theory, this was just the beginning of the evolution of of modern dance in the early twentieth century. As shown in his notation system in Figure 2.41, his theory considers the centre of the body to be around the waist, which was still an influence from traditional ballet practice. However, in current contemporary dance practice, the axis of the body is instead grounded following the natural relationship between gravity and the body (H Elliott 2016, personal communication, 4 October).[59] When the dancer tried to move only one arm, it was not a problem (see Video 2.33 from

[59] I had an opportunity to have supervision with Dr Hilary Elliott from the department of Music and Drama. Because the choreographers I referenced in this commentary such as William Forsythe and Wayne McGregor work with ballet dancers, yet

00:00 to 01:50). But she felt very awkward moving only one leg in the standing position (see Video 2.33 from 01:51 to 03:30). Because of this problem, she also struggled to make a transitional movement to the second part of the composition (see Video 2.33 from 03:31 to 06:45).

As we moved on to the second and third parts of the composition, we found more interesting movement materials. For the second part, the dancer was allowed to tether the cables onto different parts of her body, and I suggested tethering all the cables to one leg as an option. In this way, while one of her legs was restrained, she could think about creating various possible movements and also started to use the walls behind her more naturally (see Video 2.33 from 06:46 to 09:30). I reminded her to be still when she triggered too much sound. For the third part, the dancer was allowed to move freely, yet engage with the corner of the room. In fact, the corner had a column that the dancer could hold. The dancer decided to create some movement lightly hanging onto the column to engage better with the space as it was (see Video 2.33 from 09:31 to 11:38). She also tried some spinning movement stepping her hands onto the wall (see Video 2.33 from 11:39 to 12:34).

Video 2.34: The third and fifth rehearsals of *The Music Room* - https://vimeo.com/299114753/f7604a8a9b.

After we went through the entire composition two times, the dancer suggested leaning against the wall behind her for the very beginning part rather than free standing. She explained that moving only

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the style of ballet they produce is contemporary. I asked her what would be the difference between working with ballet and contemporary dancers. Elliott explained that the focal difference was how these two types of dancers were trained based on the different axes of the body as explained above.

one part of her limb while standing could be one way of applying a restriction to her, but it did not feel natural based on how she had been trained (see Video 2.34 from 00:00 to 00:59). Therefore, for the third rehearsal she tried the beginning part while crouched down to see how she could move her legs from that position (see Video 2.34 from 01:00 to 02:37). Eventually, we decided to start the composition with the dancer was sitting down and holding the column behind her (see Video 1.5 from 01:30 to 03:12). In this way, she could fix her hands holding the column more naturally while moving her legs and in return not accidentally trigger sounds with her hands. I mapped the piano notes again according to this position using function objects in Max (Figure 2.42).[60] I also added another choreographic task for the first part of the composition: ***Touch the wall with one part of your body.***

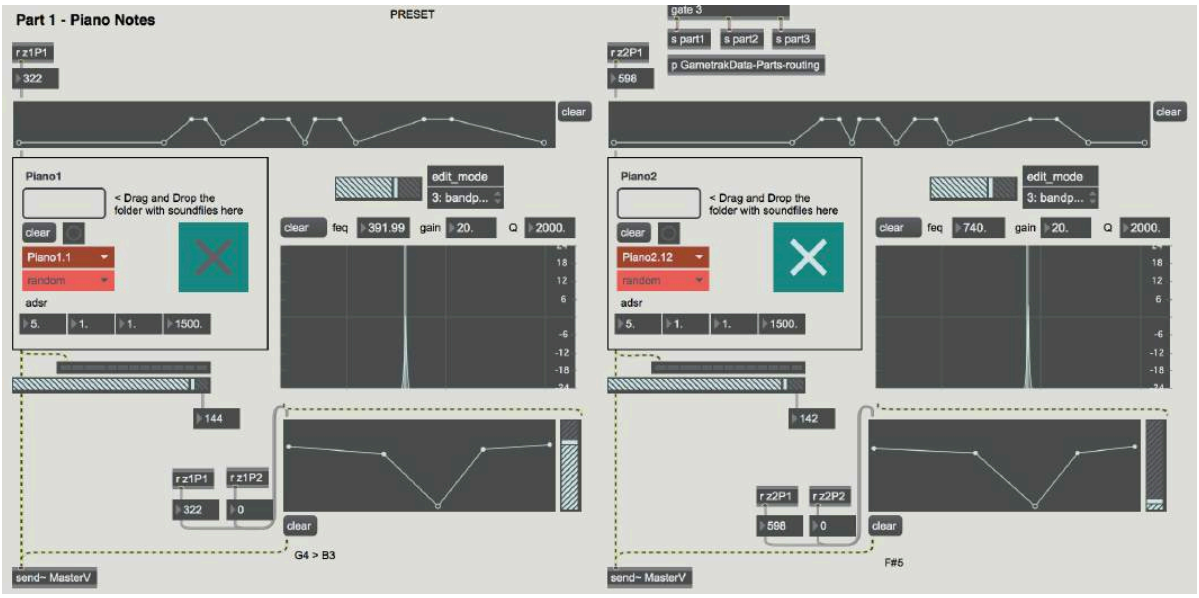


Figure 2.42: I used function objects in Max to map easily the sound files for various positions.

Once we had established the right position from which to begin the composition, the choreographic ideas for the next parts came very quickly. In the fifth rehearsal, the dancer also tried upside down positions leaning her legs against the wall (see Video 2.34 from 02:38 to 04:40). This was another interesting position in which she could fix her hands so as not to trigger unwanted sounds. In the end we no longer cared about Laban's well-structured notation system within the cube-shape

[60] A detailed explanation of the Max patches is in Appendix H.

kinesphere, but designated our own positions that were more suitable for Foti's style of dance. In Figure 2.43 I have roughly drawn the points I mapped to trigger sounds and how Foti moved between them.

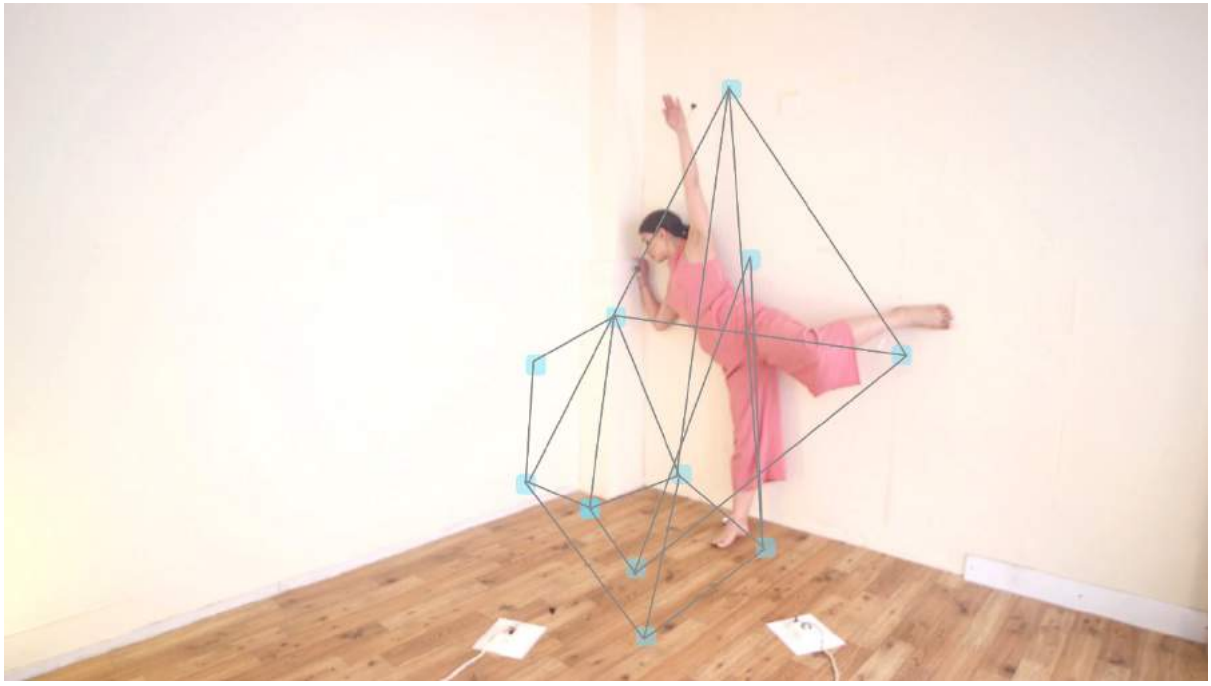


Figure 2.43: Movement trace-forms in *The Music Room*.

I decided to present this piece as a dance film to show the intimate relationship between the body, the space, and my choreographic sound composition with the viewpoints that I wanted to show. I was inspired by the style of dance films directed by Thierry De Mey, which show the original choreography without any artificial effects. I had also tried this kind of approach for *Pen-Y-Pass*, but in that case my work rather looked like a documentation than a dance film. I believe the significant mistake I had made was the shooting location. I used a drama rehearsal studio for *Pen-Y-Pass* for the ease of setting up a projector and speakers, but there was no special relationship between the space and my choreographic sound composition. In De Mey's films, however, the choreographies and the location of the films have very close relationships. The most well-known work from Anne Teresa De Keersmaeker's *Rosas danst Rosas* (1997)[61] was filmed by De Mey at the former technical school of architect Henry Van de Velde in Leuven. De Mey made "the maximum use of the

[61] Available at: https://www.youtube.com/watch?v=XaifFARSNm0 (Accessed 4 June 2018).

geometrical and spatial qualities of the Van de Veldes building" (Rosas, n.a) alongside De Keersmaeker's signature repetitive movements by layering the dancers in different rooms or corridors (Figure 2.44).

Figure 2.44: *Rosas danst Rosas* (1997) filmed by Thierry De Mey.

Another example is William Forsythe's *Thematic Variations on One Flat Thing, Reproduced* (2007), filmed by De Mey. For this choreography Forsythe aligned twenty tables in five columns and four rows in a spacious warehouse, with seventeen dancers moving among them. In an interview, Forsythe explained that the tables in the film were very slippery so the dancers trained themselves to move through the space (Forsythe, 2006).[62] De Mey captured this choreography from front, top and close-up views to show the dancers' effort of moving in the space above or below of tables. [63]

[62] The piece is a reproduced version of Forsythe's previous work *The Questioning of Robert Scott* in which he introduced the tables. This was because Forsythe had read *I May Be Some Time: Ice and the English Imagination* by Francis Spufford, in which the famous Scott expedition of 1911 – 12 to the South Pole is compared to a "baroque machinery". He also recalled other stories he had read related to polar expeditions by Sir Ernest Shackleton, Mary Shelley, and Edgar Allan Poe. As a consequence, Forsythe wanted to create the feelings of antipathy created by the metaphor of baroque machinery by using the slippery, dangerous, and ice-like translucent tables (Forsythe, 2006).

[63] The film can be seen on the website for *Synchronous Objects* (https://synchronousobjects.osu.edu/) with different camera perspectives, Forsythe's annotation, and visual notations.

For *The Music Room*, I used one wide and one zoom lens camera and filmed five takes. It was a challenge to operate the cameras and my interactive sound system by myself, but I had a very clear image in my head about what kind of shots I wanted to film. For my previous works, I had picked one best take and only used that take filmed with different cameras to create the film. It was my intention at that time not to break the original real-time composition that had been created. For this piece, however, I used the best take (see Appendix I) as a guide take around which to structure the entire film, and mixed between all the other takes during the editing process. Since my sound was organising the body during the process of composition, it no longer mattered whether I keep the original real-time composition or not. For the close-up shots, I followed the movement, holding the zoom lens camera to track how my gaze would wander around the dancer's movement. Eventually, I tried to capture the effort of moving with my choreographic sound rules and the space as a "hidden feature" of the choreography just as Laban highlighted the intimate relationship between space and movement in his choreutic theory (Ullmann, 2011: 3–4).

2.4.2. *Queen of the Night* (extra-study)

Video 2.35: *Queen of the Night* - https://vimeo.com/273860109/9f431a84c3.

Queen of the Night (Video 2.35) is a dance film I created as an extra-study of *The Music Room*. Unlike my previous interactive compositions, I filmed the choreography created by my collaborating dancer Foti and composed sound in post-production. I wanted to challenge my usual method of sound composition for choreography.

The piece was inspired by another Laban's text, "The Night", in *A Life For Dance*. In this story the "Queen of the Night" was used as a metaphor for moments when he felt a contradiction between his view of art and the art produced for the capitalistic world. Most often, he uses it in reference to a high-class woman whom he met when he first moved to Munich to make his artistic dreams come true. Laban sought help to start his career in this new place, and a distant uncle who was a well-known poet introduced him to this woman as she had a lot of connections in the theatre world. At first, she seemed to understand Laban's ideas but soon he saw her true side. She laughed at Laban's work and advised him to wake up from his "fairy tales" as he was not interested in the business of entertainment (Laban, 1975: 39). One day later, Laban also encountered the extreme difference between the rich and the poor in the big city when he met the shop-girl at his uncle's company, living in a district covered with coal dust. As a consequence, he created the piece *The Night* as a satire towards the bourgeoisie.

In this story, I was particularly interested in how Laban observed the movement and sound of people at the table where he met the woman for the first time:

> Her long slender arm was fashionably covered with dark gloves reaching above the elbow and I could not help comparing her with my old friends in the land of adventure, the graceful, beautiful vipers – banal as this may sound. The men surrounding her competed in saying or doing something exceptional. They obviously wanted to draw the exclusive attention of the Queen of the Night to themselves. One of them would stare into a corner with exemplary stupidity; another would automatically adopt a new pose every half minute – movement habits in those days were quite different from the ones to-day, a third would utter nothing but short unfinished sentences, substituting an elegant gesture of the hand for the unspoken ending; and the fourth – my fashionable poet – chattered on and on although nobody was listening. I sat there like the fifth wheel of the triumphal coach of the goddess and felt most uncomfortable. She looked out above our heads and smiled vaguely at the various group of people who were stirring their teacups with an air of profundity, their little fingers affectedly crooked. Afterwards I felt as if nobody had spoken a single word of sense during the whole three-quarters of an hour of our visit. During this time I was also introduced to a number of people of both sexes, all politely grinning, but my fashionable poet took my arm and indicated that it was time to leave. I was given a slender viper-hand for a good-bye. (Laban, 1975: 33–34)

I wanted to recreate this scene, not as a representation of the story, but by taking the feeling of the situation. I shared the story with Foti and planned to shoot the film around sunset to capture the natural dim daylight.

Figure 2.45: Improvisation in kinesphere in 360°, 180°, and 90° degrees.

As an extension of my study of kinesphere, I asked Foti first to improvise in a free space without any obstruction, and then improvise against a wall and in the corner of a room as I had in *The Music Room*. The idea was to cut the 360° kinesphere into 180° and 90° and see how these spaces affect the choreography (Figure 2.45).[64] It was also my interpretation of the story "The Night", as Laban described how much he struggled the more he got to know the high class woman and the people around her. Foti suggested improvising as if there were some cables restricting her body. Initially, she was going to improvise three different acts in each space. However, I asked her to repeat the first improvisation she had made in the free space in the other spaces at the same pace. For example, if she could do a full swing with her arm in the free space, she could swing it only half in the 180° space. And when she touched the wall, she had to wait the same amount of the time that she would have spent on the full swing. Then, she could move onto the next movement. This created intervals between her movements that depended on the space itself. In other words, the space organised her movements, similar to the role of my choreographic task in *The Music Room*.

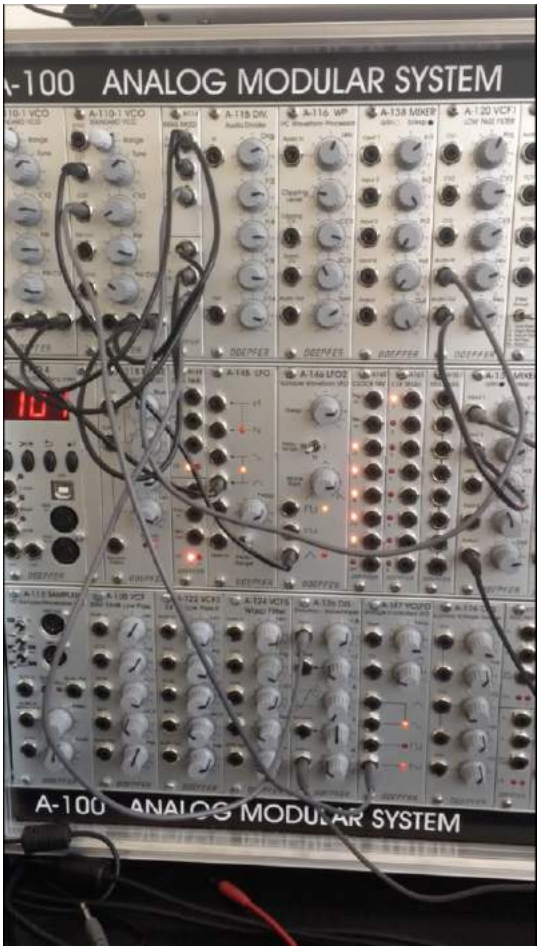
It was a challenge for me to compose for the already filmed work as it was not usual for me to create sound for captured choreography. Also, choreography was composed to music traditionally, but not vice versa. For *The Night*, Laban used "a caricature of jazz" which made "gruesome" sound (Laban, 1975: 45). Interestingly, according to Lisa Ullmann's annotation (Laban, 1975: 45) the music was composed by Erich Ytar Kahm "following Laban's notation of the rhythms and metres bar by bar". This means that Laban created choreography first and then Kahn composed music for it after. I was curious whether this way would work for me too.

When I finished editing the film, it already sounded complete with the recorded location sound. Just the sound of breath and dragging feet on the floor, and stepping hands on the walls sounded enough. I therefore decided to mute the location sound and compose a soundtrack only watching the movement. For me, the table scene quoted above reminded me of the Mad Hatter's tea party as it became in the end a nightmare for Laban. I therefore wanted to start the composition with soft and elegant sounds as if Laban was revealing the mysterious and graceful goddess figure of the Queen

[64] The uncut version of improvisation is included in Appendix J.

of the Night under the moonlight for the first time.[65] Then I wanted to gradually develop the sound into a crazy table scene at which everybody was pretentiously talking nonstop while stirring their tea cups.

Initially, I wanted to create this piece as the second part of the composition for *The Music Room*. As a continuation I therefore wanted to use musical instruments for sound materials again, and, as a consequence, I used viola, prepared piano and flute. I then wanted to create some beats as Foti hit the walls with her feet and hands the more the space got narrower.



Video 2.36: Improvisation with Doepfer A-100 Analog Modular System – https://vimeo.com/273615500/2949f90328.

[65] This is from the moment where Laban met the Queen of the Night at a courtyard outside of a theatre. Before he got to know the high-class lady he saw an opera singer. When he met the high-class lady, Laban overlapped the presence of the opera singer's glamorous look towards the high-class lady (Laban, 1975: 32).

In the meantime, I was also exploring the analog sound module Doepfer (Video 2.36). One day I thought about how the beat created with the module was similar to how the choreography was created in *Queen of the Night*. Just as a constant low frequency alternated with another higher frequency pulse, so was the choreography with the walls created with intervals. Therefore, I decided to add the beats played by Doepfer to increase the tension in the piece as though a modern version of the Mad Hatter's tea party.

After I had finished the sound composition, it did not feel right to present the film without the sound of movement recorded on location. In my previous works I had intentionally removed sound from the location because I did not want to distract the audience with sounds other than the sound composition created with my interactive synthesis and the dancers' movement. However, the choreography here had an intimate relationship with the space, and I decided to include the location sound. I also synchronised the sound with the movement throughout, but I felt there was no specific purpose for the synchronisation, which in fact just sounded banal. As a consequence, I rearranged my sound composition all over again to interplay with the sound of breath, feet, and hands. Although the location sound also captured some sounds of people passing by and the sound of an electric meter clock, I tried to include them as part of my sound composition too.

Conclusion

Since I started collaborating with contemporary dancers, several questions have been aroused in my head. Eventually these led me to start my PhD research. At the beginning of my collaborations, it was simply exciting to see how my sound compositions could be realised with the dancers' movement in real-time. But I had to ask what made my compositional use of interactive technology valuable. To answer this, I investigated in the history of dance and technology up to the present time to understand what were the main contexts of using technology in different periods of time.

Based on this investigation, I sought ways to integrate interactive technology into the choreographic process rigorously to create my sound composition rather than merely to receive movement data as an interface. I therefore studied the choreographic methods of some choreographers I liked, to understand how contemporary dance works are structured. My aim was to understand the basic principles and stimuli of contemporary dance so that I could introduce technology into the making process. As a consequence, I stopped looking for more sophisticated technology to achieve more accurate motion-tracking results, and decided to dedicate my entire practice to using the tactile and visible vintage Gametrak controllers. In this collaboration I wanted to use interactive technology rather casually as a tool with which to compose a work together with my collaborating dancers, not to create representational works of dance movement data in another medium. Perhaps this might be the result of my consideration of what a true post-digital approach would be as a result of listening and watching glitch artworks at the beginning of my research.

Using the Gametrak controllers, I restricted the size and shape of the dancers' kinesphere. This primarily challenged them to move around the restrictive environment in response to my choreographic tasks, which was not a typical performance condition for them. I tried to push their limits so that they would find new movement materials beyond their habits. This process naturally affected the resulting sound composition as well. I strove to use a more intuitive language for the dancers for my directed improvisation so as to compose in collaboration in such a way that the interactive system benefited both dance and sound composition. This required me to carefully balance the point of control and non-control in terms of directing the improvisation so that we could

preserve the simultaneity of movement and sound, and also evolve dramaturgy during the composition process using the interactive system.

Locus was my fresh start in this research to test whether my compositional approach was convincing for my collaborating dancers (see Section 2.1.2). Throughout this piece, I observed how restriction affected the dancers' awareness of their bodies and the performance space. I tried to elaborate the technical aspects of *Locus* in my next piece *Pen-Y-Pass*. However, after completing *Pen-Y-Pass*, I found this piece was the least successful. This was because I had prefixed the narrative and the choreographic tasks without giving the dancers enough freedom to evolve something new out of the process (see Section 2.2.2). In the end, the result was a rather representational work of my trip to Pen-y-Pass. In *Temporal*, I decided to use other objects – two chairs – in addition to the Gametrak controllers. I found that the chairs became a medium through which to create double enforcement for the restriction as well as to evolve dramaturgy (see Section 2.3.2). For me, my final work *The Music Room* was the most well demonstrated piece in terms of using restrictions with interactive sound synthesis. Here the sound triggered by the dancer also restricted her movement, creating stillness, and the corner of the room became a physical enforcement to restrict the size and shape of her kinesphere (see Section 2.4.1).

My contribution to knowledge in the field of interactive dance with computer music is that I offer a rather different compositional approach by integrating motion-tracking devices as a primarily choreographic tool for dancers based on the investigation into contemporary dance composition methods. As a consequence, I have tried to broaden the dominant engineering perspective in interactive dance to include creative composition process in collaboration with professionally trained contemporary dancers. I believe it is crucial to investigate other art media which I have not practised, primarily in collaborative and interdisciplinary composition. Music and dance have served as impetuses for each other and have shared similar qualities. They are both reproductions of physical energy in the time domain. However, the more I got to know about these two media through this research, the more I came to realise that they are very different when it comes to performance, and require different physical skills. Thus, this research was my journey towards understanding the basic principles of the two media in portraying the present time of art with technology and my efforts to structure them as composition.

I hope to expand this study to examine the technologies already existing around us for their intrinsic choreographic structures, which under our current conditions of rapid technological progress may not yet have been fully discovered. Furthermore, I would like to continue to develop my choreographic sound composition methods further using various other technologies than the Gametrak controllers, including objects and architecture, to seek ways to stimulate my collaborating dancers' awareness of the relationship between body, space, and sound.

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18 Happenings in 6 parts (1959) by Allan Kaprow's

A Volume, Within Which It Is Not Possible for Certain Classes of Action to Arise (2015) by William Forsythe

Aftershock (n.a) by Herman Kolgen

Apparition (2004) by Klaus Obermaier

Aufwand (2015) by William Forsythe

Café Müller (1978) by Pina Bausch

D.A.V.E. (1998 – 2000) by Klaus Obermaier

December 1952 (1952) by Earle Brown

Der Schwingende Tempel (1922) by Rudolf Laban

Die Geblendeten (1921) by Rudolf Laban

Eidos : Telos (1995) by William Forsythe, Thom Willem and Joel Ryan, Frankfurt Ballet Company

Einstein on the Beach (1976) by Philip Glass

Electric stimulus to face (2009) by Daito Manabe

Fase, Four Movements to The Music of Steve Reich (1982) by Anne Teresa De Keersmaeker

Fearful Symmetry (n.a) by Ruairi Glynn

FireTraSe (n.a) by Todor Todoroff

Green Light Corridor (1970) by Bruce Nauman

Human Harp (2013) by Di Mainstone

Improvisation Technologies (2011) by The Forsythe Company and ZKM

Inception (2010) by Christopher Nolan

L'Après-midi d'un faune (1912) by Vaslav Nijinsky

Lady's Glove (1994) by Laetitia Sonami

Les Gestes (2011-2013) by Joseph Malloch, Ian Hattwick, Sean Ferguson, Marlon Schumacher, Isabelle Van Grimde, Van Grimde Corps Secrets

Magnificent Triumphal Arch (2010) by Pablo Bronstein

Mind and Movement from the project *Choreographic Thinking Tools* (2013) by Wayne McGregor | Random Dance

Nemesis (2001) by Company Wayne McGregor

One Pig (2011) by Matthew Herbert

Rheo: 5 Horizons (2010) by Ryoichi Kurokawa

Rhizomatiks Circle (n.a) by Rhizomatiks Research

Rosas danst Rosas (1997) by Anne Teresa De Keersmaeker, filmed by Thiery De Mey

Seismik (n.a) by Herman Kolgen

Study after Velázquez's Portrait of Pope Innocent X (1953) by Francis Bacon

Synchronous Objects (n.a) by William Forsythe, Maria Palazzi, and Norah Zuniga Shaw

Tent (1965) by Alwin Nikolais

The Card Players (1894 – 1895) by Paul Cézanne

The Fact of Matter (2009) by William Forsythe

The Poet Max Herrmann-Neisse (1927) by George Grosz

The StyHarp (n.a) by Yann Seznec

Thematic Variations on One Flat Thing, Reproduced (2007) by William Forsythe, filmed by Thiery De Mey

Topos (2014) by Luiz Naveda

Tower (1965) by Alwin Nikolais

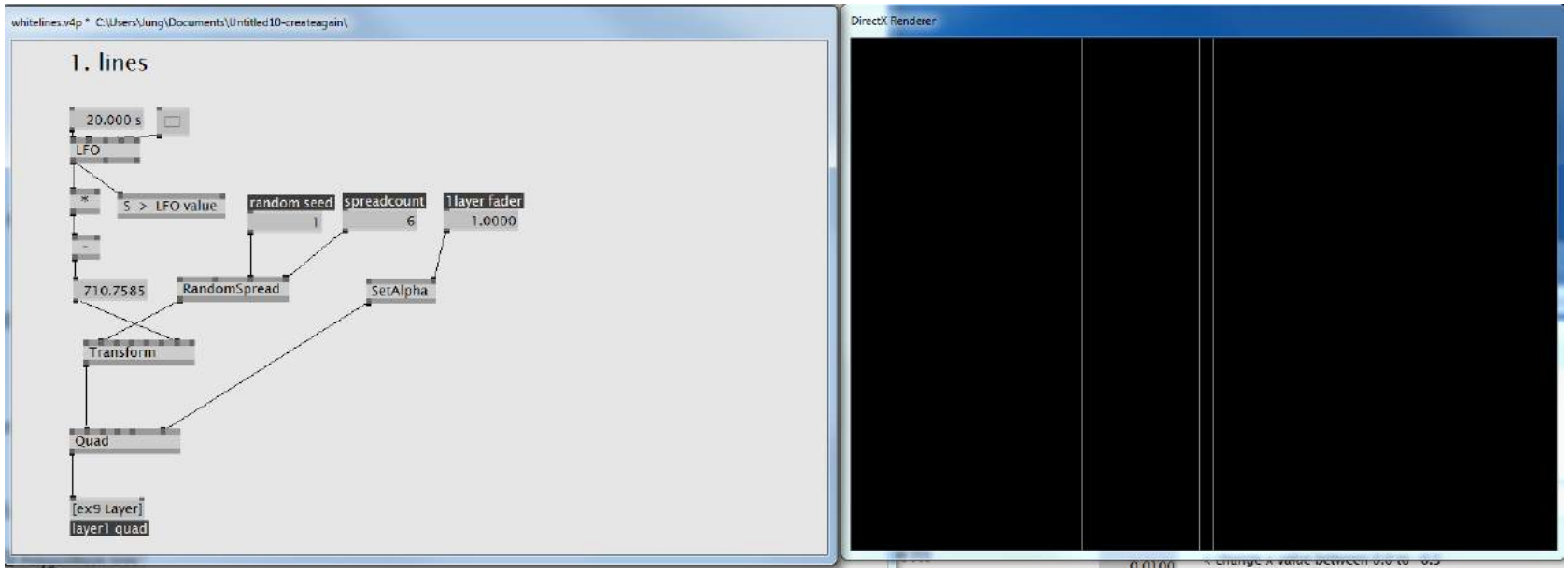
Variations V (1965) by John Cage, Merce Cunningham, David Tudor, Gordon Mumma, Carolyn Brown, Barbara Dilley.

VIVISECTOR (2002) by Klaus Obermaier

Appendix A

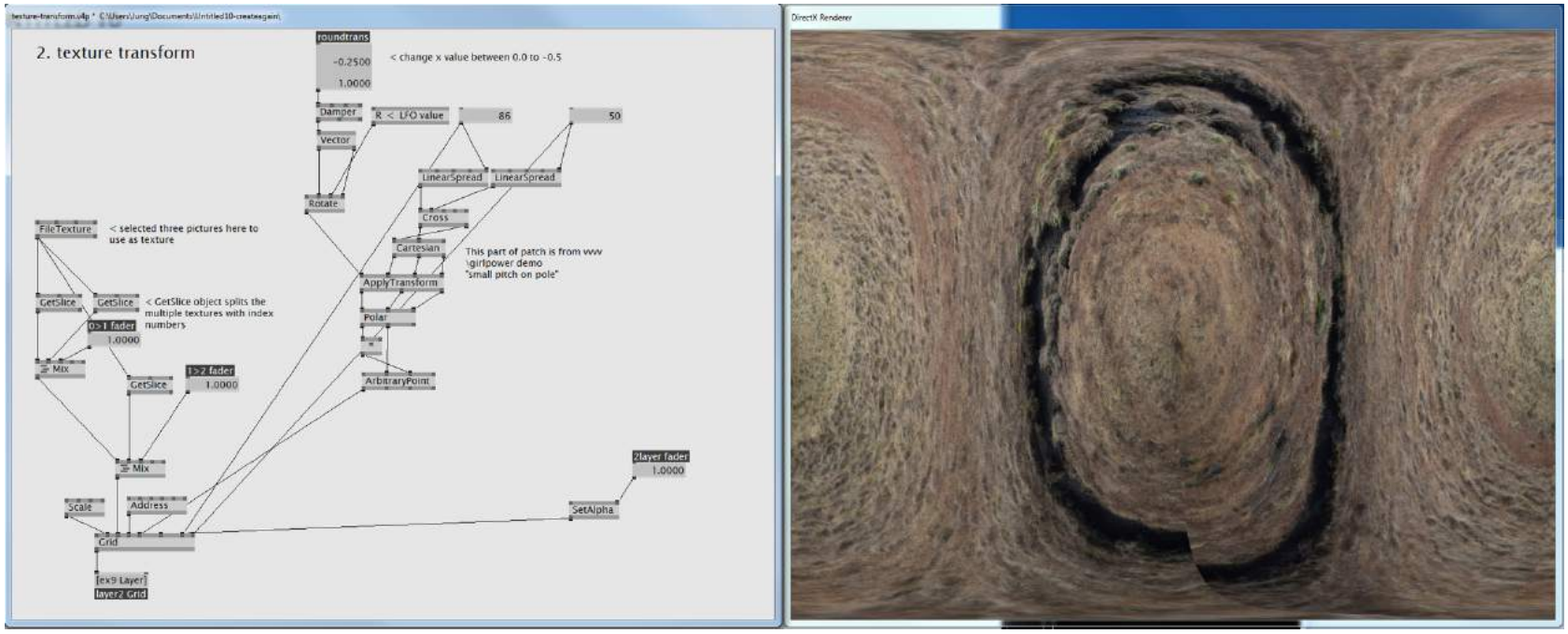
This is additional information for Section 2.1.1. *Untitled 10*. *Untitled 10* consists of seven sections of vvvv composition. vvvv only works in the Windows environment and I used Bootcamp to operate Windows 7 with my Macintosh computer. This is the overview of the vvvv patch I submitted in /3.Max_vvvv_patches/2.1.1.Untitled_10/Untitled_10_vvvv/0.Untitled10-main.v4p. To open the sub-patches for each section, right click on the sub-patch to open and right click again to close.

1. Lines



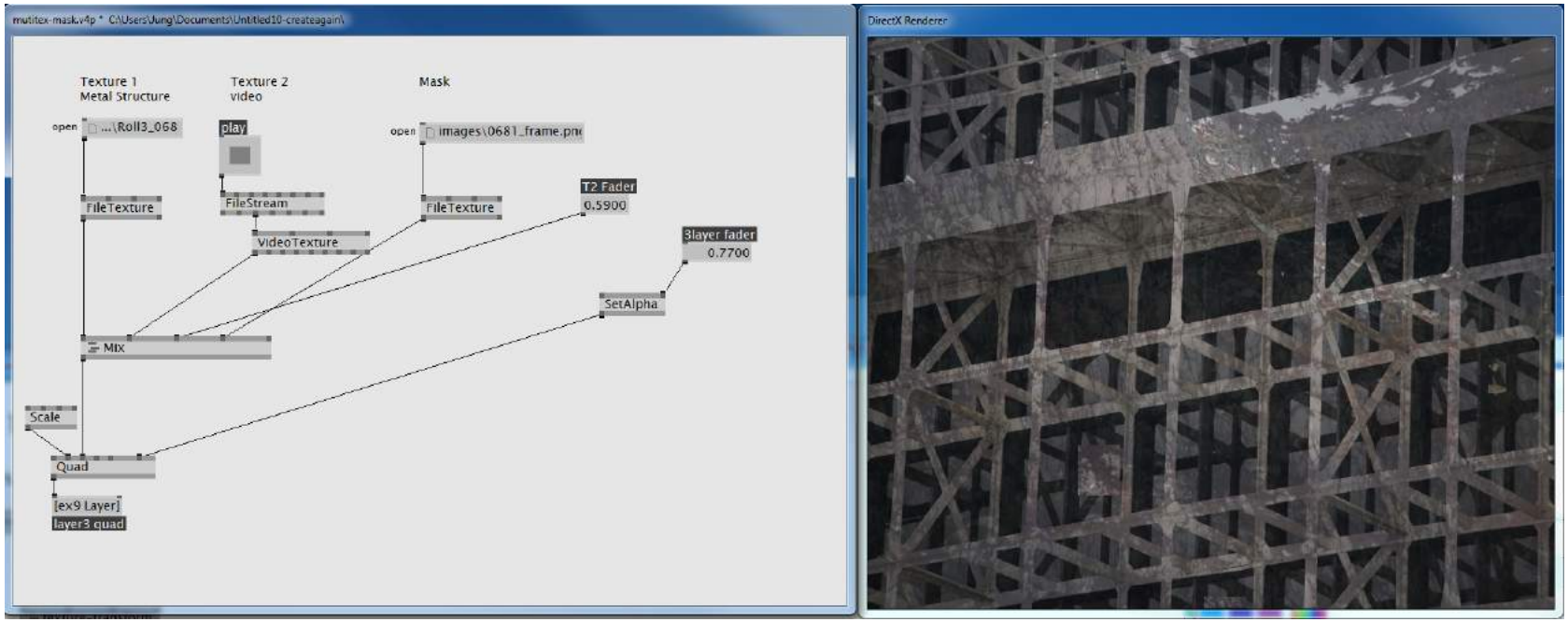
This was an exercise to generate simple vertical white lines in vvvv. I made a rectangle with Quad object and transformed its shape to be vertically long and horizontally thin. I then multiplied it using RandomSpread so that it populated across a set of random locations. RandomSpread offers presets of irregular numbers, rather than generates random set of numbers in real-time, and the set of numbers can be changed by changing the value of the parameter “random seed”. Spreadcount is the number of generated images and LFO makes these images move (towards the left in this video) with signal data. I connected my MIDI controller to change the parameters of random seed and spreadcount to compose in real-time with MIDI data.

2. Texture Transform



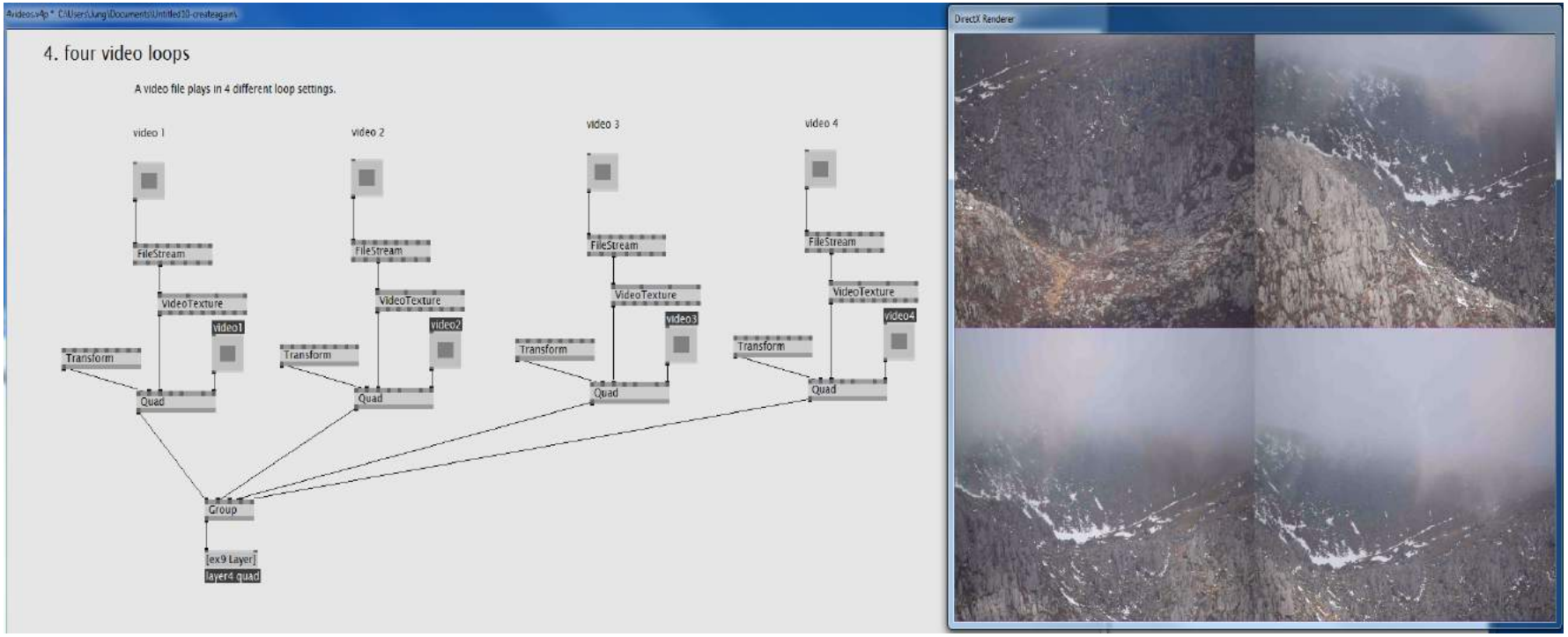
I used the three photographs (see Figure 2.5) as textures of a layer and transformed the layer to move in a circular shape. This effect is demonstrated in one of the demo files that comes with the vvvv installation package.

3. Multiple Textures with Mask



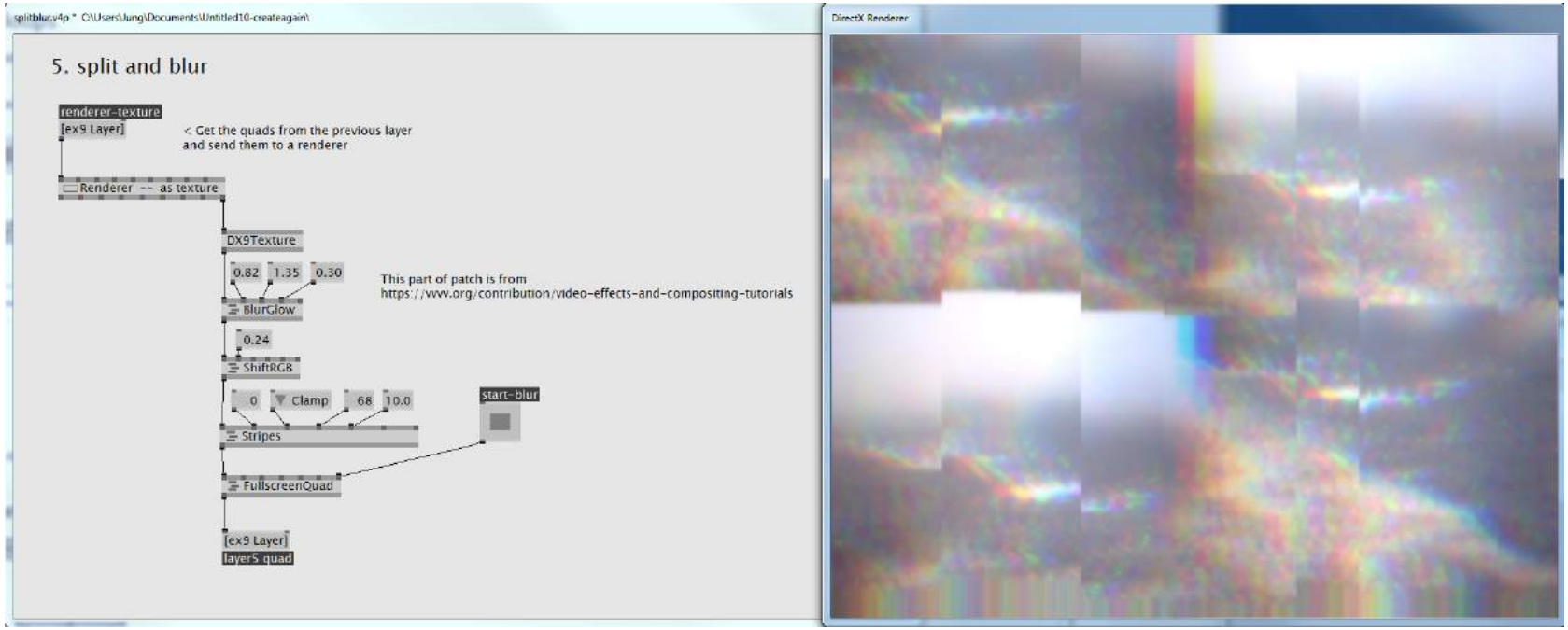
I took a photograph of Manchester Central railway station and a video recording of a snowy mountain. In Photoshop, I cut out the pattern of the metal structure of the railway station building and used that file as a mask in vvvv. I overlapped the video recording onto the mask.

4. Four Video Loops



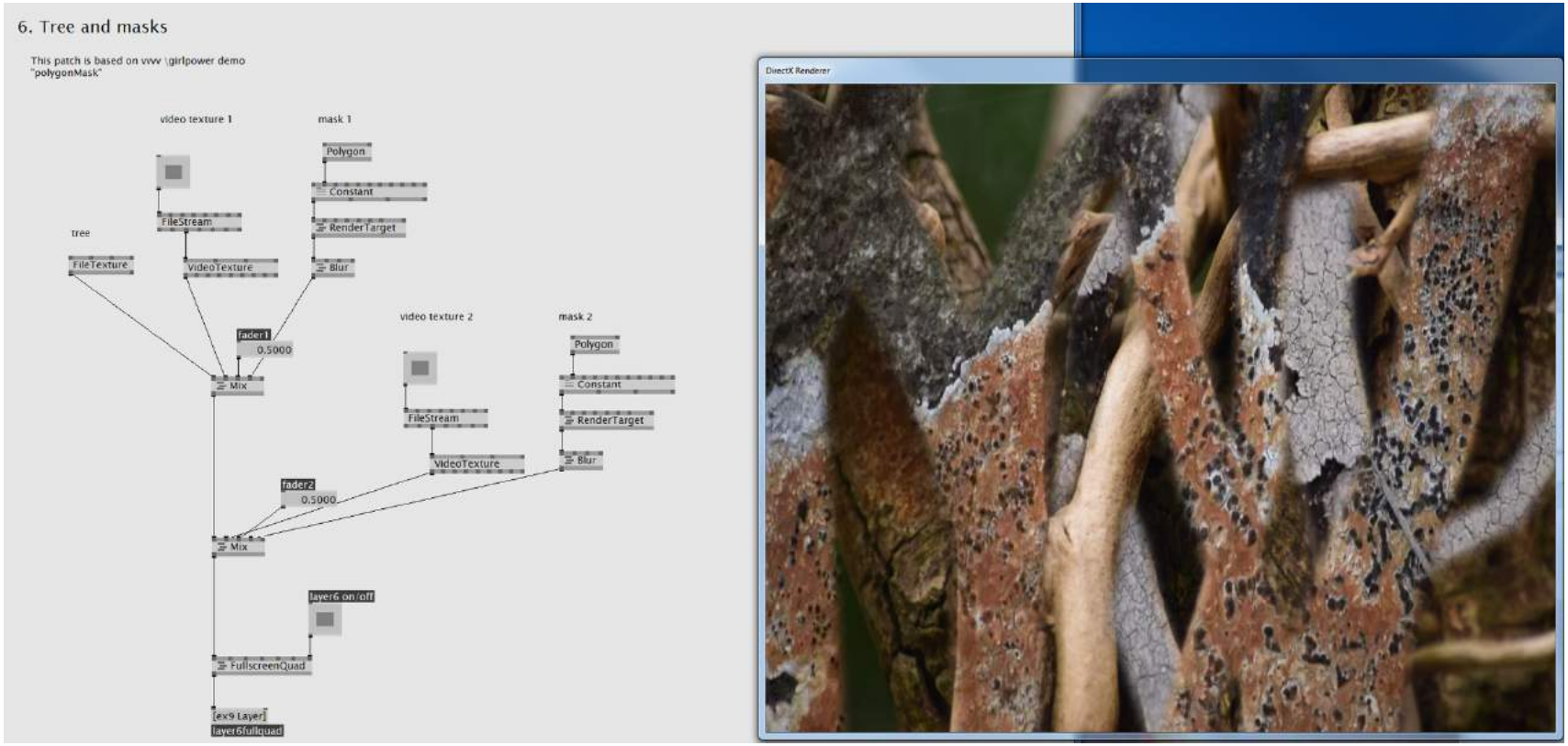
I divided the renderer screen into four parts and played the video recording of the snowy mountain in loops of four different speeds.

5. Split and Blur



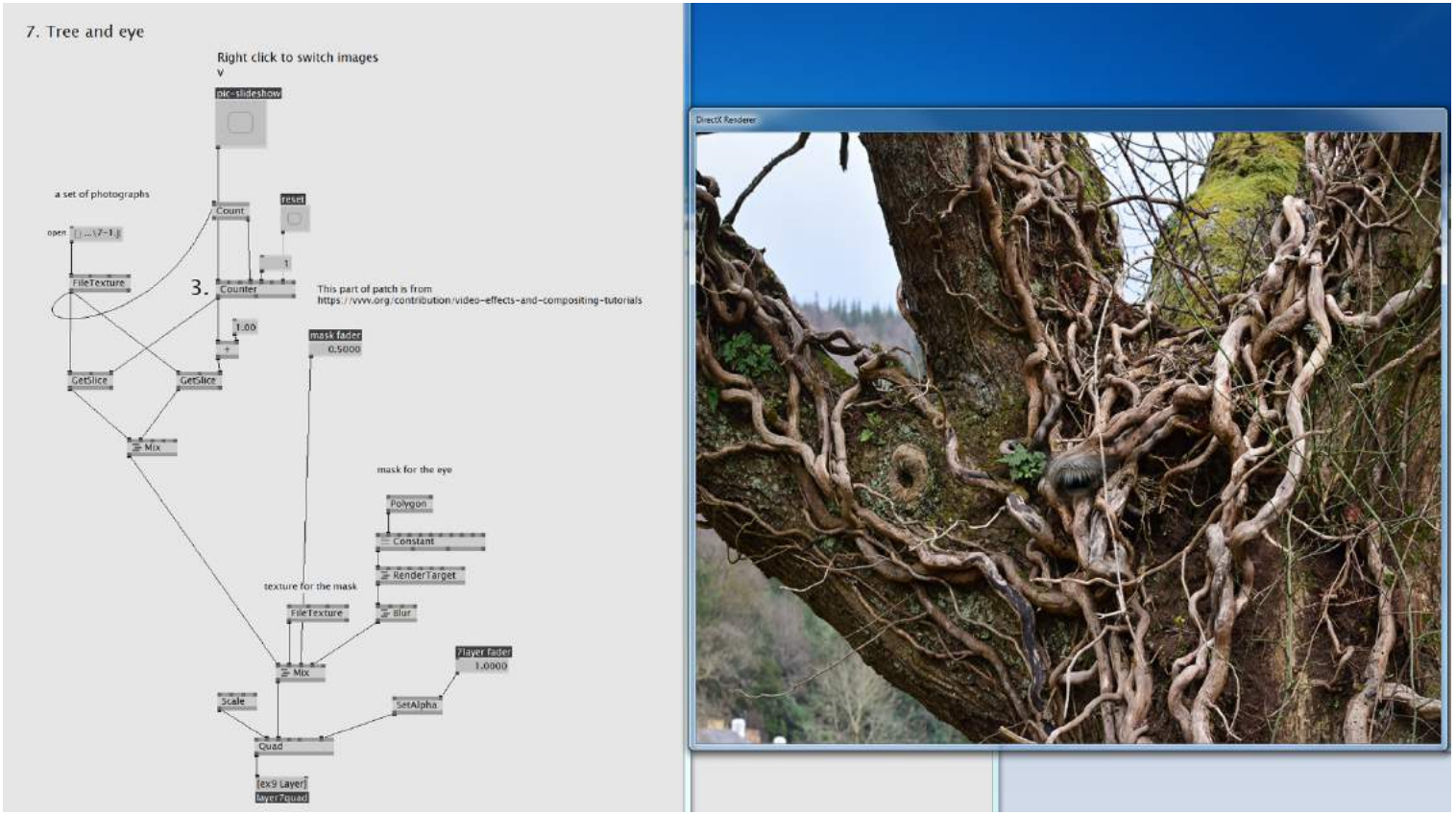
I added the blur effect onto the renderer and also split the screen into ten parts vertically. The effect made each part move up and down.

6. Tree and Masks



For this section, instead of creating a mask layer in Photoshop, I used the Polygon object to mask some areas in vvvv. Based on the demo patch in /girlpower/Graphics/DX9/Texture/PolygonMask/PolygonMask.v4p that comes with the vvvv install package, I created my own mask using multiple polygons over the tree image. I played two different video recordings of mosses on rocks over these masks.

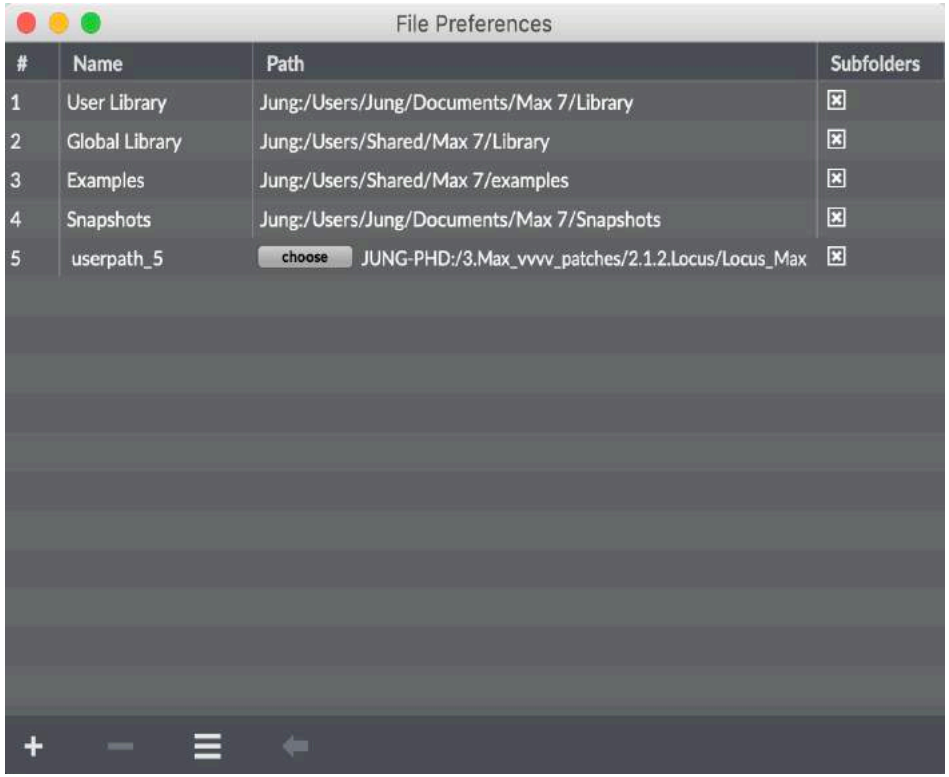
7. Tree and Eye



I called up a picture of a goat in a meadow and created a mask using the Polygon object around the goat's eye. I then called up multiple photographs for the background texture so that it could be changed like a slideshow.

Appendix B

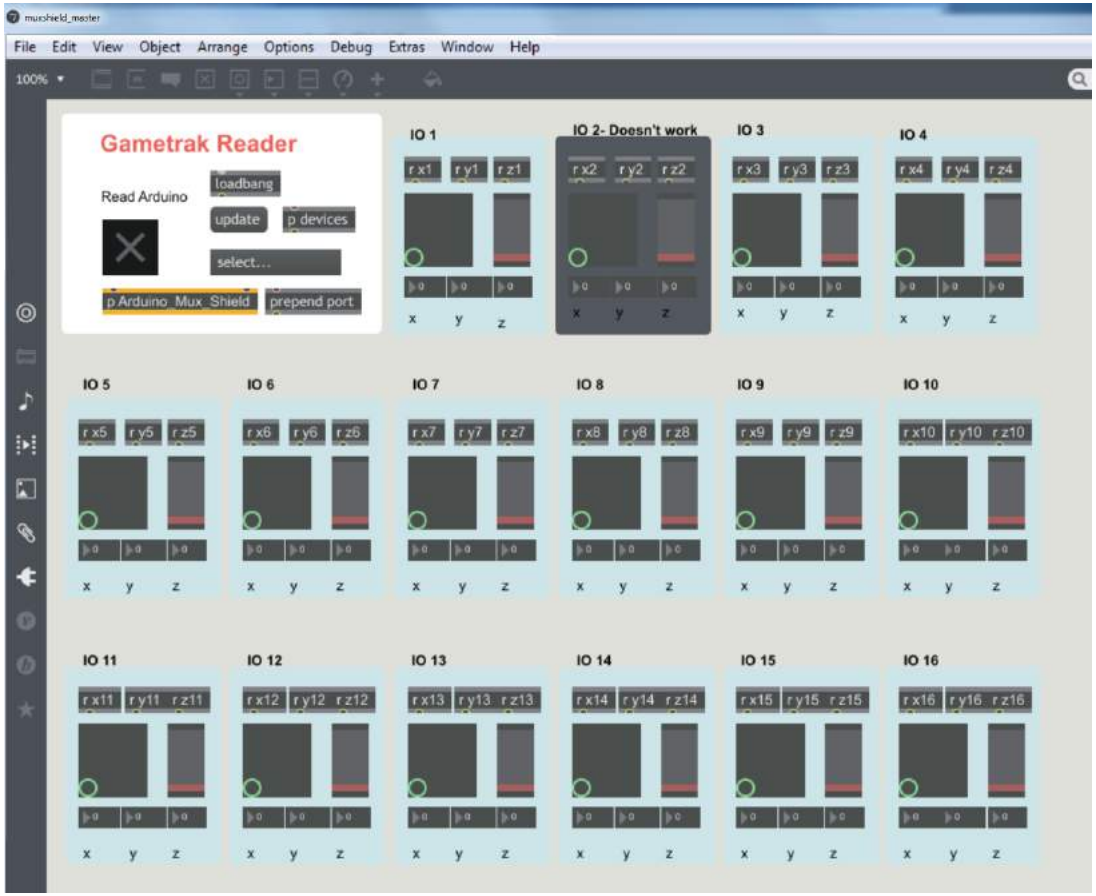
This is additional information for Section 2.1.2. *Locus*. This is an overview of the workflow between the vvvv and Max patches in /3.Max_vvvv_patches/2.1.2.Locus/Locus_vvvv/0.Locus_main.4vp, /3.Max_vvvv_patches/2.1.2.Locus/Locus_Max/0.TOP_Locus.maxpat, and /3.Max_vvvv_patches/2.1.2.Locus/Locus_Max/1.muxshield_master.maxpat in Windows 7 using Bootcamp.



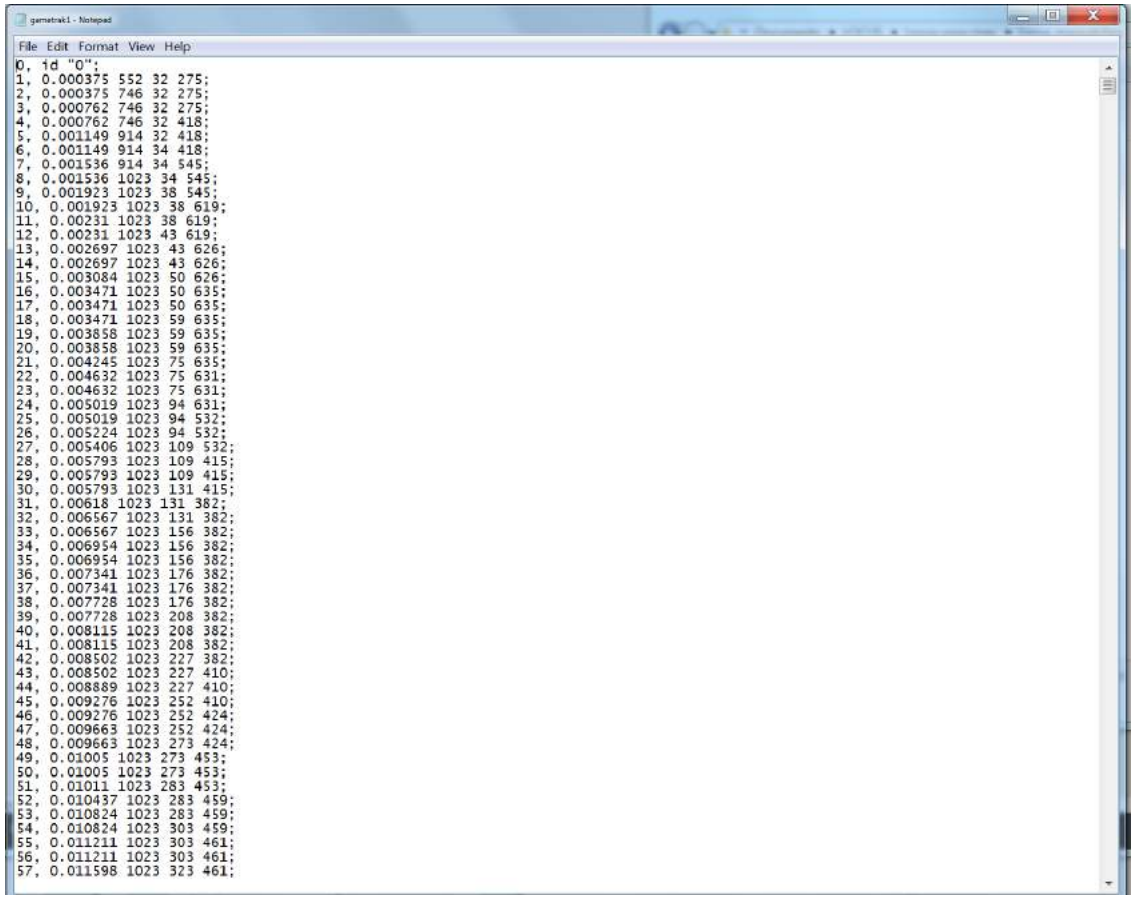
First, before loading any Max patches, the folder /Locus_Max should be added to the Max search path in the Options> File Preferences menu. Otherwise it won't load any Gametrak simulation files or sound files for buffer~ object.

** If any error occurs when loading sound files for buffer~ object even though the folder is added to the Max search, the issue may be resolved if the entire folder /Locus_Max is copied and pasted to the desktop, and the Max patch is opened from the desktop directly instead of from the USB drive.

The Gametrak controllers are connected to the Arduino microcontroller (see Video 1.2) and the received data is monitored through the patch 1.muxshield_master.maxpat. To start reading the data, the Arduino board from the dropdown menu should be selected, and the ‘Read Arduino’ toggle should be on.

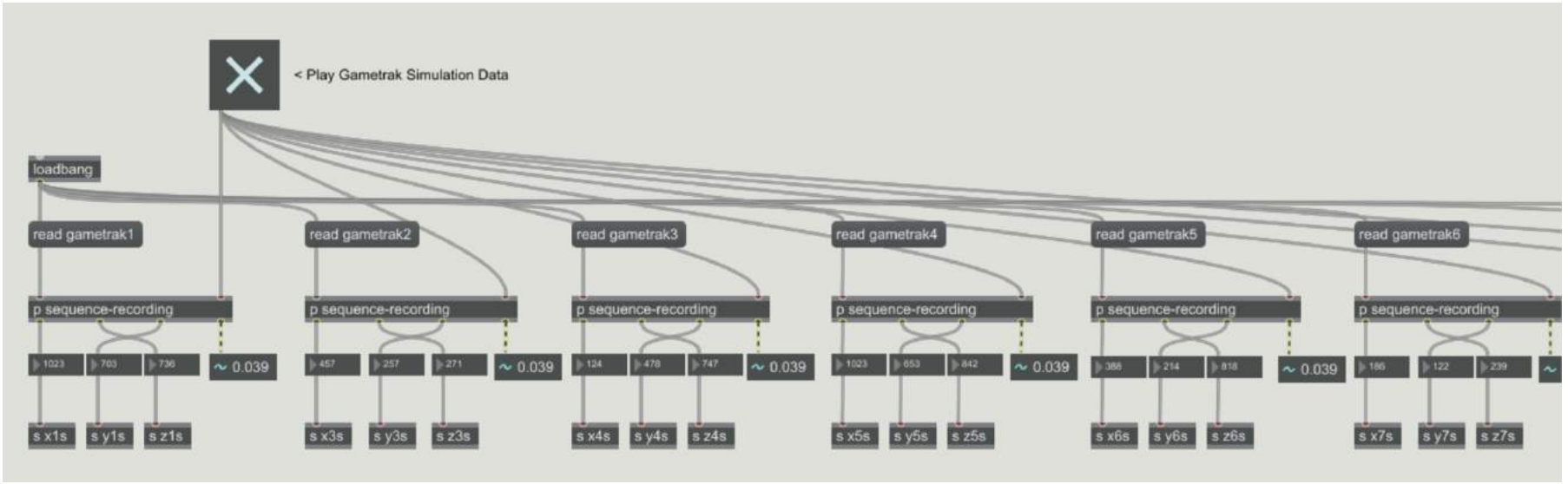


I recorded some input data from the Gametrak controllers in Max using seq~ object so that I could simulate the interactive environment to test my patch without an actual performance. The simulation data is stored in the folder /Locus_Max/simulation. When 1.muxshield_master.maxpat is open, it automatically loads the simulation files for eight Gametrak controllers.

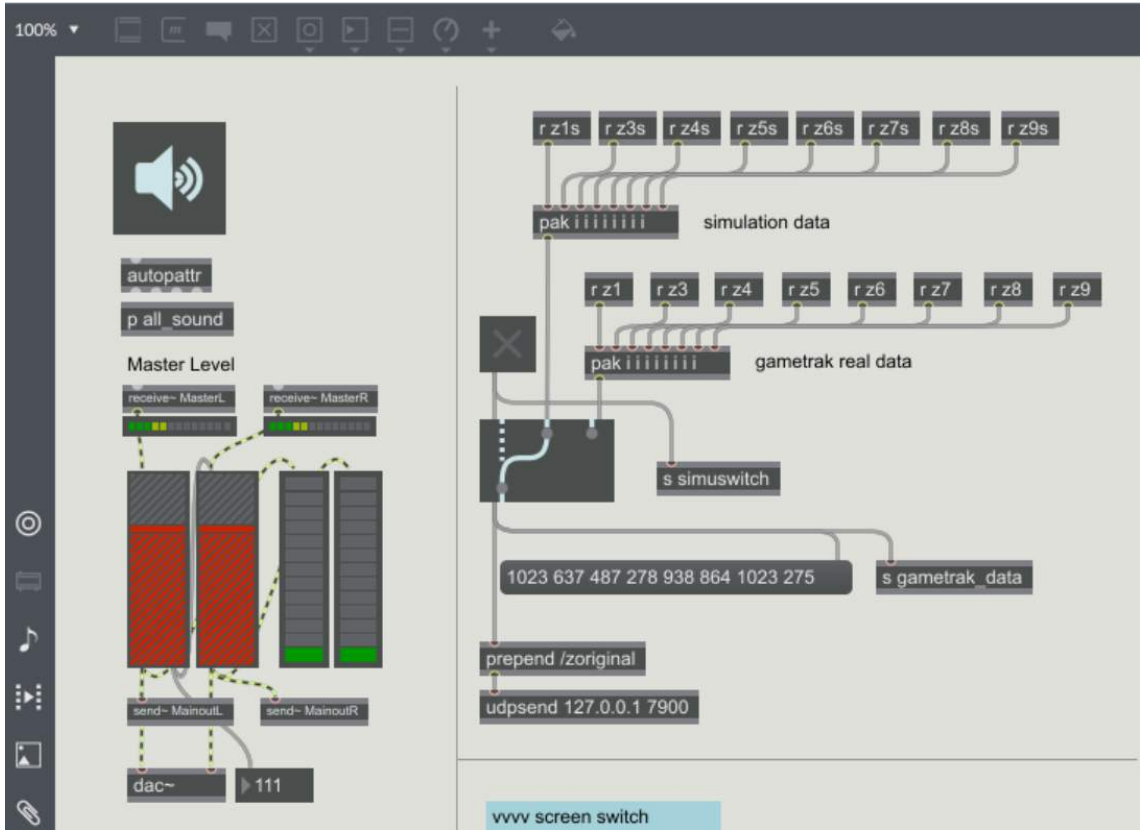


When the ‘Play Gametrak Simulation Data’ is on, the simulation data starts to flow. To play the simulation data, the audio in Max should be on as seq~ object is an event sequencer that is driven by a signal input.

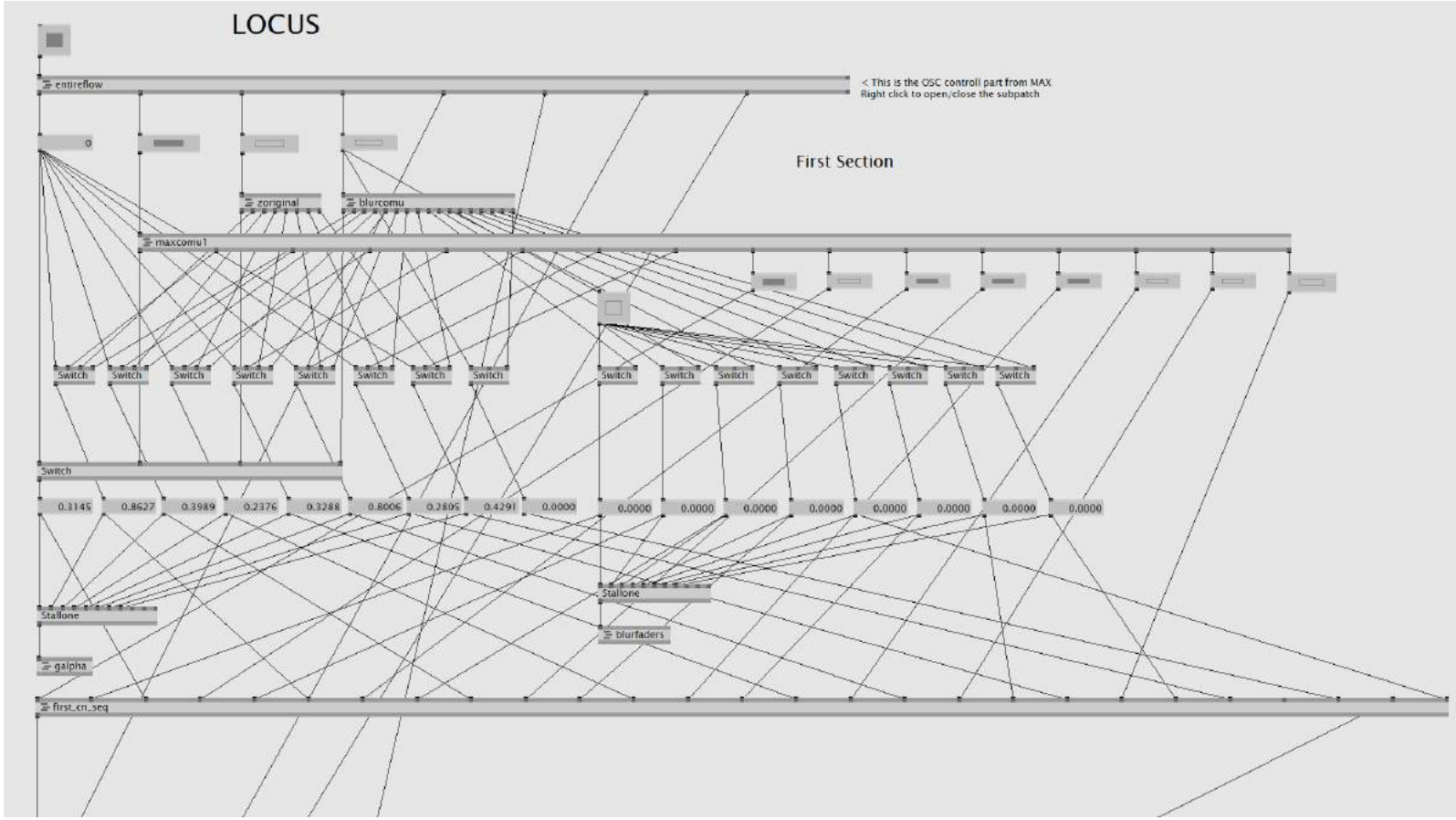
** The simulation data only lasts for about two minutes.



Both the data from the Arduino board and the simulation data are sent to the main Max patch 0.TOP_Locus.maxpat. The far left of the screen shows the master volume control. On the right, I can choose whether I want to receive the data from the Arduino board (Gametrak real data) or the simulation data. These data, as well as all other data for the visuals, are sent to the vvvv patch 0.Locus_main.4vp via Open Sound Control (OSC).

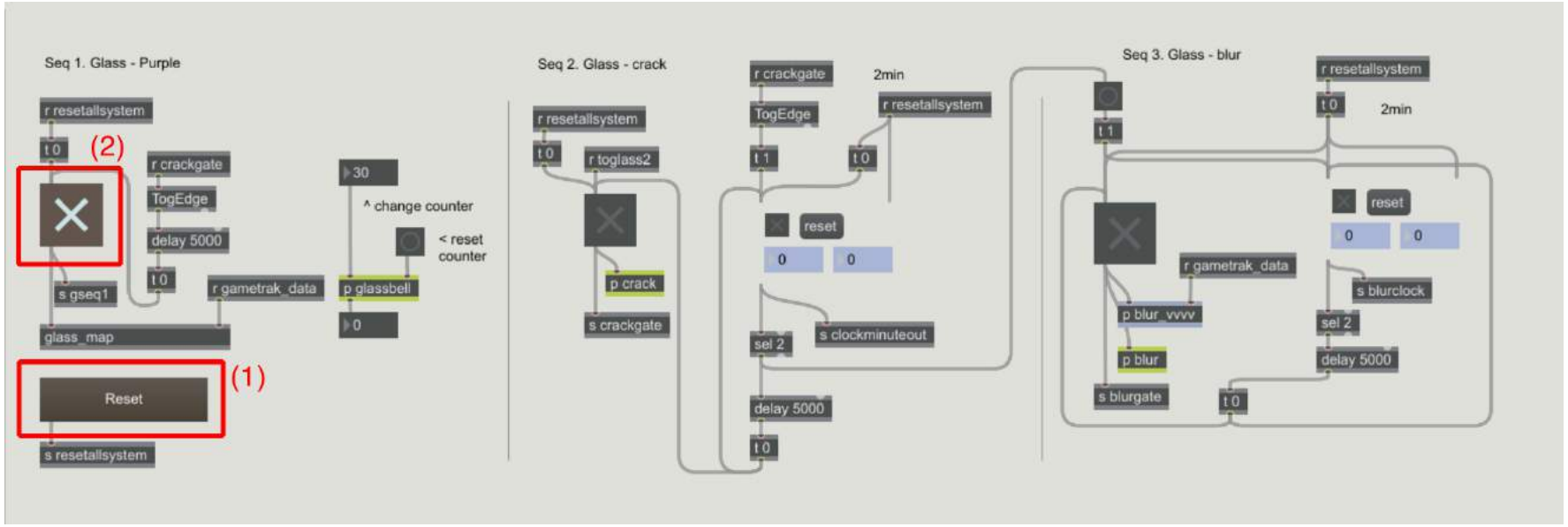


Before running the Max patch, the vvvv patch should be loaded as well because some parts of the Max patch are controlled by the vvvv patch. Below is the main vvvv patch of *Locus*. The entire communication flow between Max and vvvv can be seen in the sub-patches entireflow and maxcomu1. The Gametrak data sent to these sub-patches are scaled to control the visual parameters in each section of the composition.

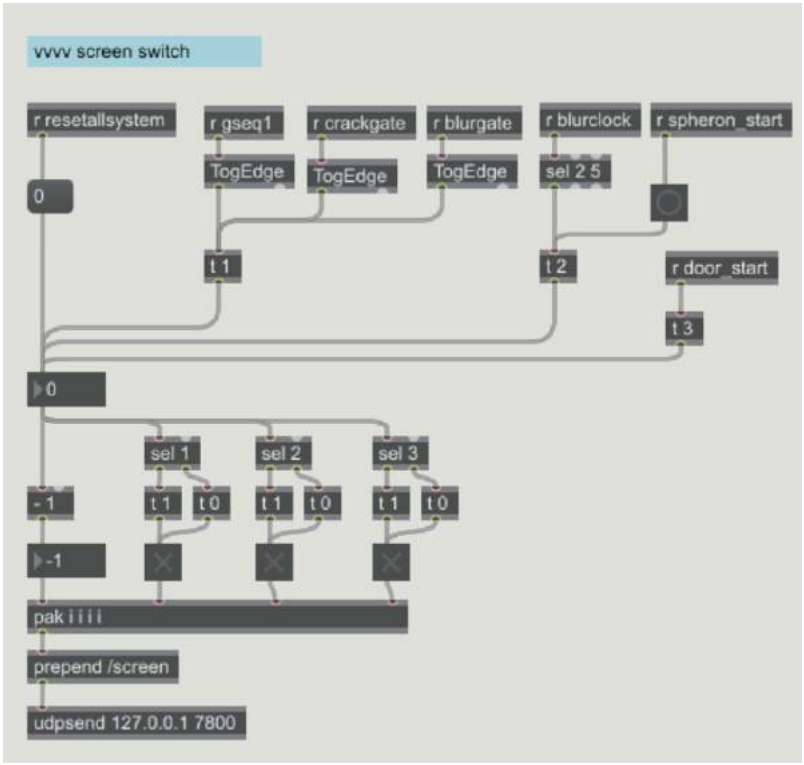


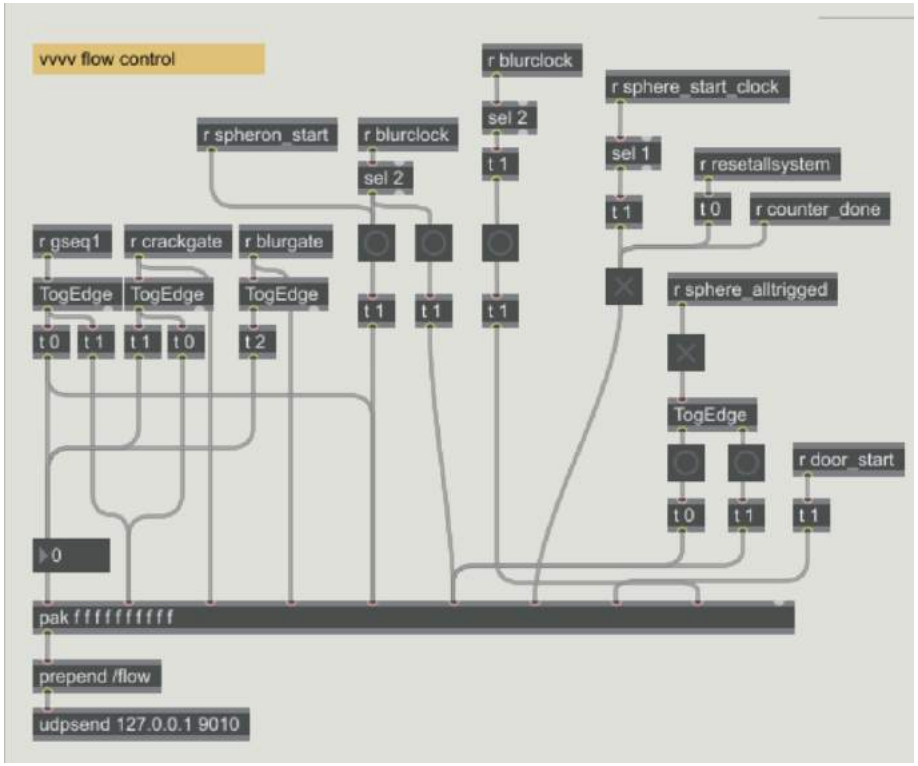
The screen below shows the first part of the composition consisting of three variations (see pages 68–69) in the Max patch. Before running the entire composition, (1) the Reset button should be pressed several times to reset every part of the composition. The composition can then be started by pressing (2) the start button.

The first variation Seq 1. Glass – Purple has a counter object so that it can count the gong sound thirty times before playing the second variation. In the second variation, the clock counts for two minutes. When it reaches this point, it stops the current variation and plays the next one. The third variation is the same as the second one.

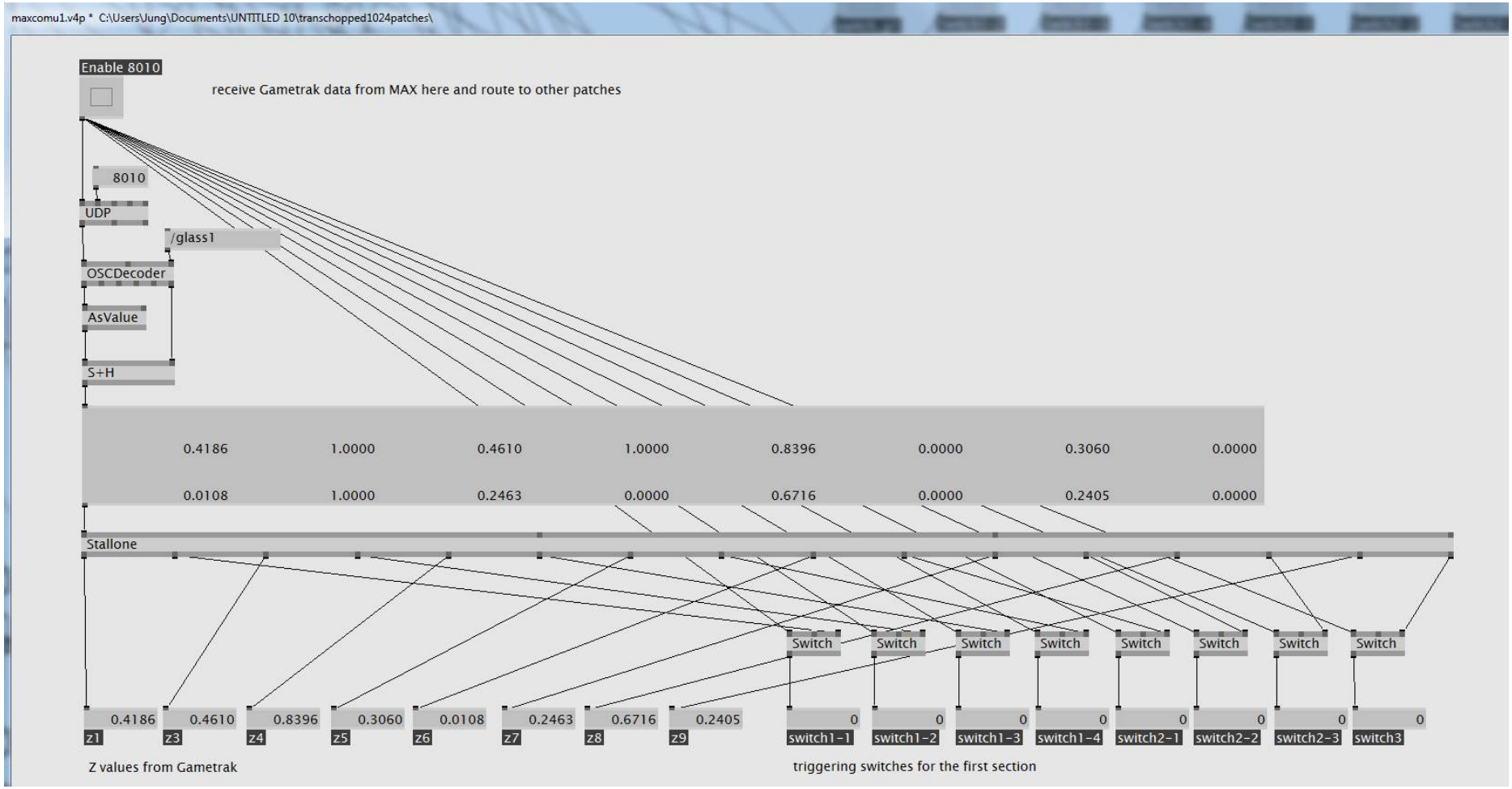


Whenever there are transitions in sound between variations or sections, information is sent to the sections “vvvv screen switch” and “vvvv flow control” to change the images and control the visual effect parameters in vvvv.

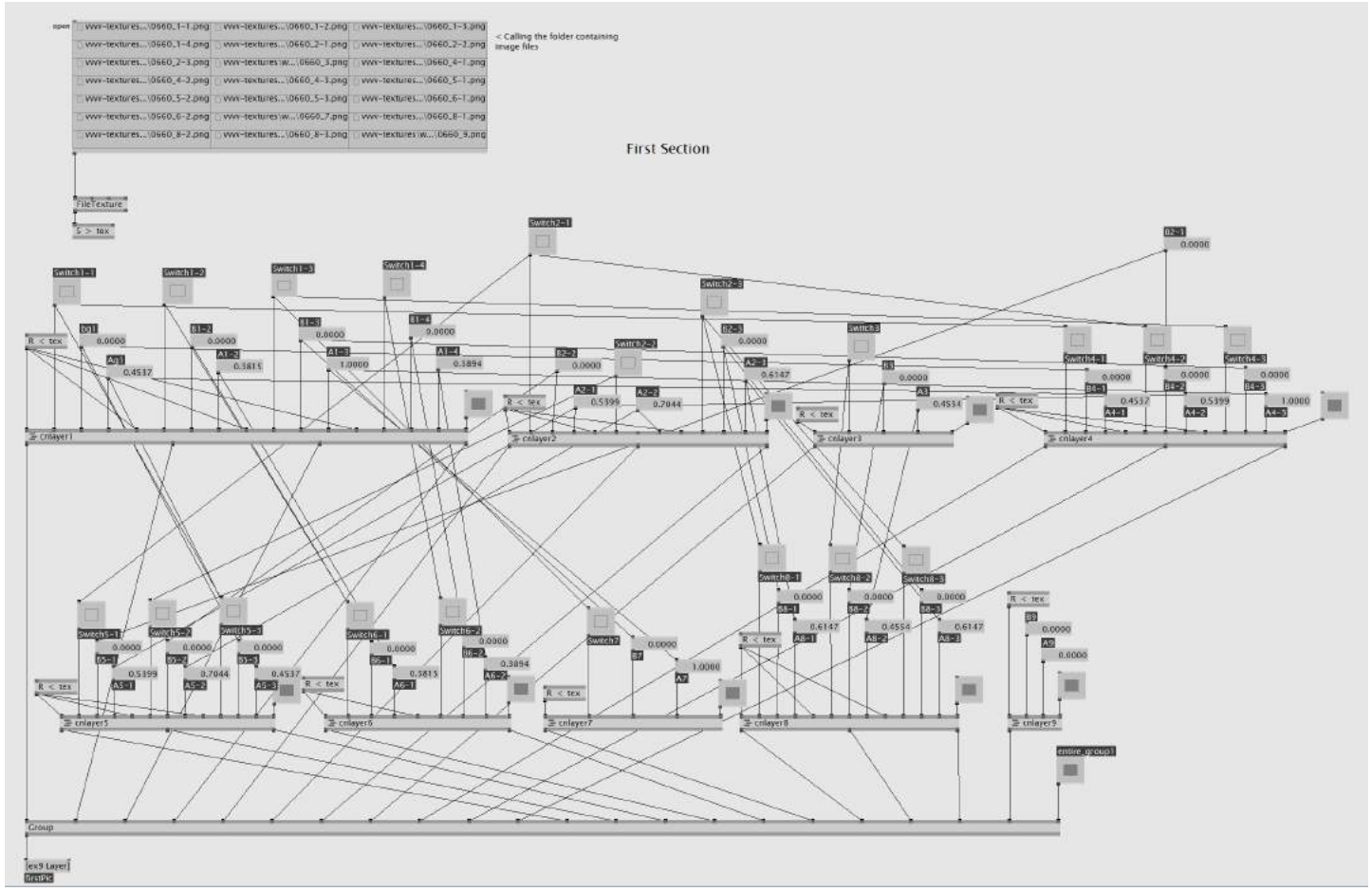




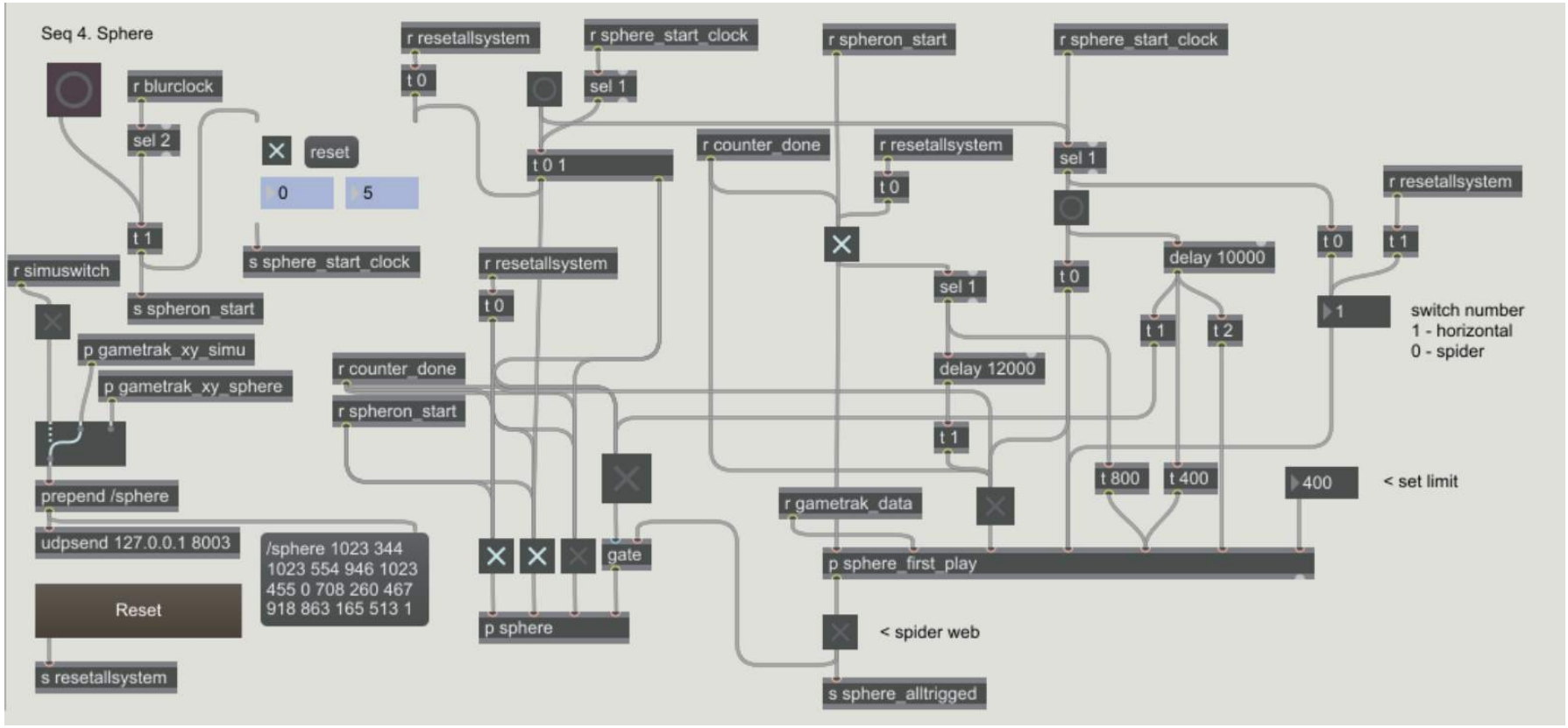
In the sub-patch maxcomu1 the z values from the Gametrak controllers are scaled to control the visual parameters in the first section.



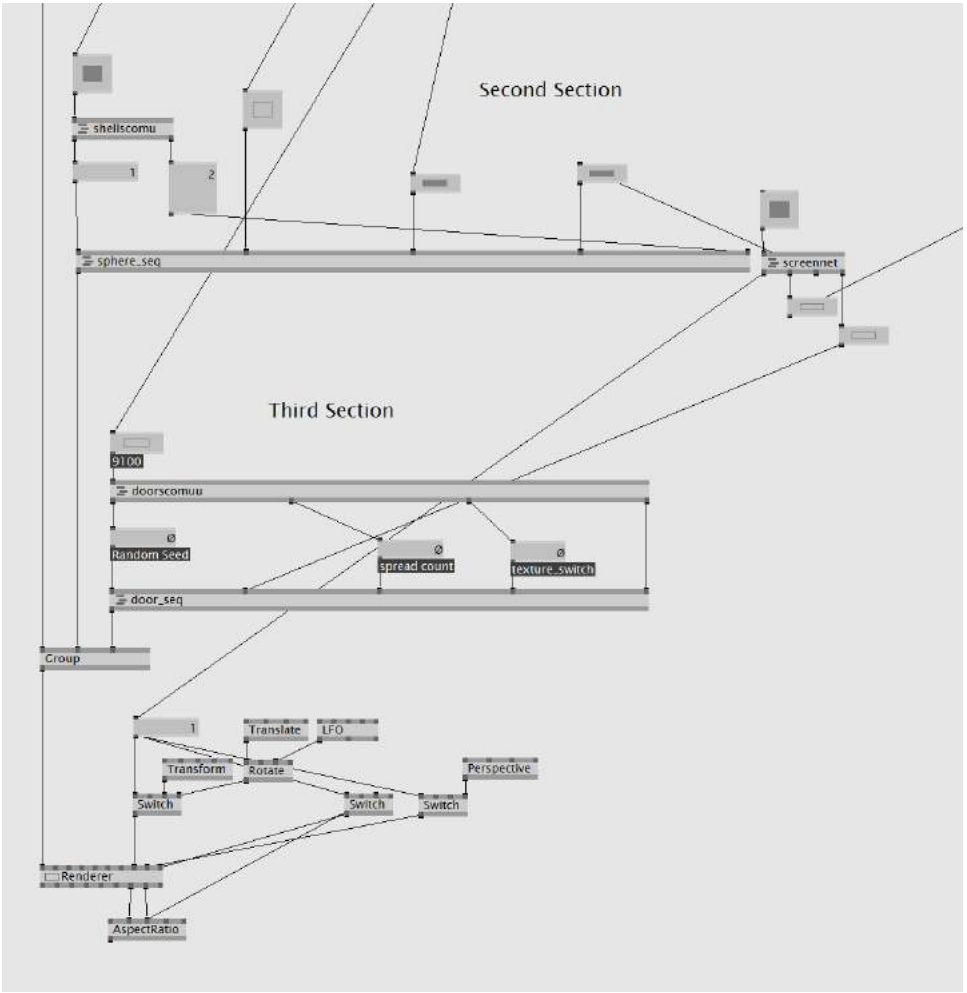
Below is the sub-patch first_cn_seq. Each piece of the glass window image is called up as a texture and distributed to each cnlayer sub-patch. Each cnlayer patch controls the colour, brightness, and blurring effects over the glass window images.

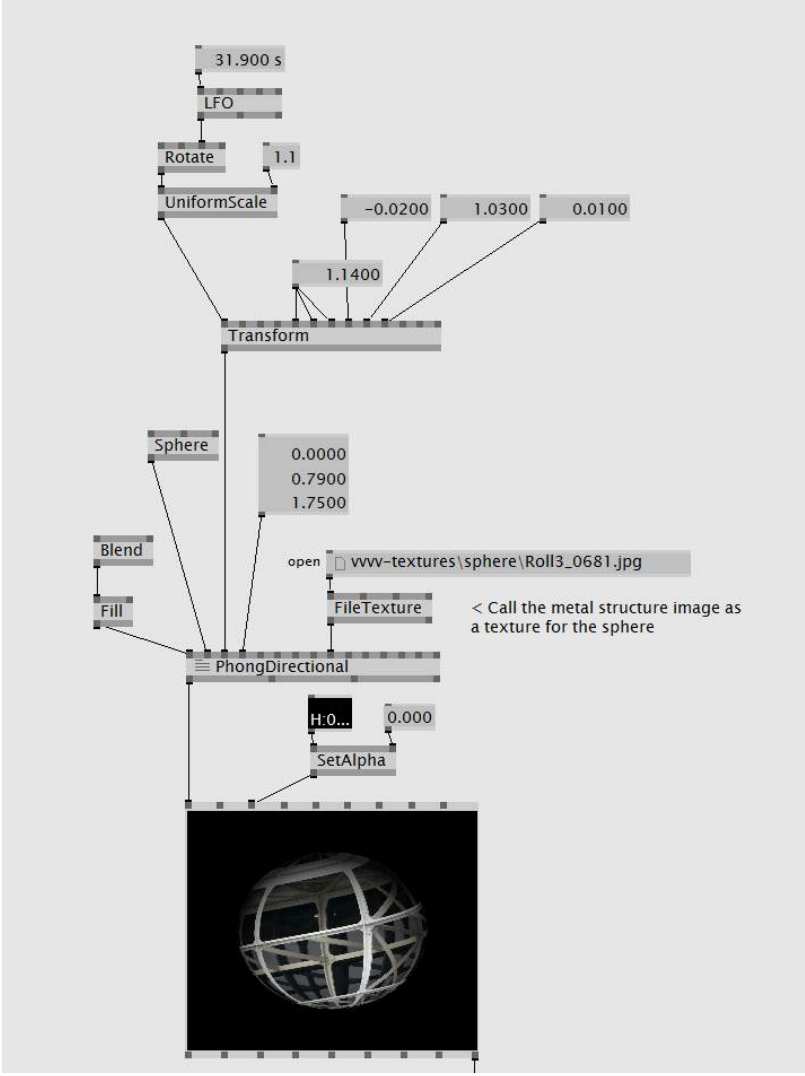


This is the second part of the composition in Max (see pages 69–70).

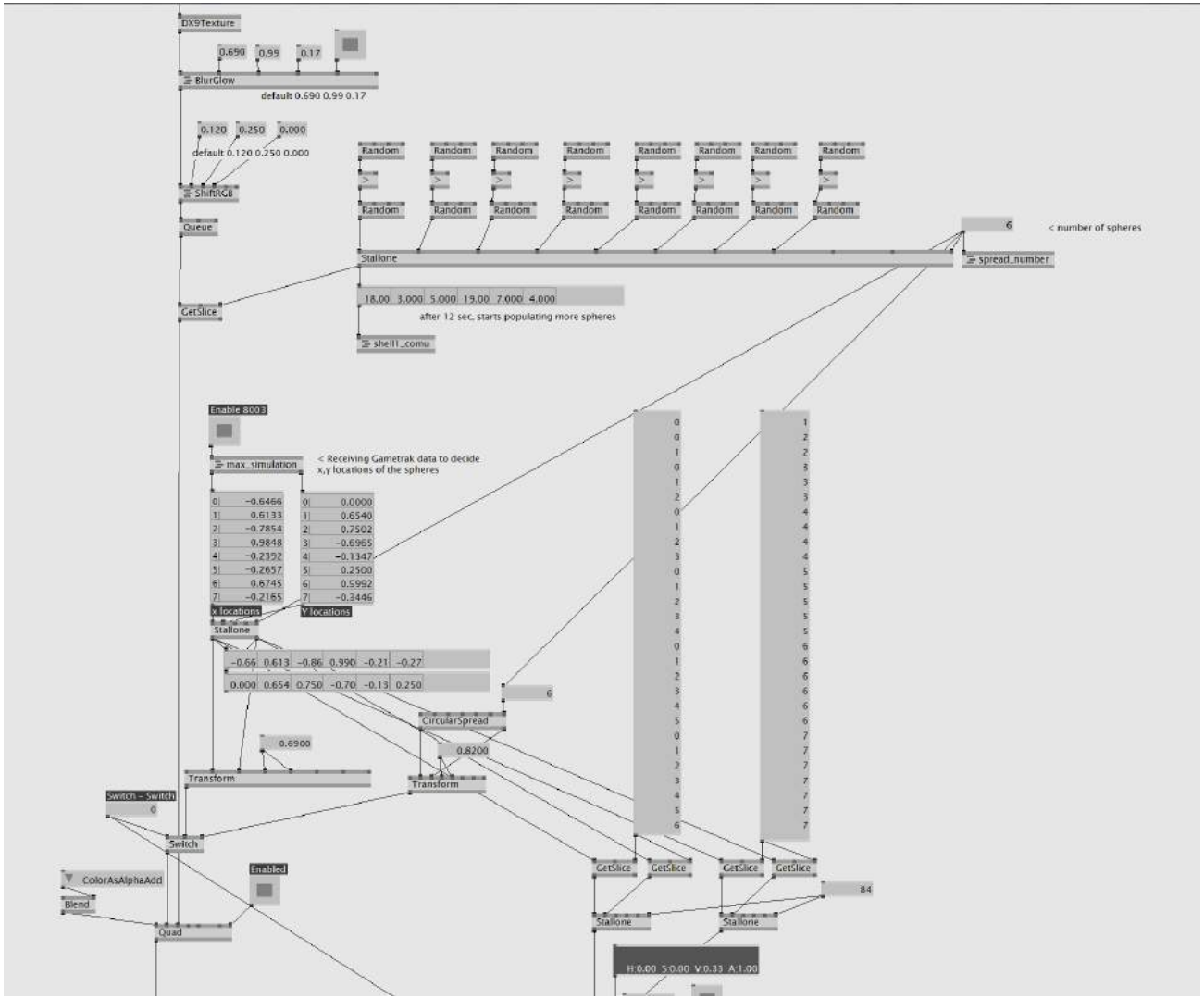


sphere_seq and door_seq are the sub-patches for the second and third parts of the composition.



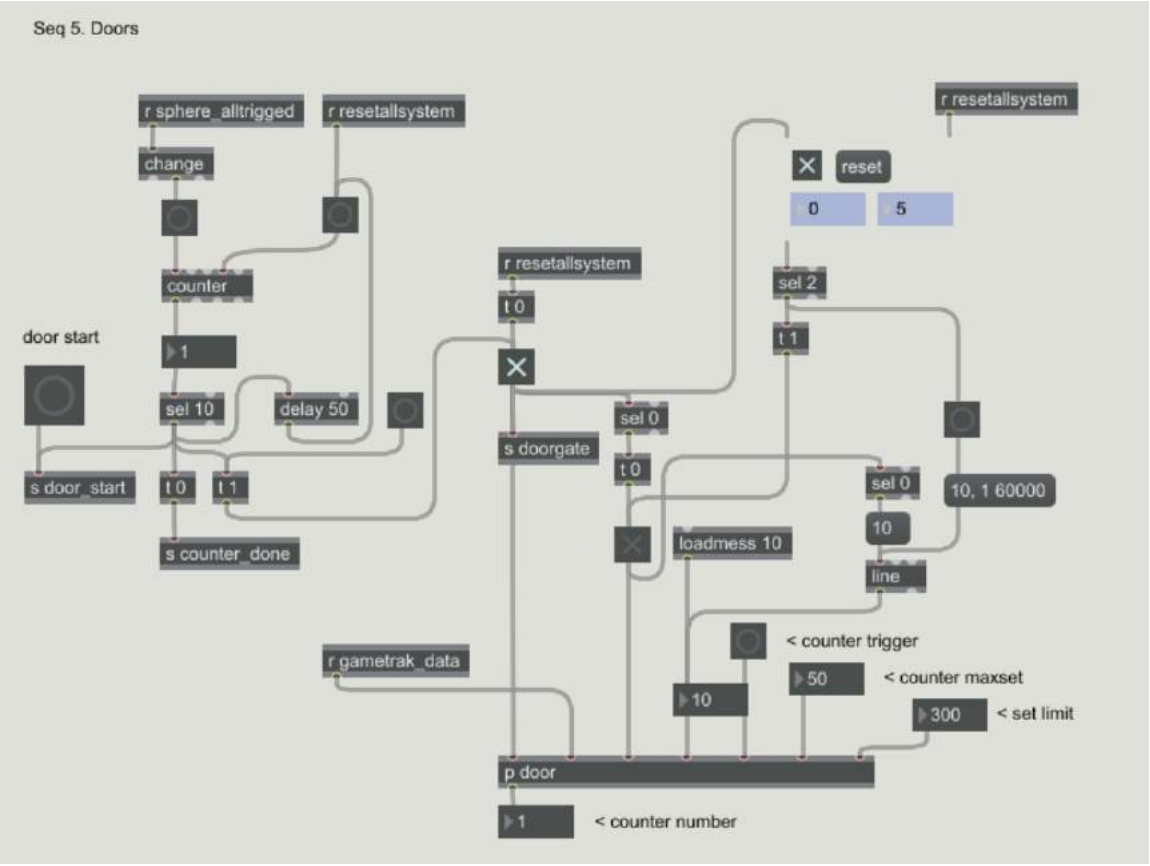


This is the first part of the sub-patch sphere_seq which creates the glitch-like rotating movement of the sphere.

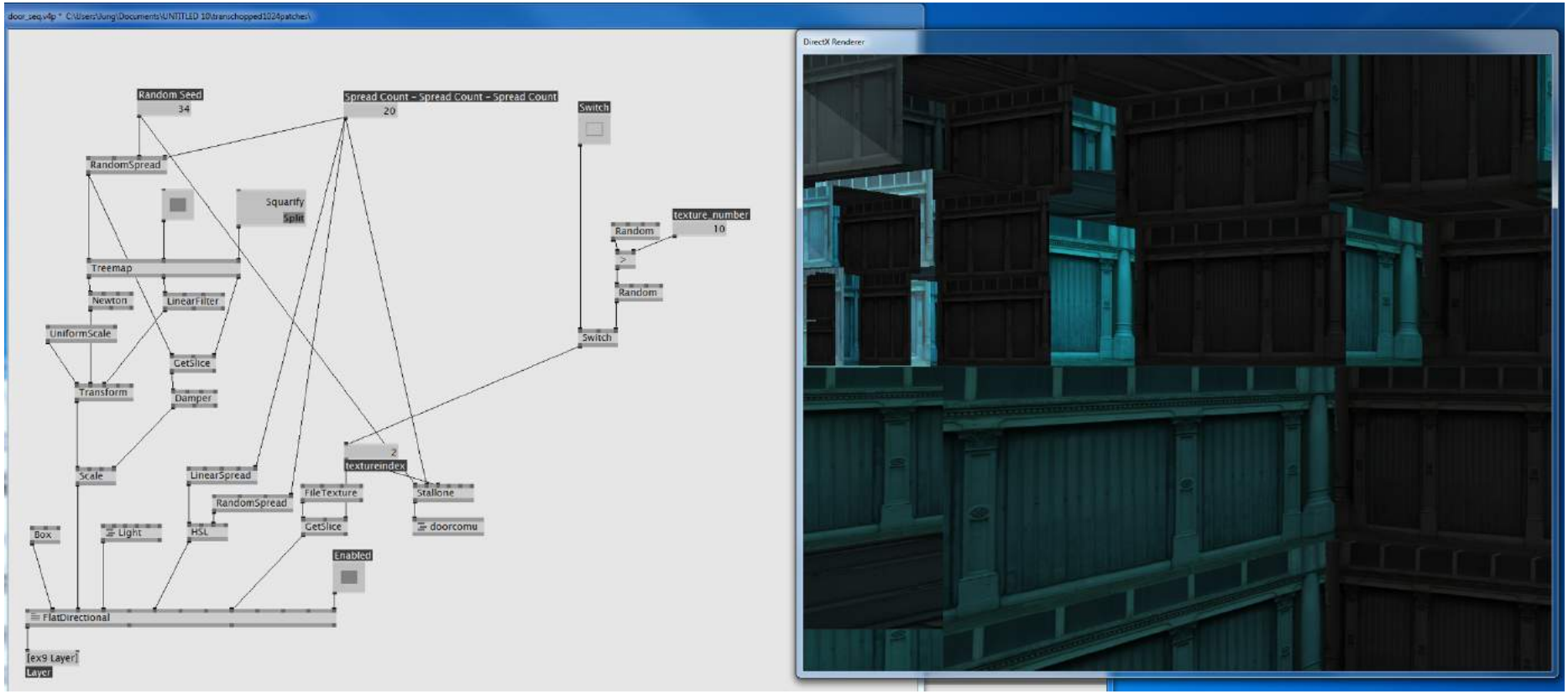


This is the second part of the sub-patch sphere_seq. The x and y values of the Gametrak data are sent here to change the locations of the spheres according to the data coordination and draw the lines between the spheres.

This is the third part of the composition in Max (see page 71).

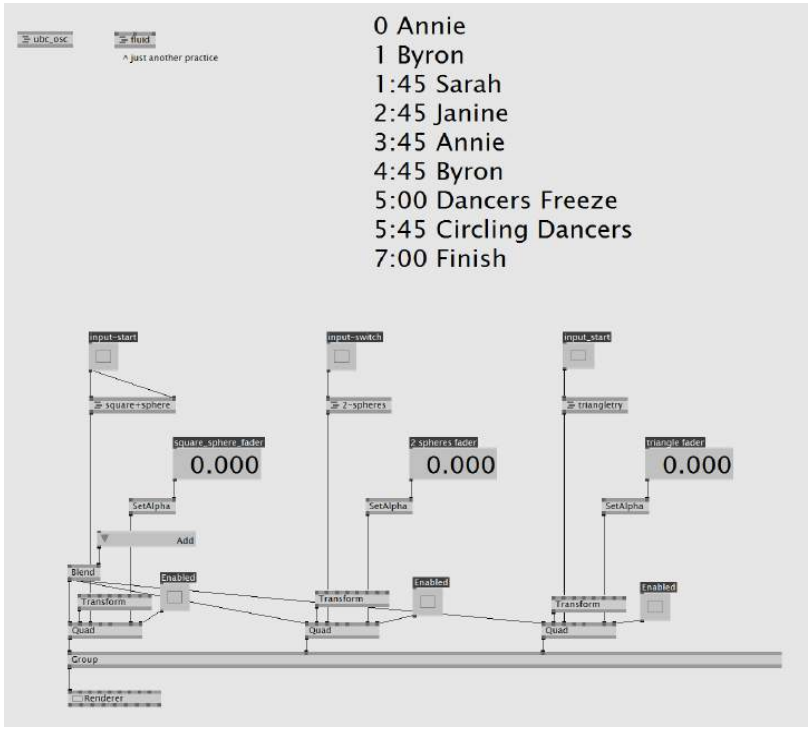


This is the third part of the composition in vvvv. This is the sub-patch of door_seq.

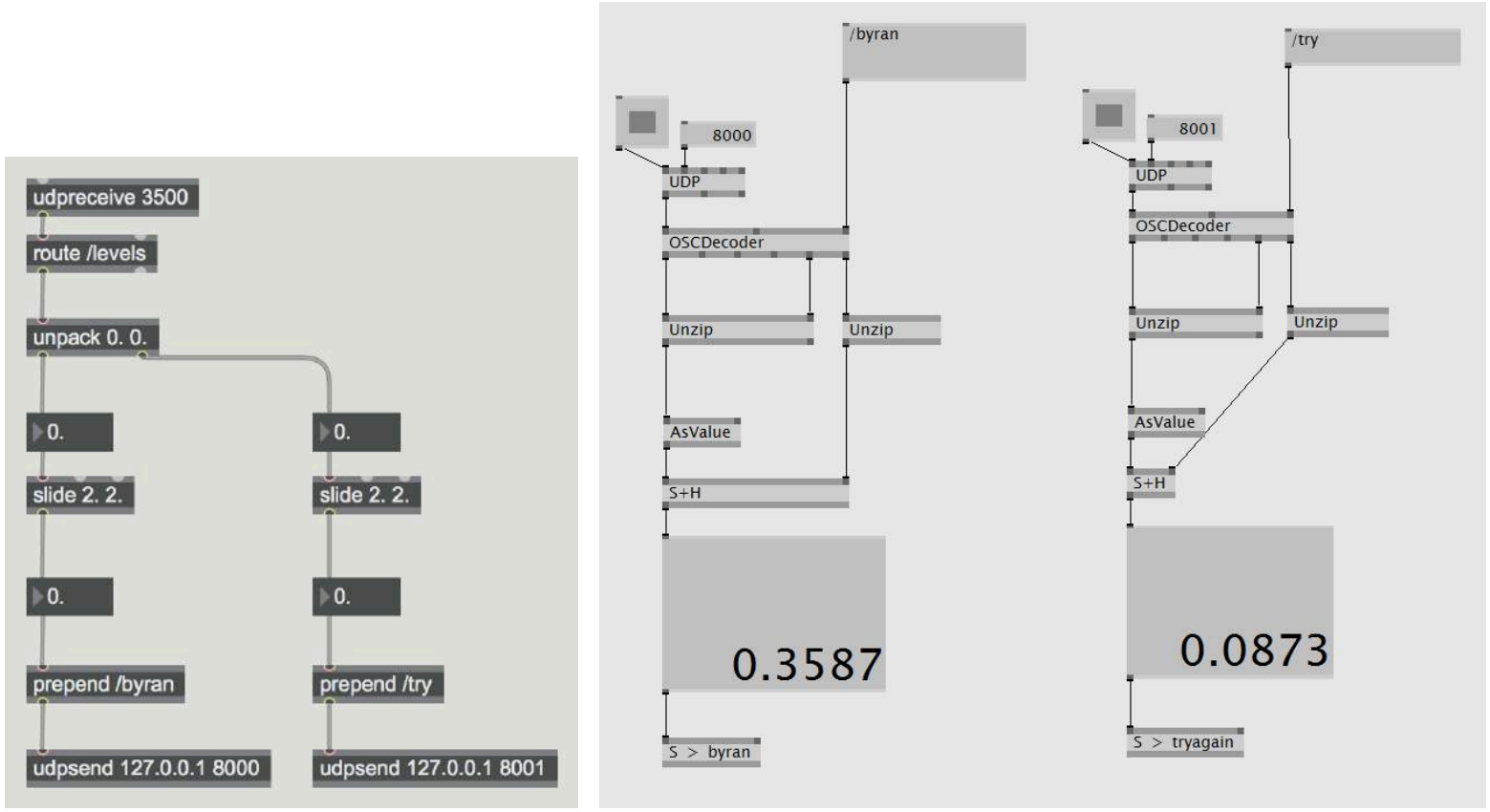


Appendix C

This is additional information for Section 2.2.1 *NEON*. The following is an overview of the vvvv patch I submitted in /3.Max_vvvv_patches/2.2.1.NEON/NEON_vvvv/0.NEON_mainUBC.v4p. To open the sub-patches for each section, right click onto the sub-patch and right click again to close. *NEON* contains three components of visual composition and these are saved as subpatches 'square+sphere', '2-spheres', and 'triangletry'.

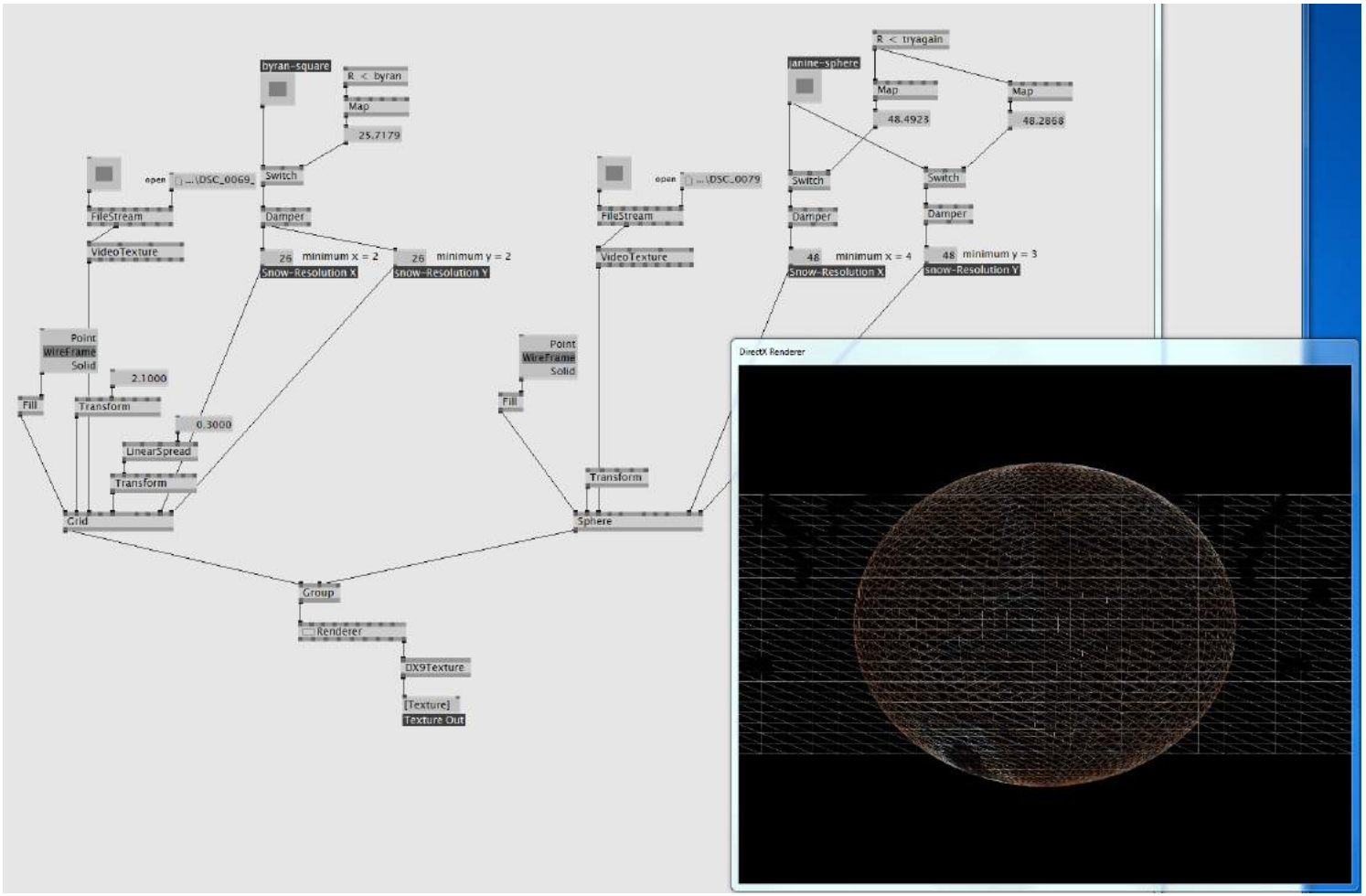


The sound levels of the French horn and the trombone are input into the Max patch in /ubc-max/ubc_collab.maxpat via OSC from the other computer where the sound interface is connected. The slide objects smooth the input data logarithmically before sending it to vvvv. The filtered input data is sent to the ubc_osc subpatch via OSC and distributed to the other subpatches.



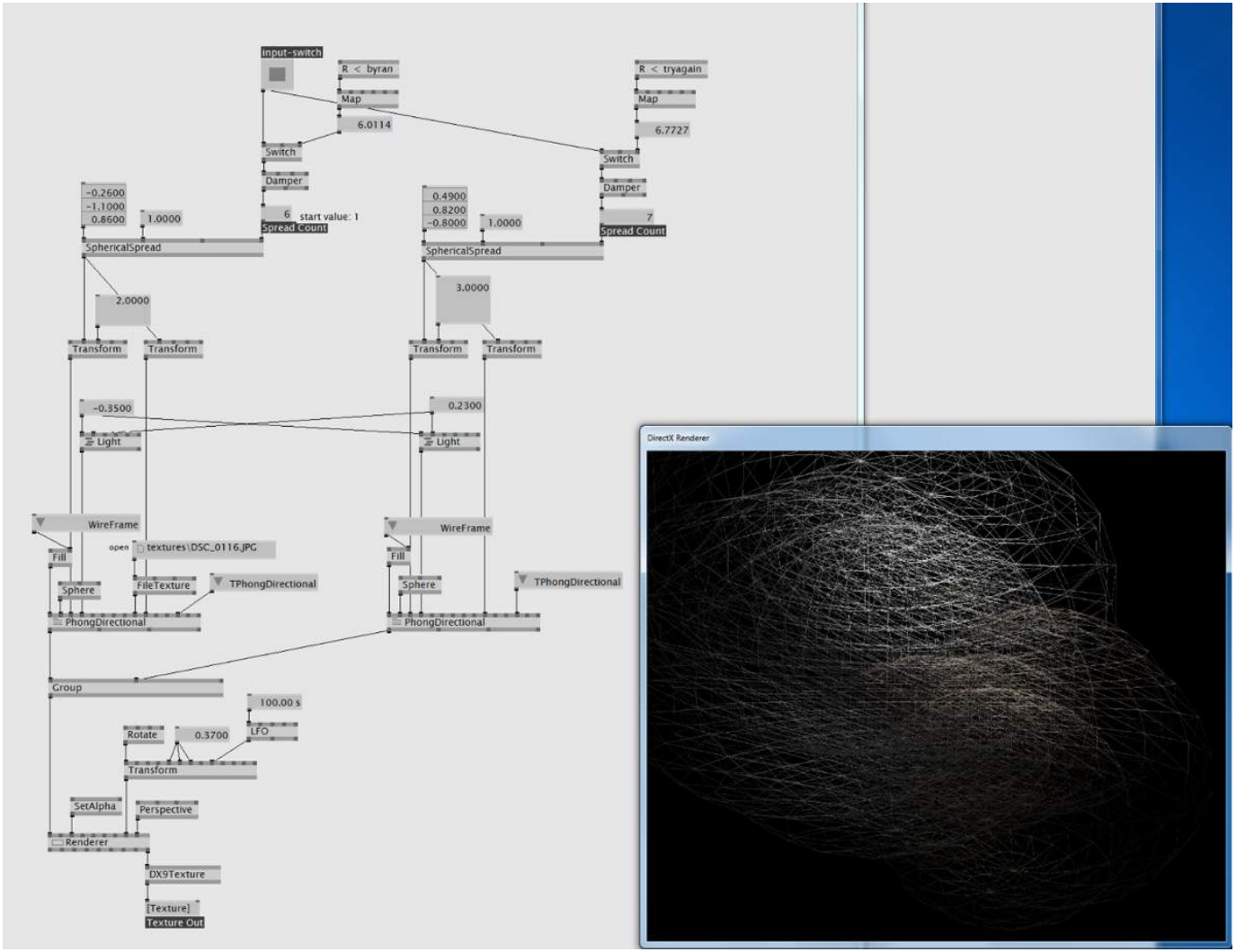
1. Square + sphere

This is the first variation, which creates a rectangle and diamond shapes. The densities of the grids are synchronised with the sound level of the French horn and trombone (see Video 2.8).



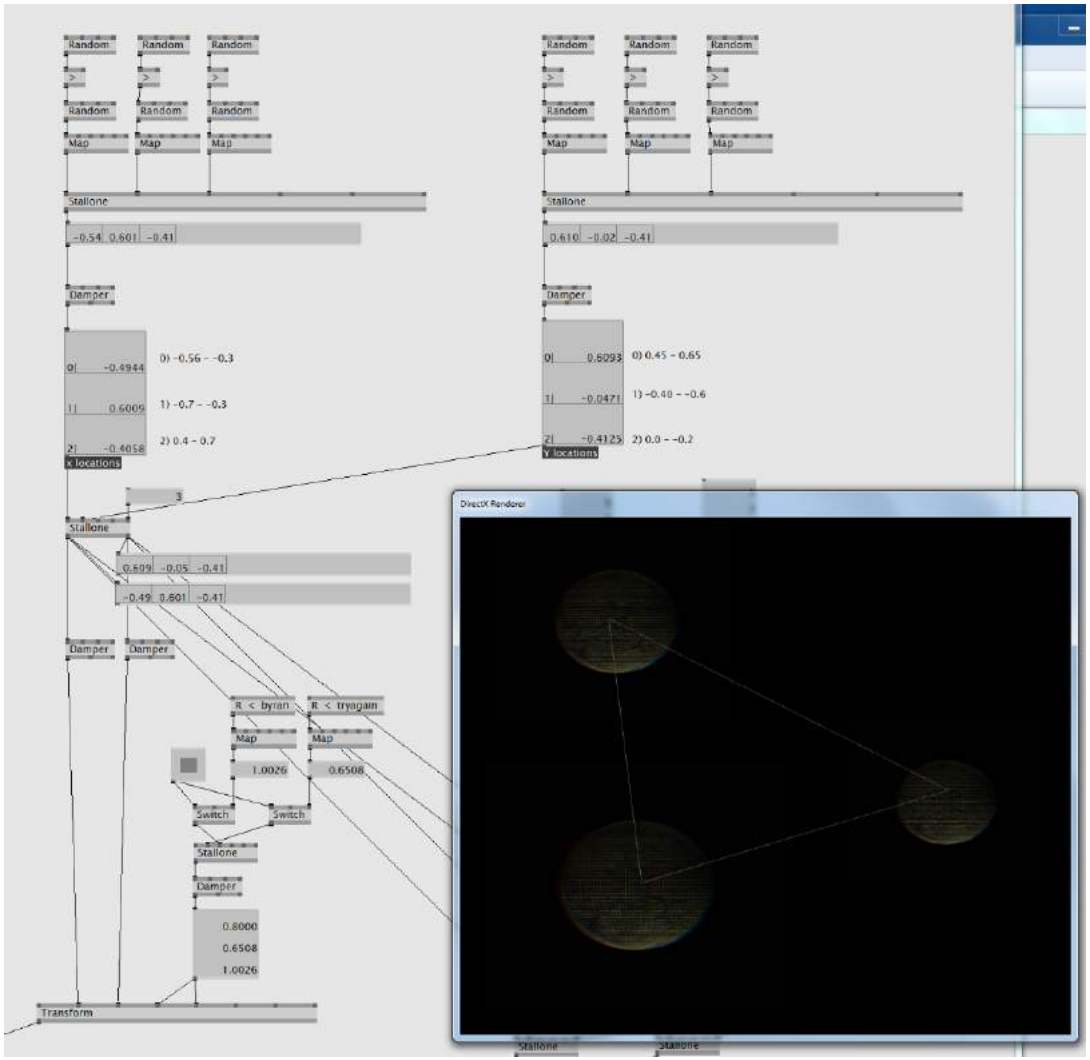
2. 2-spheres

This is the second variation with two rotating spheres. The sizes of the spheres change depending on the sound levels of the French horn and trombone.



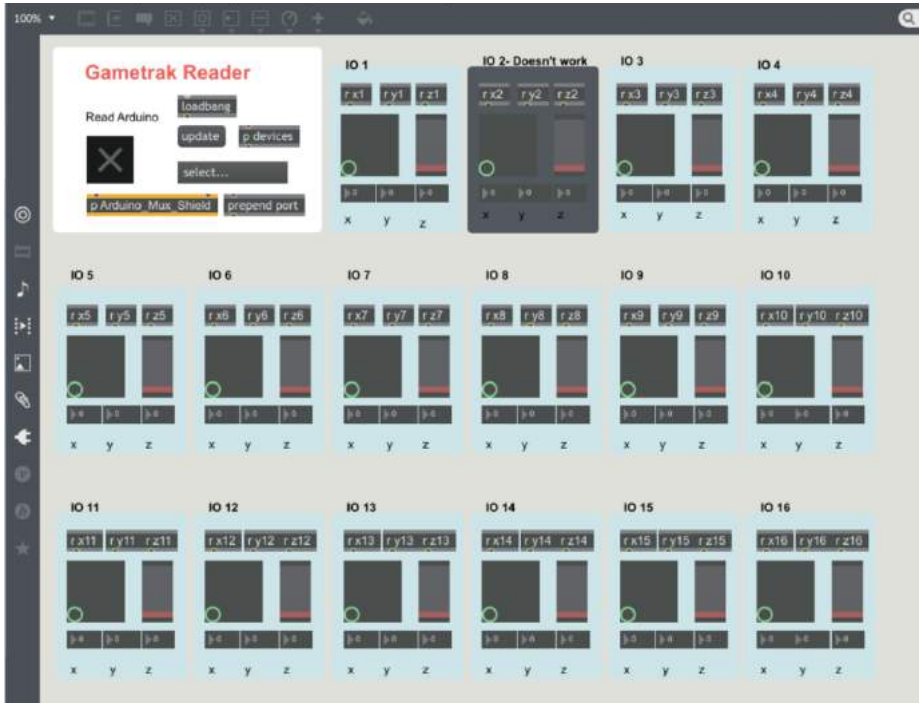
3. Triangletry

This is the third variation with three spheres connected by white lines. The sizes of the lower left and right spheres change depending on the sound levels of the French horn and trombone.



Appendix D

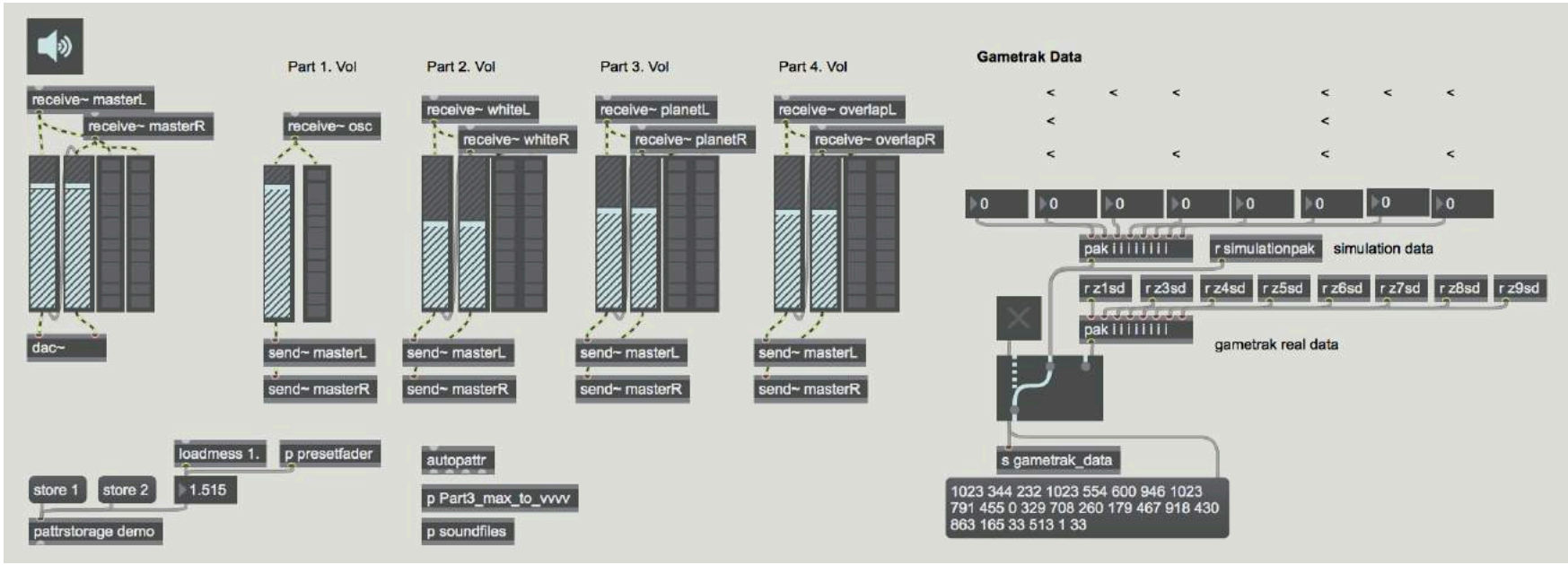
This is additional information for Section 2.2.2. *Pen-Y-Pass*. The following is an overview of the workflow between the vvvv and Max patches in /3.Max_vvvv_patches/2.2.2.Pen-Y-Pass/Pen-Y-Pass_vvvv/0.Penypass_Mainconsole.v4p and /3.Max_vvvv_patches/2.2.2.Pen-Y-Pass/Pen-Y-Pass_Max/0.TOP_Penypass.maxpat in Windows 7 using Bootcamp. First, the Gametrak controllers are connected to the Arduino microcontroller and the received data is monitored through the patch 1.muxshield_master_penypass.maxpat. This first step is the same as *Locus* (see Appendix B).



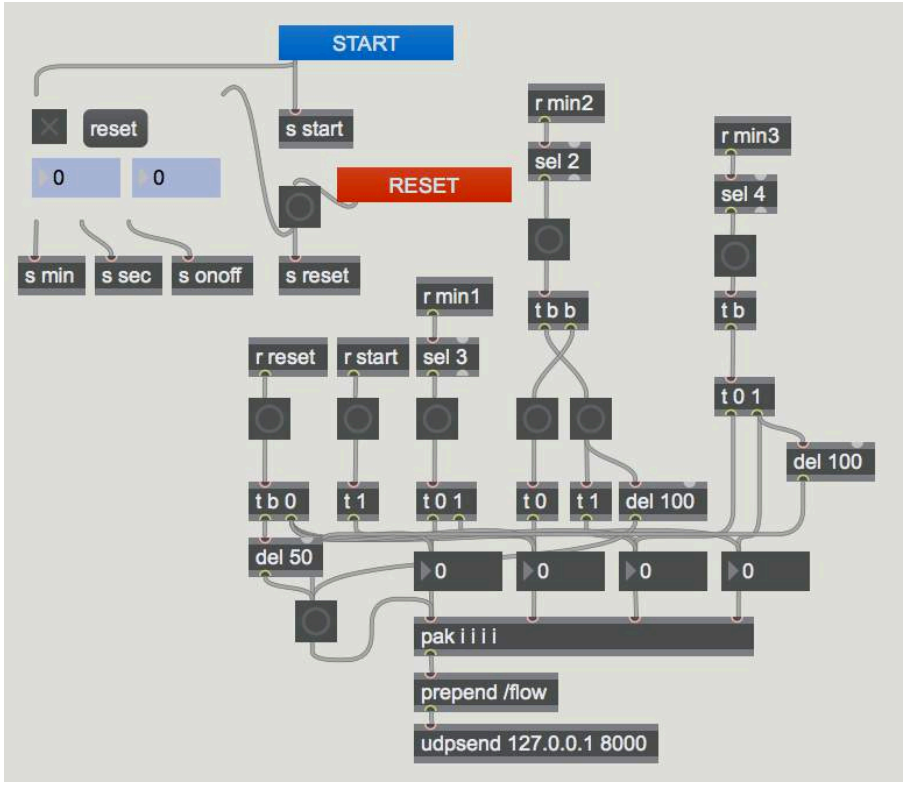
Before loading any Max patches, the folder /Pen-Y-Pass_Max should be added to the Max search path in the Options> File Preferences menu. Otherwise it won't load any Gametrak simulation files or sound files for buffer~ object.

** If any error occurs when loading sound files for buffer~ object even though the folder is added to the Max search, the issue may be resolved if the entire folder /Pen-Y-Pass_Max is copied and pasted to the desktop, and the Max patch is opened from the desktop directly instead of from the USB drive.

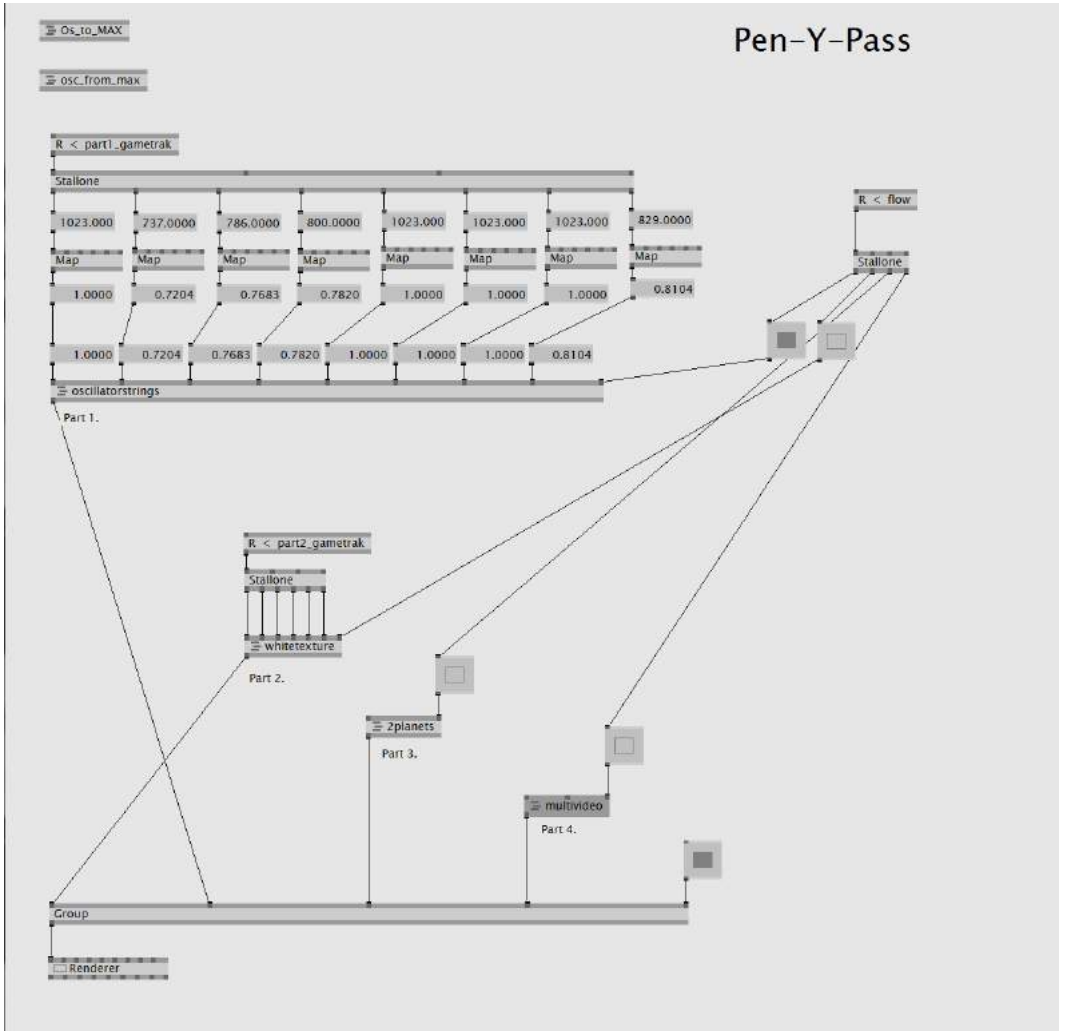
The first part of the Max patch shows the main volume control and the volume controls for each part of the composition. On the right, I can choose whether I want to receive the real Gametrak data from the Arduino board or the simulation data from the 1.muxshield_master_penypass.maxpat patch.



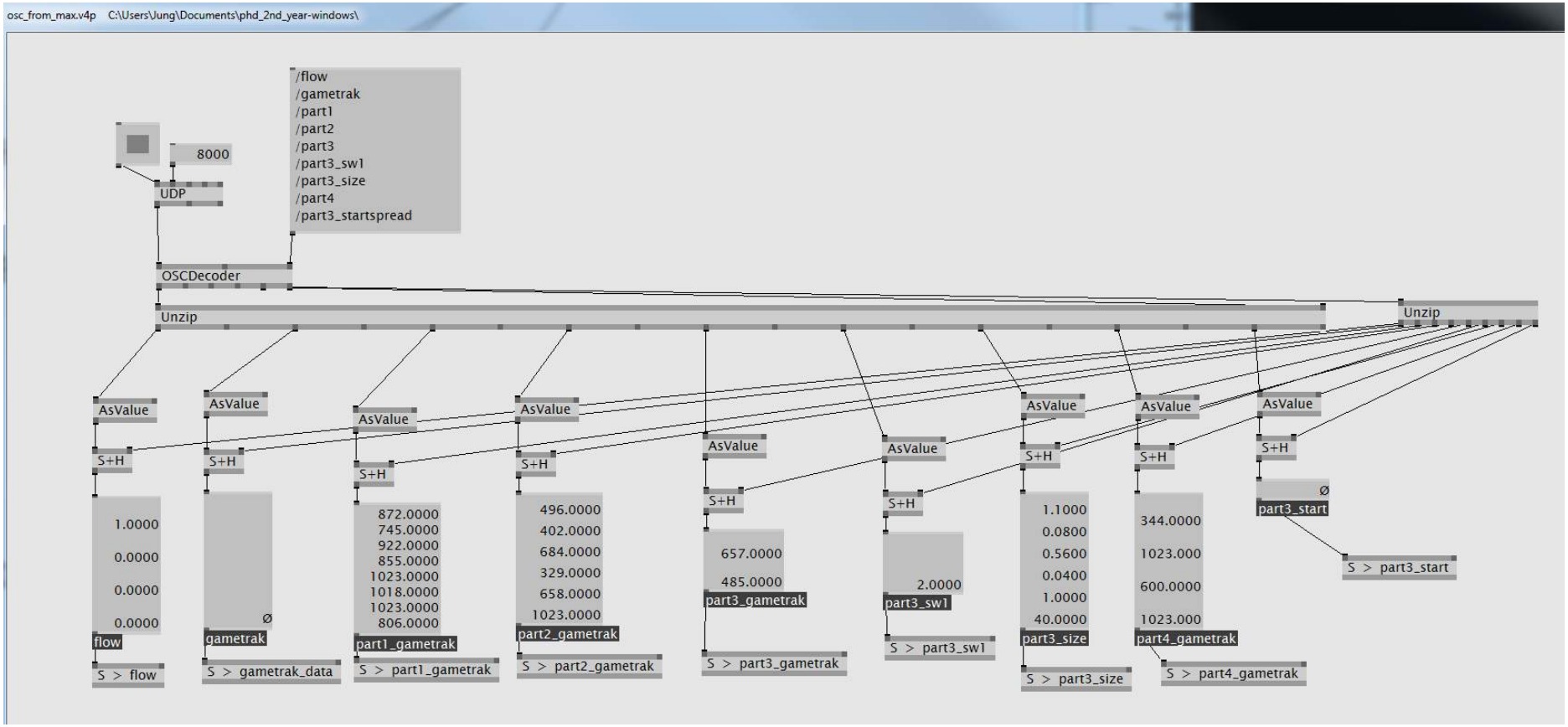
The next part shows the master clock for activating each part of the composition. This information is also sent to the vvvv patch to activate the visual composition. Before running the composition, the red RESET button should be pressed several times to reset every part of the composition. The composition can then be started by pressing the blue START button.



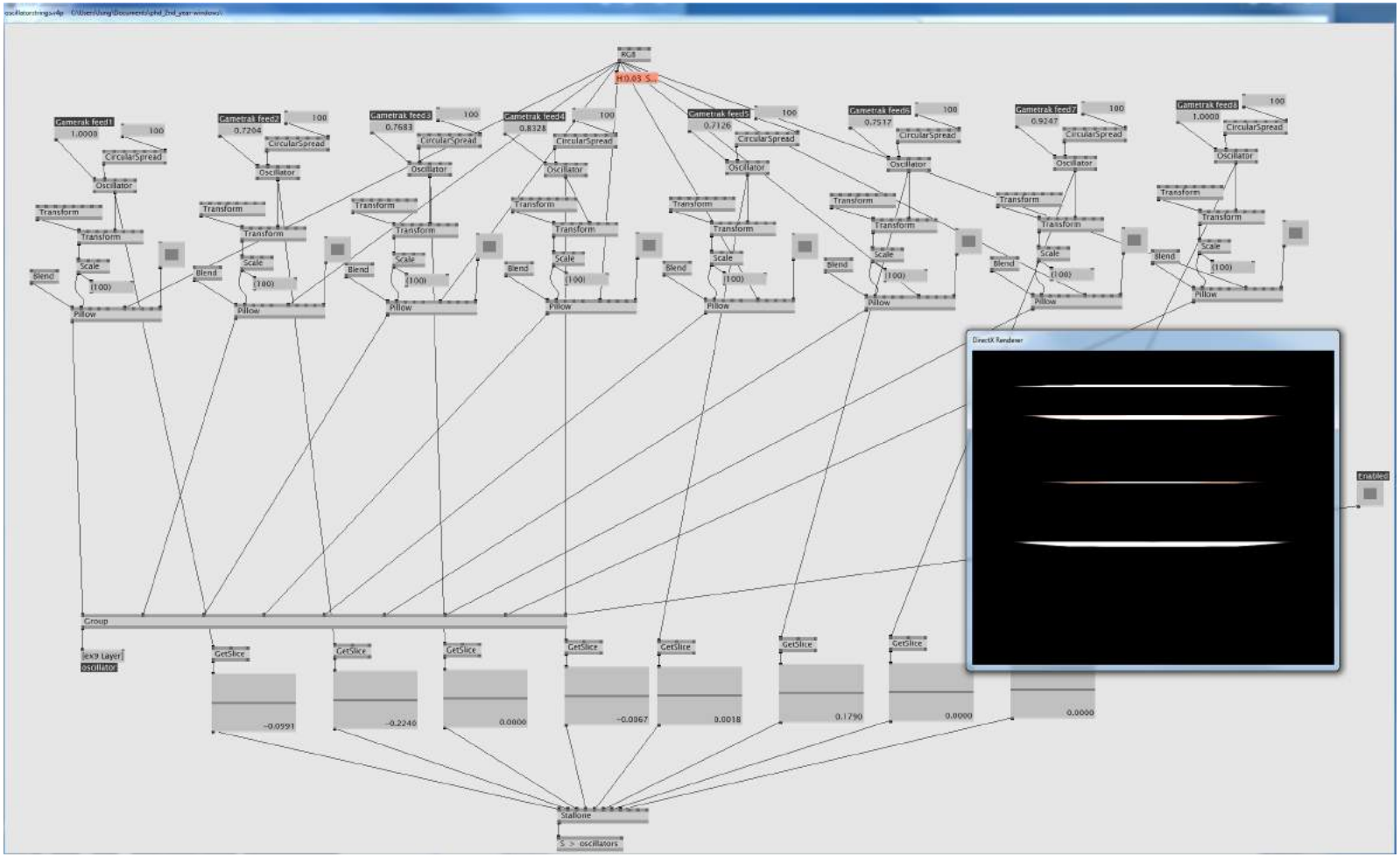
On the right is the main vvvv patch of *Pen-Y-Pass*. The entire communication flow between Max and vvvv can be seen in the sub-patches Os_to_MAX and osc_from_max.



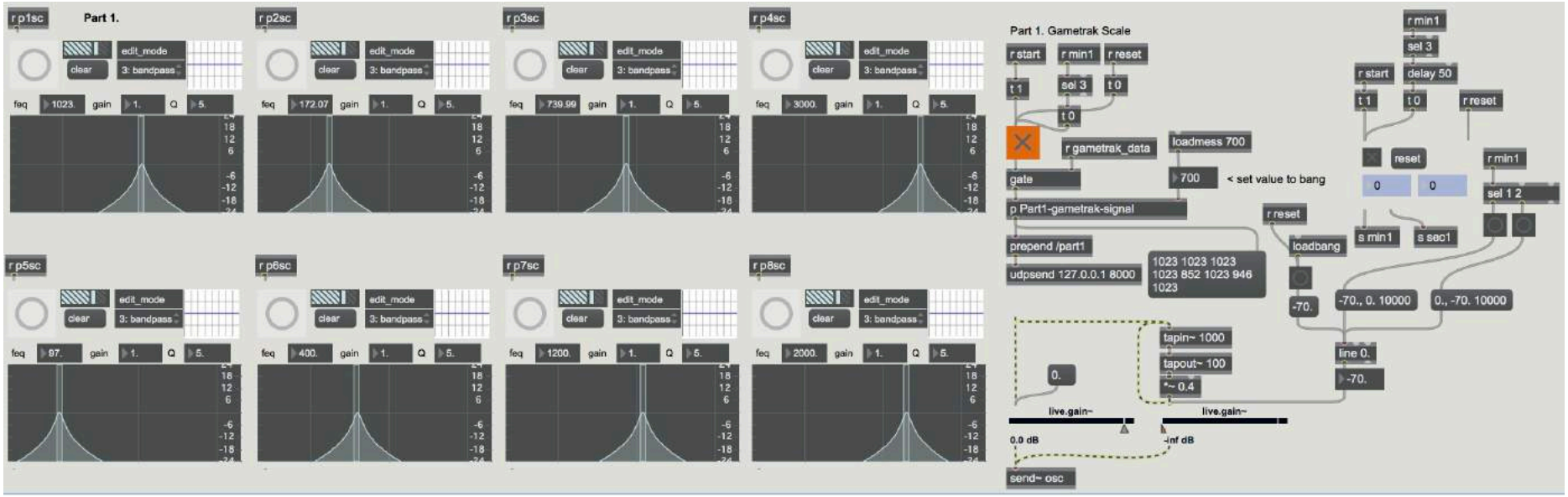
The Gametrak data sent to the sub-patch osc_from_max.v4p is scaled to control the visual parameters in each section of the composition.



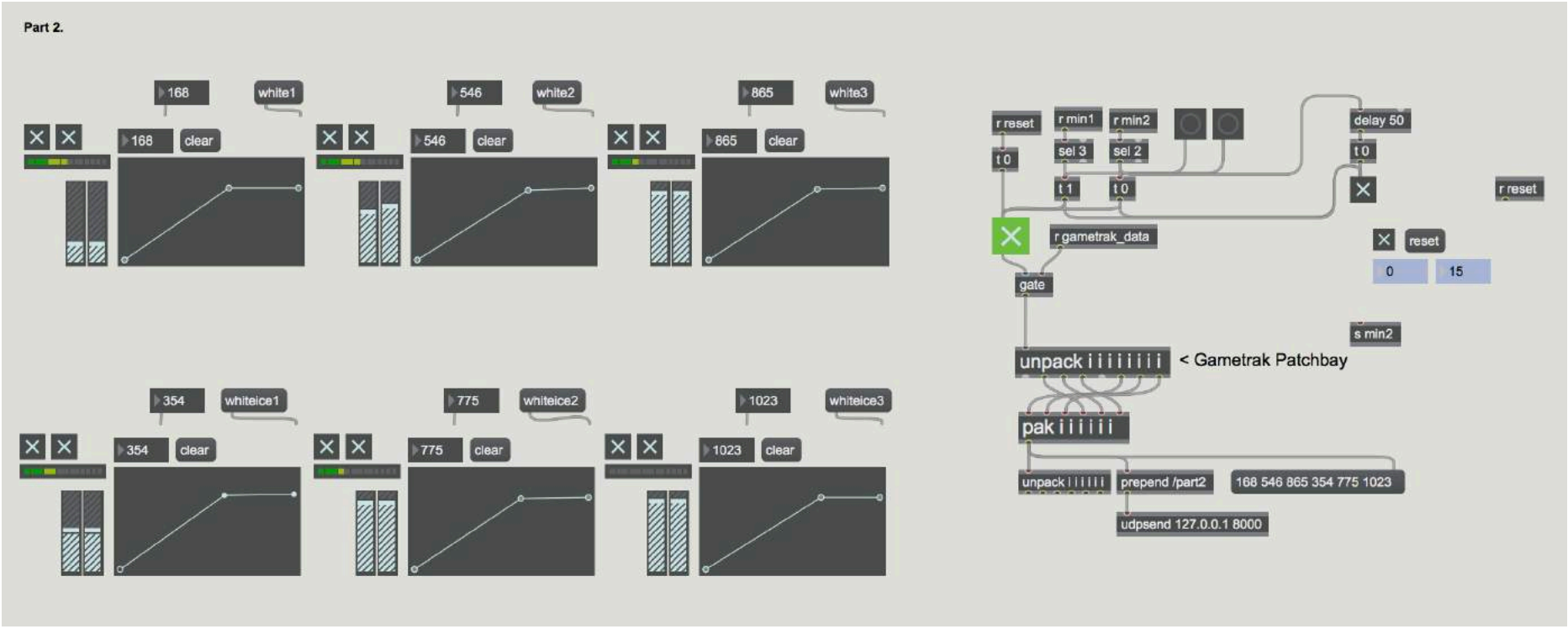
Below is the sub-patch oscillatorstrings, which generates the horizontal lines for the first part of the composition (see pages 88–91).



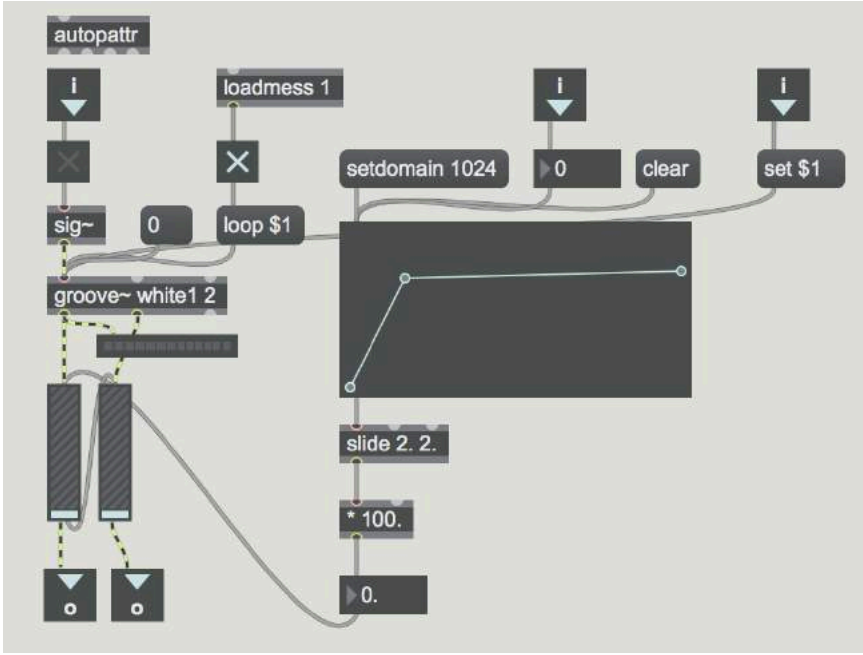
This is the first part of the composition, consisting of two variations (see Video 2.11).



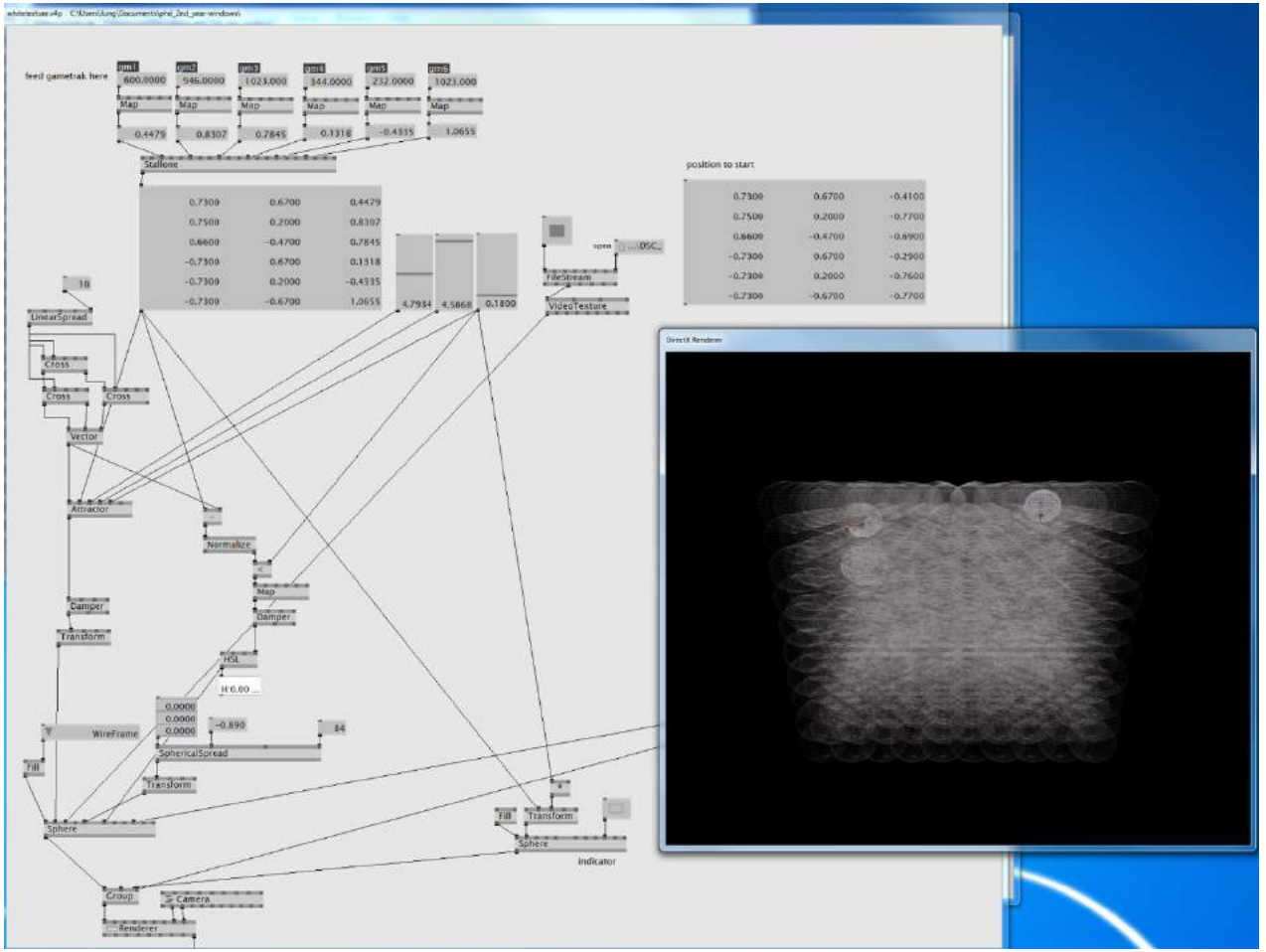
This is the second part of the composition in Max (see pages 91–94). I created a “Gametrak Patchbay” so that I could easily redirect the real-time Gametrak data to the vvvv patch depending on the Gametrak controllers the dancers decided to use during the composition process.



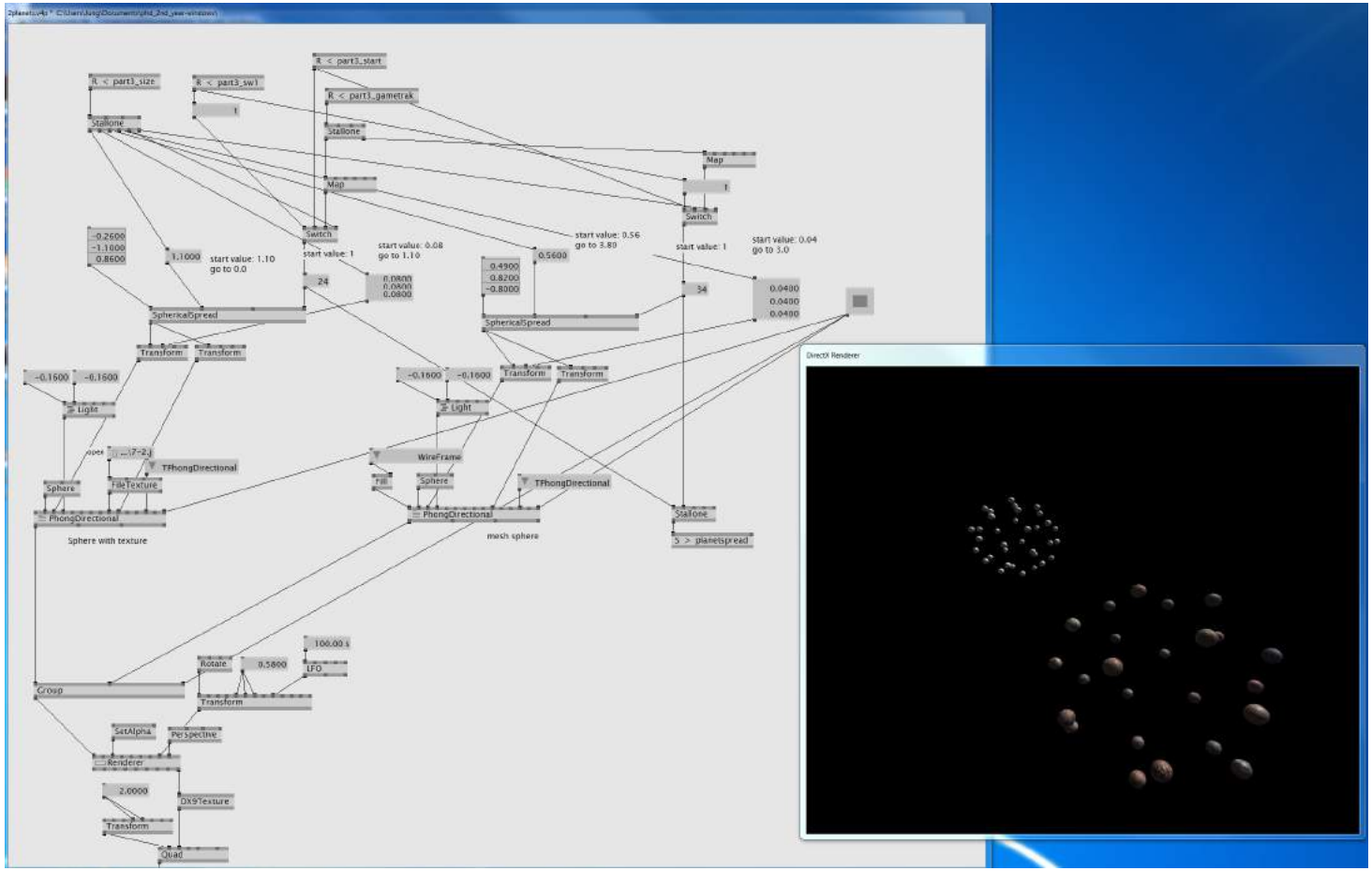
For the second part, I created a sub-patch with a groove object that I can easily map onto the volume control with a function object. I then called up the sub-patch with multiple bpatcher. This was to make it easy to calibrate the Gametrak data and the volume control during the rehearsal at the performance space.



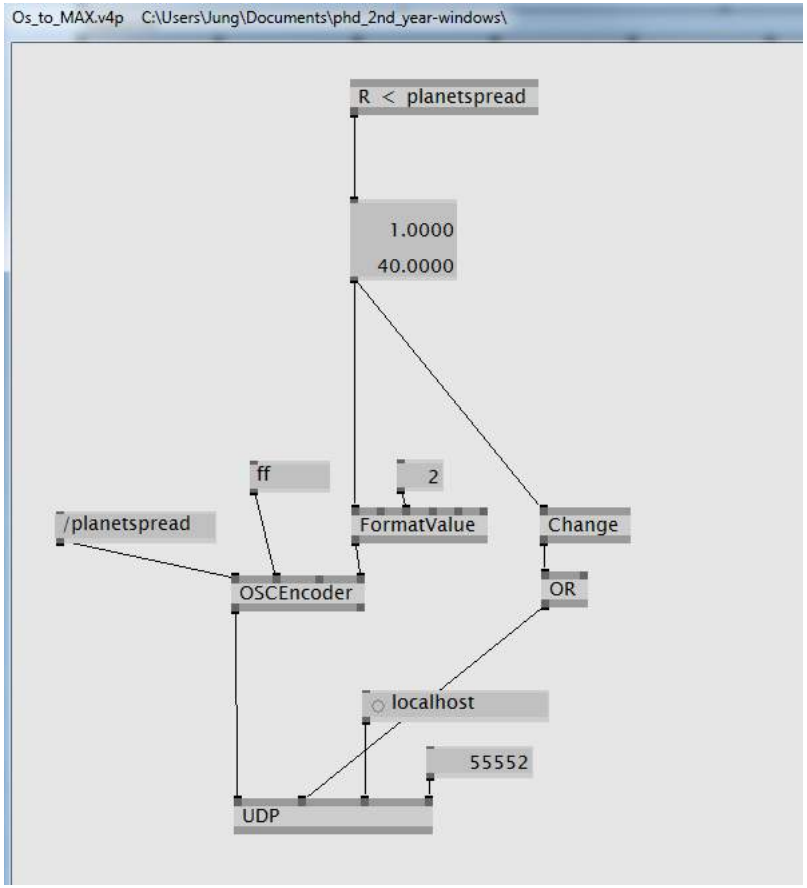
This is the sub_patch of Whitetexture for the second part of the composition.



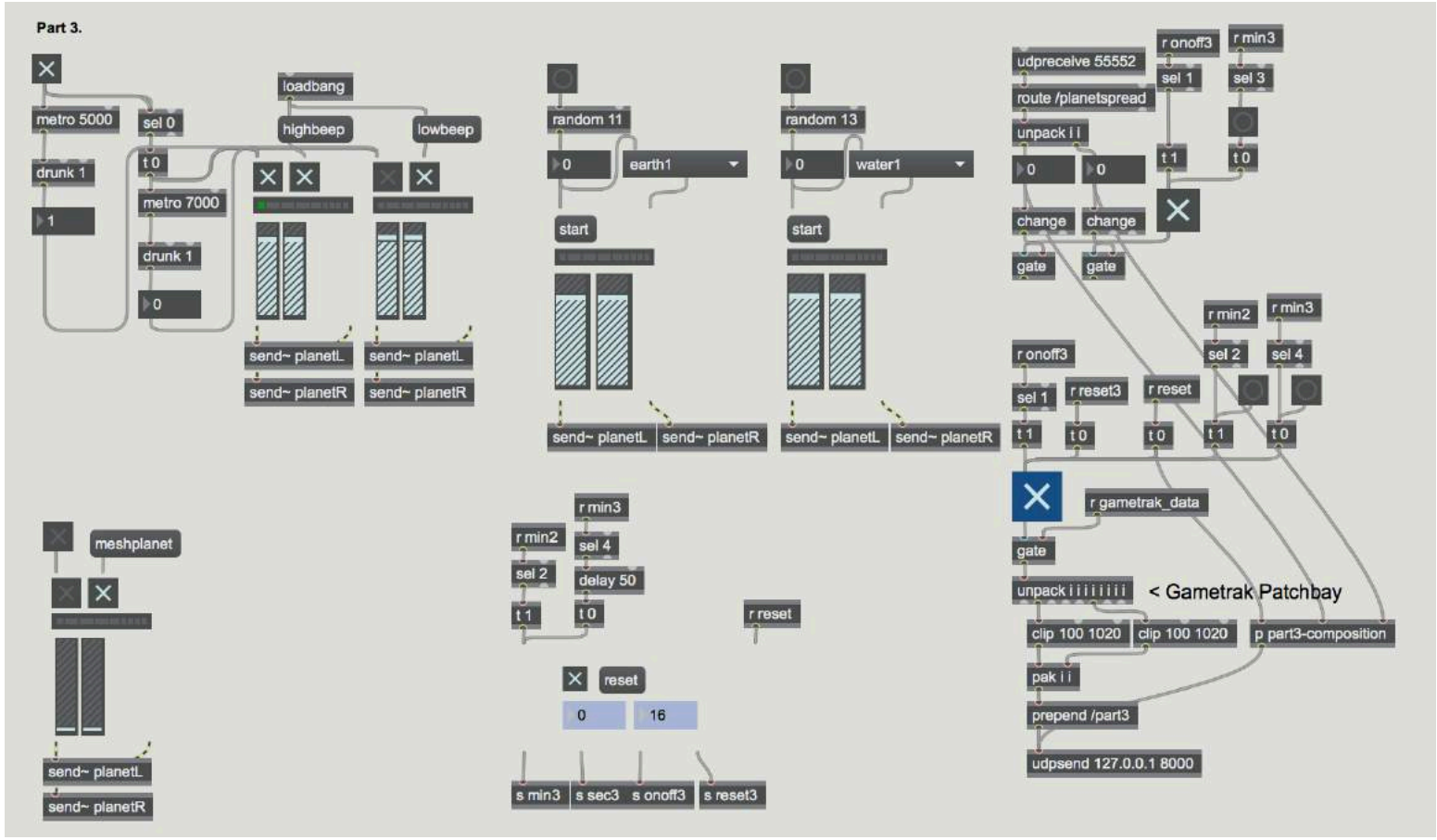
This is the sub-patch of 2planets for the third part of the composition (see pages 95–97). Whenever more spheres are populated, it sends the number of populated spheres to the sub-patch Os_to_MAX.



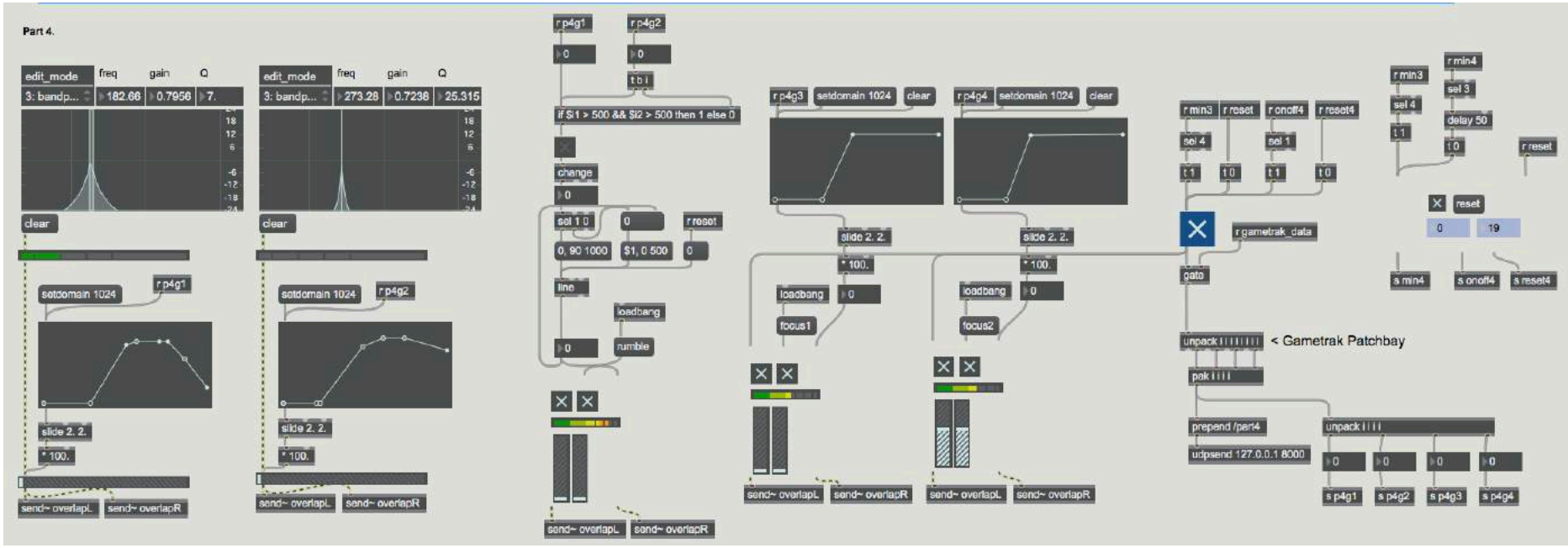
The sub-patch Os_to_MAX receives the information that more spheres have been triggered and sends that information to Max.



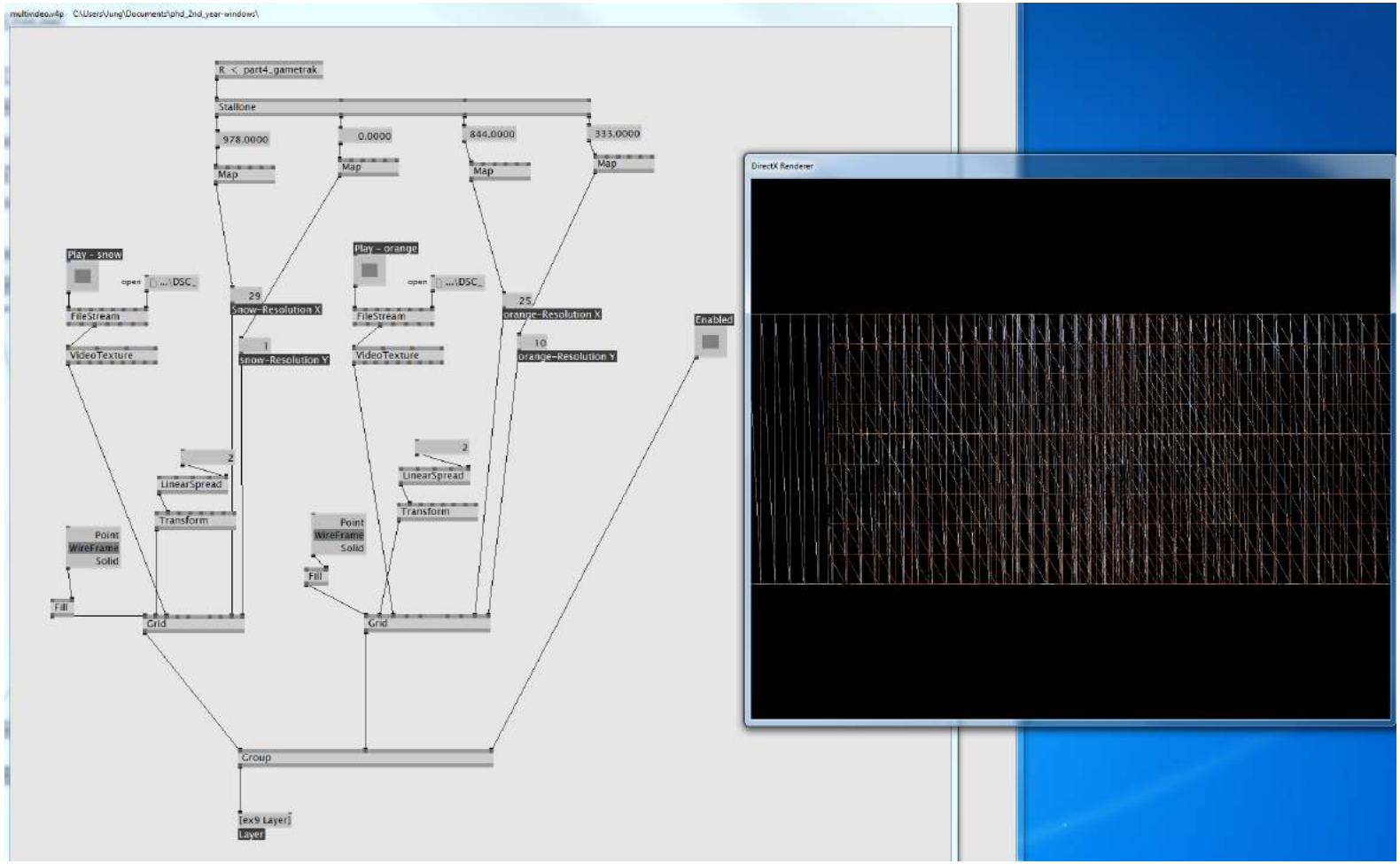
This is the third part of the composition in Max. It triggers the high-pitched tones at random. On the right, it receives information about the populated spheres and triggers the two different sphere sounds.



This is the fourth part of the composition (see pages 97–99). On the left, I used the same technique as the first part of the composition to generate a wind-like sound.

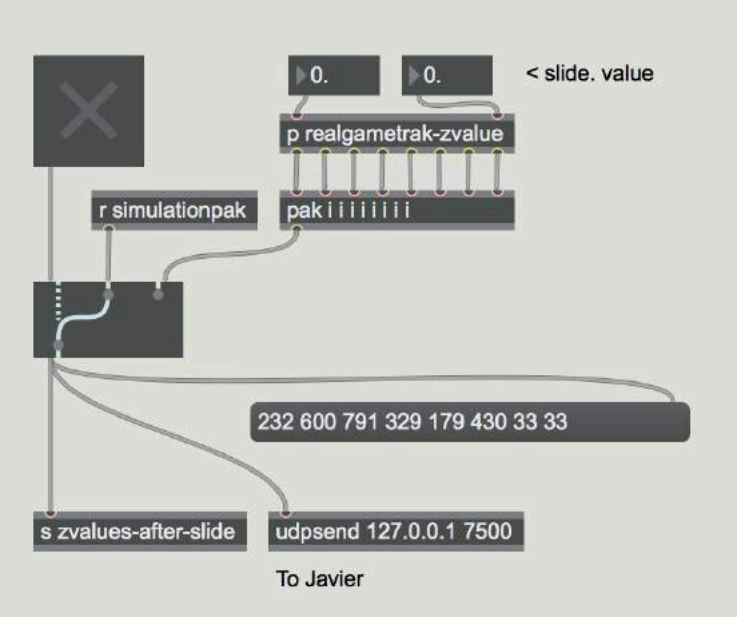


This is the sub-patch multivideo for the fourth part of the composition.



Appendix E

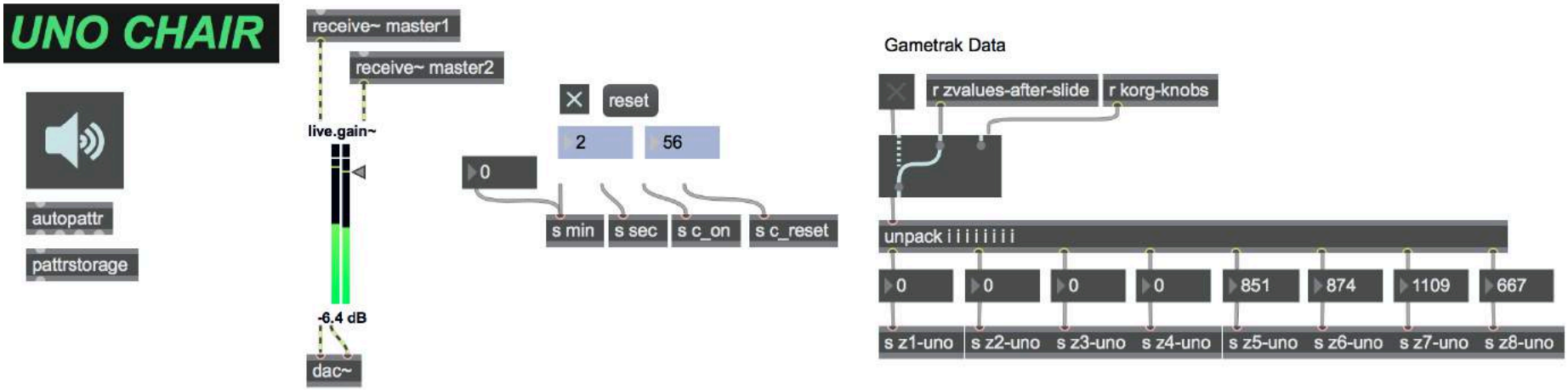
This is additional information for Section 2.3.1. *UnoChair*. The following are overviews of the two Max patches in 3.Max_vvvv_patches/2.3.1.UnoChair/UnoChair_Max/1.Uno-chair-jungin.maxpat and 3.Max_vvvv_patches/2.3.1.UnoChair/UnoChair_Max/2.Uno-chair-javier.maxpat. First, the Gametrak data was received using the same interface patch created for previous projects in 0.muxshield_master_UNOchair.maxpat (see Appendix B). I created a switch with which I could control whether the simulation or the real Gametrak data would flow into the main Max patch.



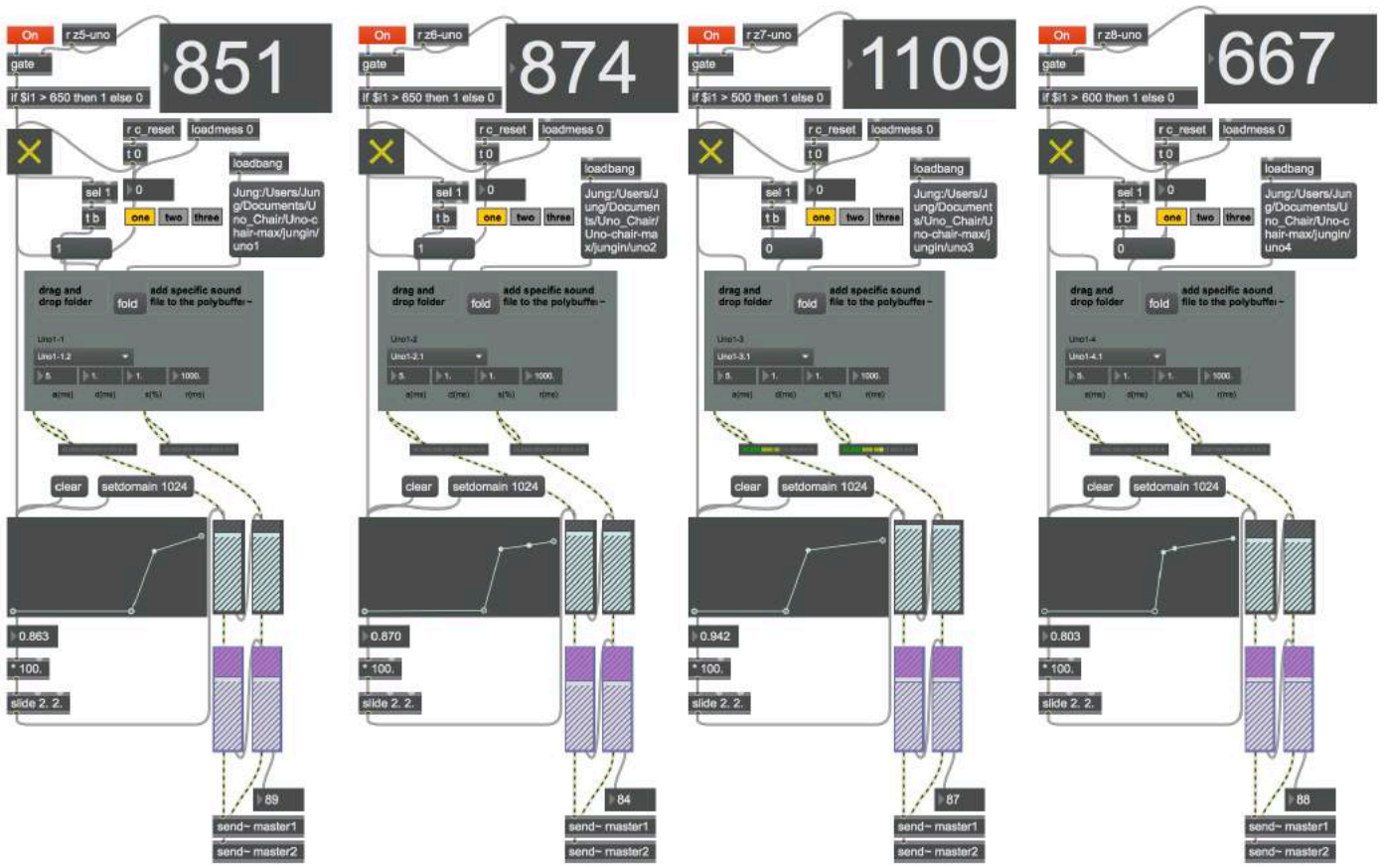
Before loading any Max patches, the folder /UnoChair_Max should be added to the Max search path in the Options> File Preferences menu. Otherwise it won't load any Gametrak simulation files or sound files for buffer~ object.

** If any error occurs when loading sound files for buffer~ object even though the folder is added to the Max search, the issue may be resolved if the entire folder /UnoChair_Max is copied and pasted to the desktop, and the Max patch is opened from the desktop directly instead of from the USB drive.

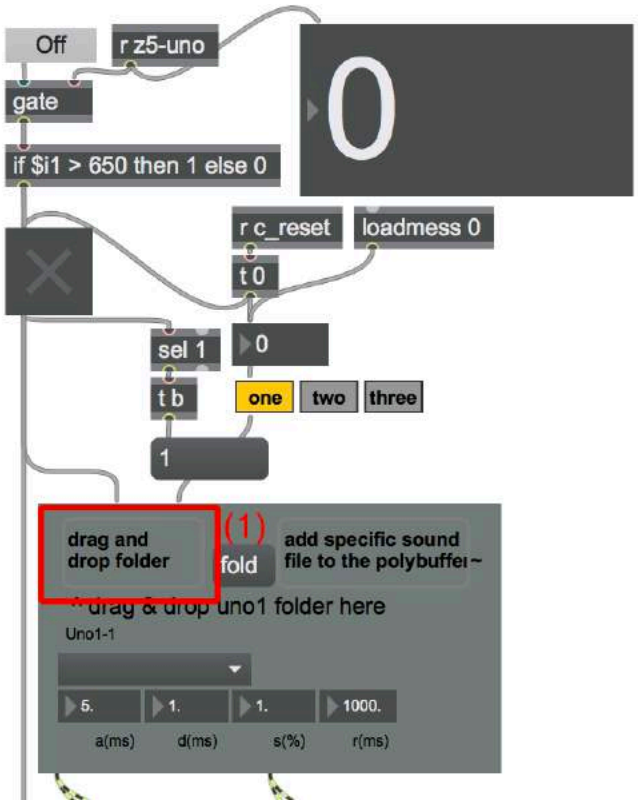
Below is the first part of the Max patch 1.Uno-chair-jungin.maxpat. It receives the Gametrak data from 0.muxshield_master_UNOchair.maxpat and maps it to control some sound parameters in this patch. I used the MIDI controller 'nanoKONTROL2' from Korg to test the patch without Gametrak controllers (the controller patch is 3.korg_nanokontrol.maxpat). I created a switch with which I could choose whether to receive data from the Gametrak controllers or the MIDI controller. I added the clock here simply to monitor the duration of the performance rather than to activate automatically different sound variations.

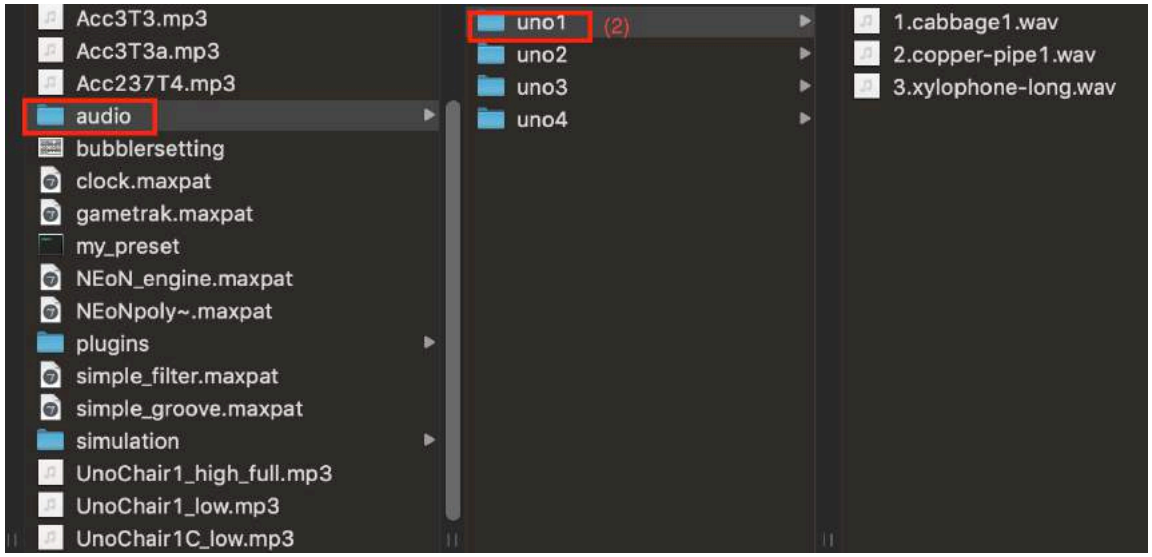


I used the same poly~ sound player used for *NEON* to load different sound files.

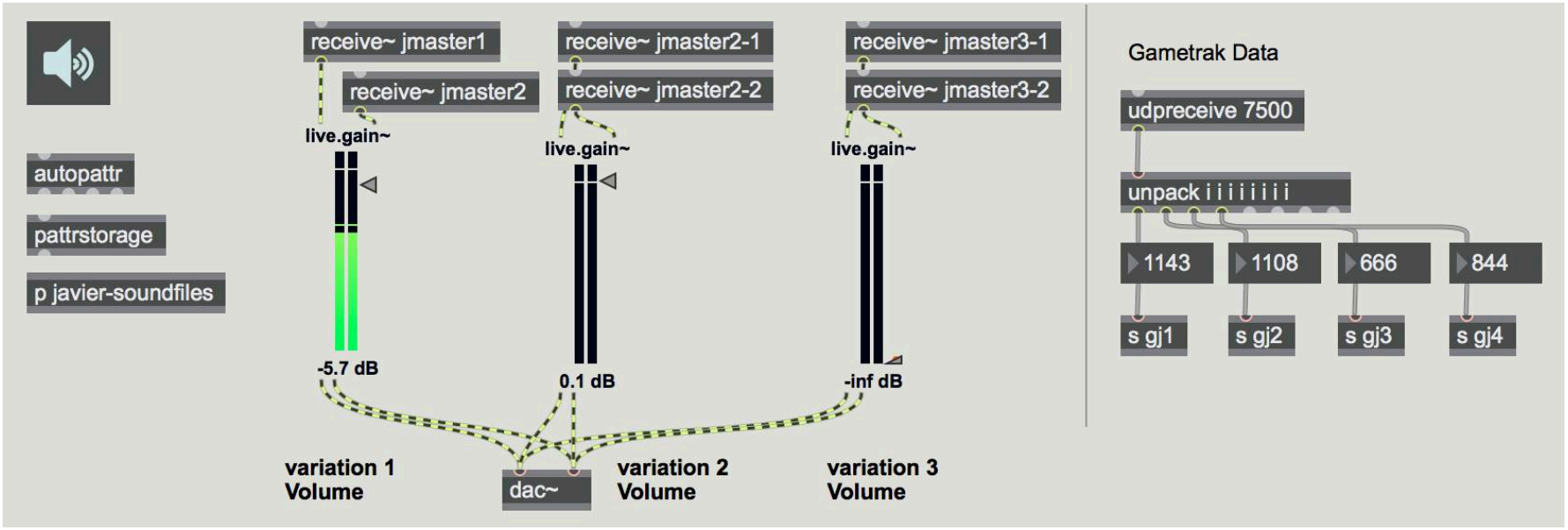


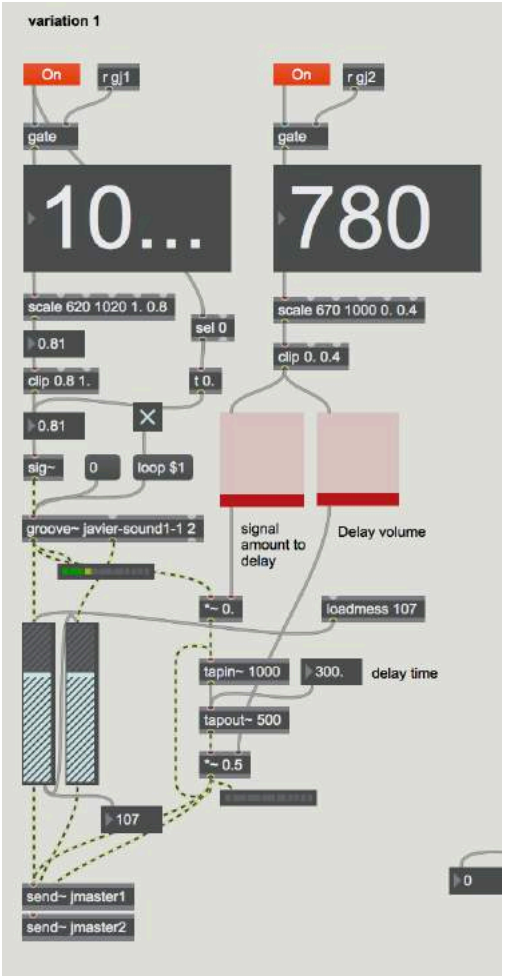
For each sound player, the audio folders should be dragged and dropped in the right order. For instance, for (1) Uno1-1 sound player, the audio folder (2) 'uno1' in /UnoChair_Max/audio should be dragged and dropped. See Video 2.22 for a demonstration of this patch.





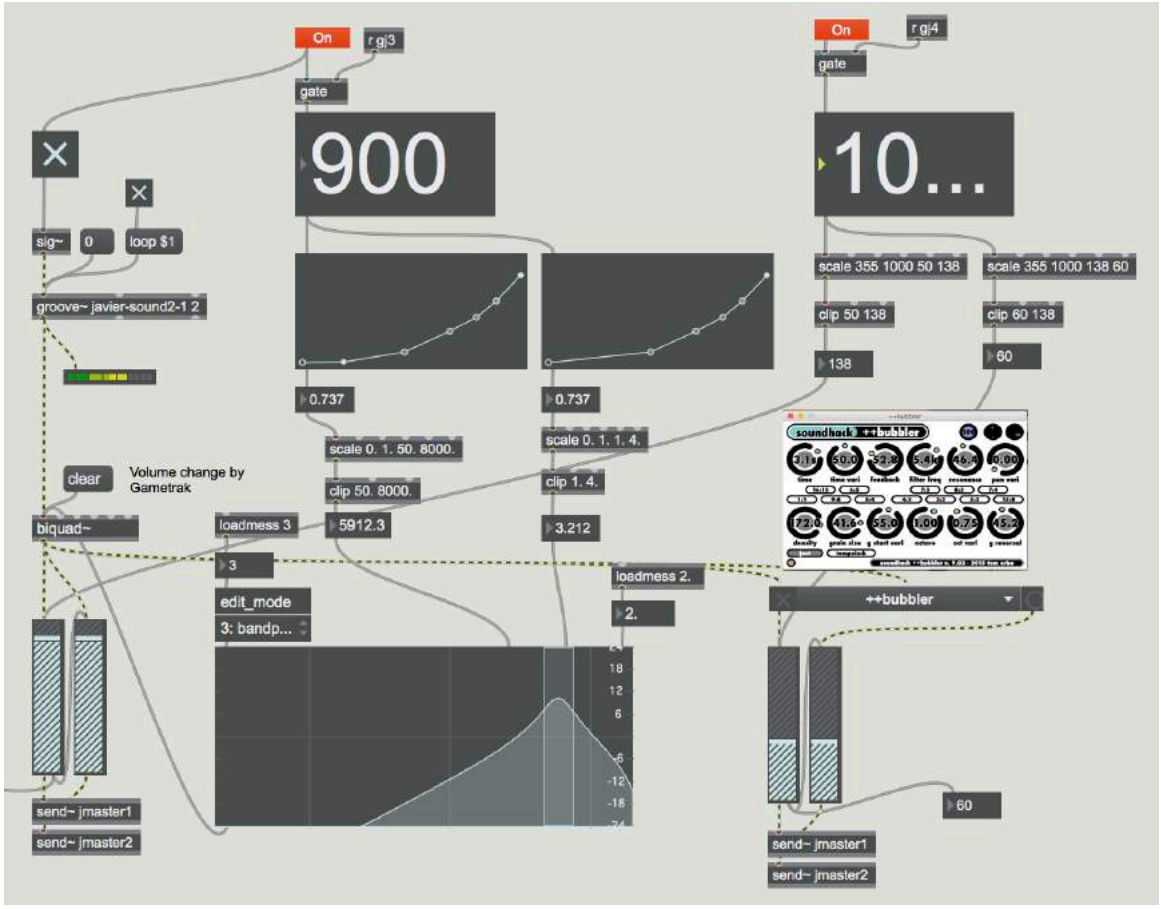
This is the first part of 2.Uno-chair-javier.maxpat. There are three sliders for fading in and out the three different sound variations.

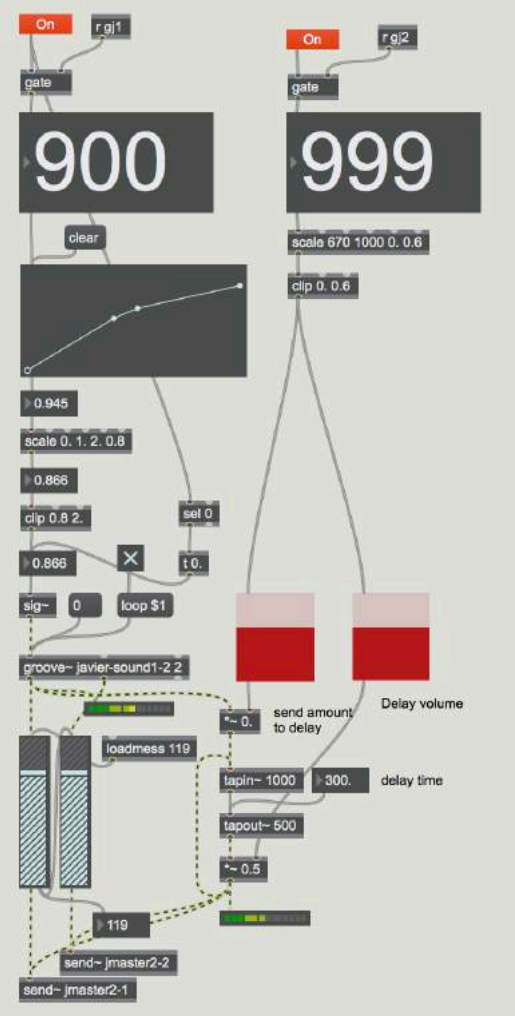




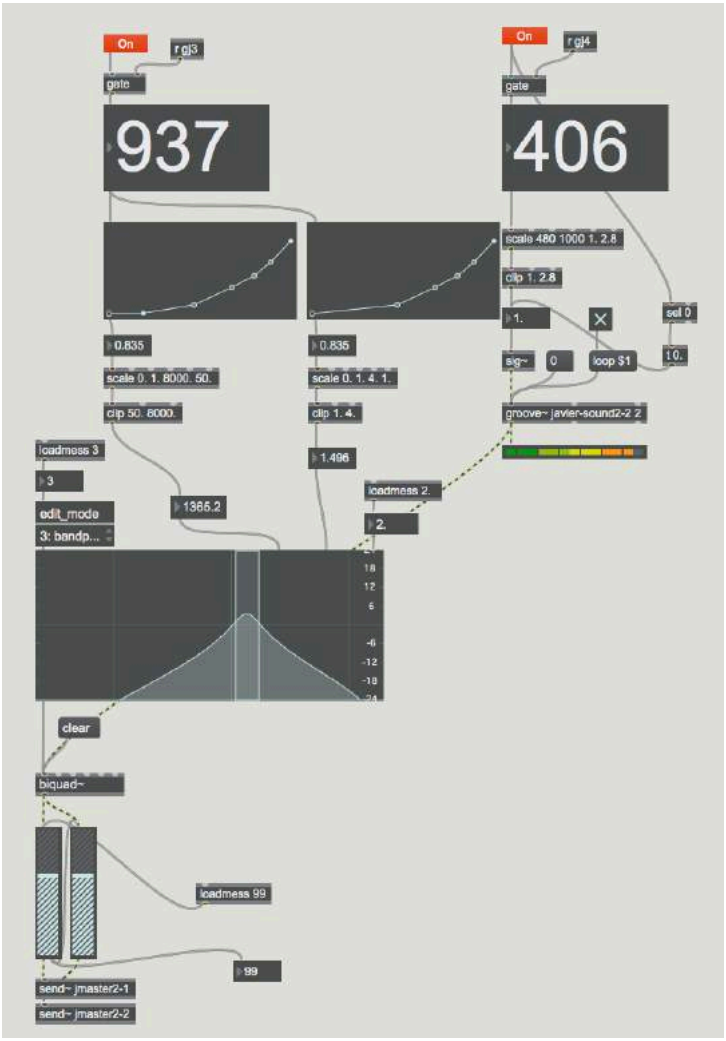
This is one part of the first variation. One Gametrak controller changes the playback speed of the buffer and another changes the delay amount according to the length of their cables.

This is the other part of the first variation. One Gametrak controller changes the frequency range of the bandpass filter to create a sweeping effect. Another Gametrak controller adds the granular delay effect with the ++bubbler plugin.

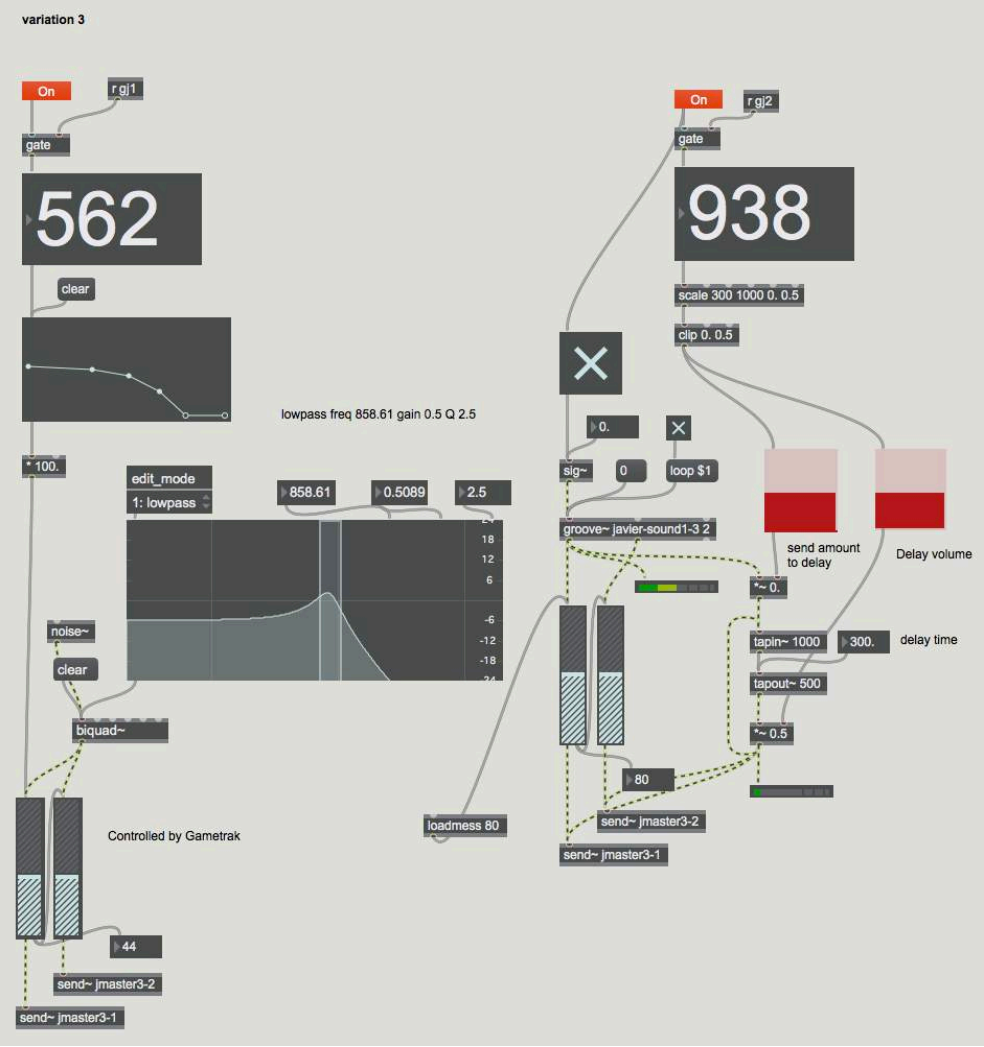




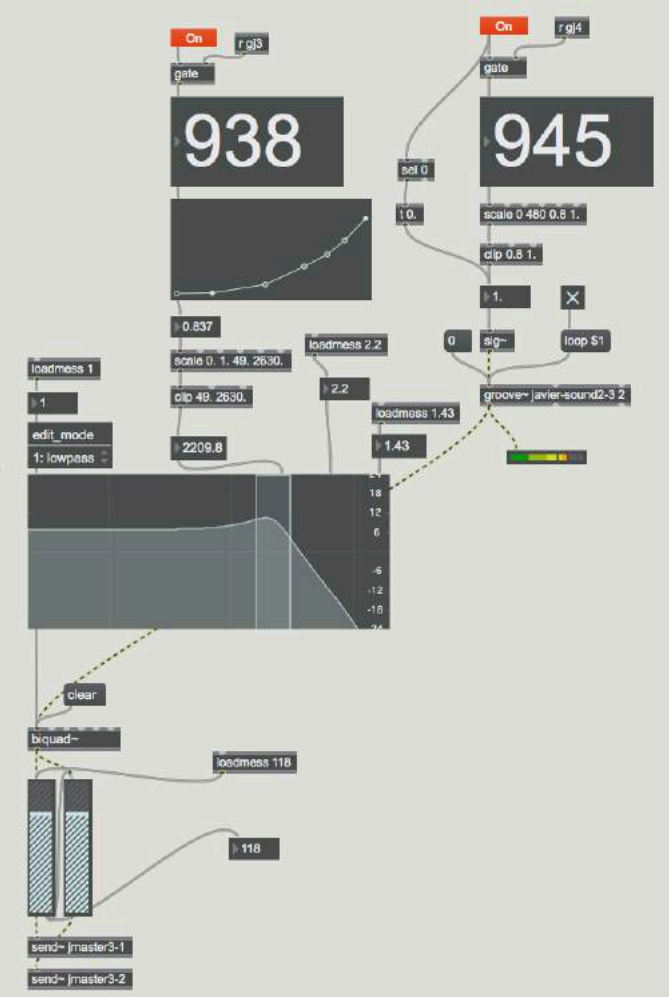
This is the first part of the second variation. Similar to the first variation, it changes the playback speed of the buffer and the delay amount.



This is the other part of the second variation. It changes the playback speed and the frequency range of the bandpass filter.



This is the first part of the third variation. I added white noise with a lowpass filter so that one Gametrak controller could change the frequency range of the filter. Another Gametrak controller adds the amount of delay for a melodic sound loop.

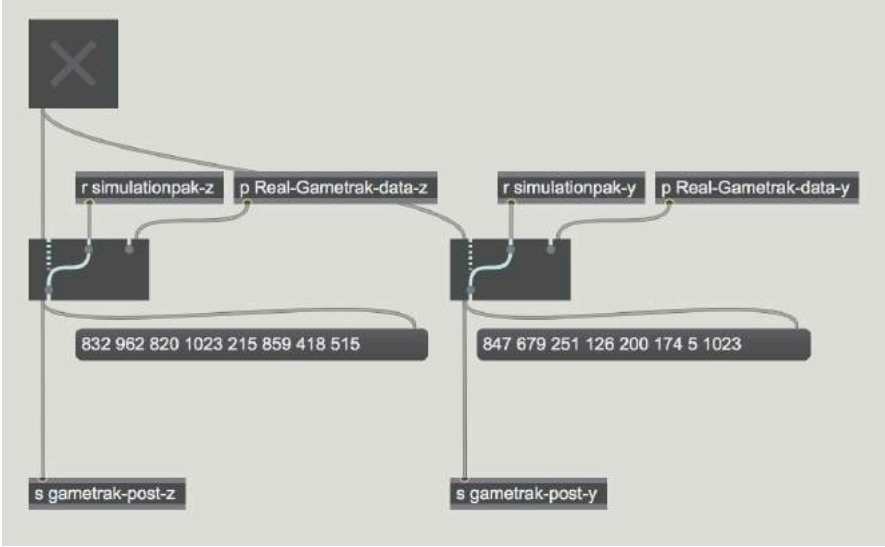


This is the second part of the third variation. It changes the playback speed of the buffer and the frequency range of the lowpass filter.

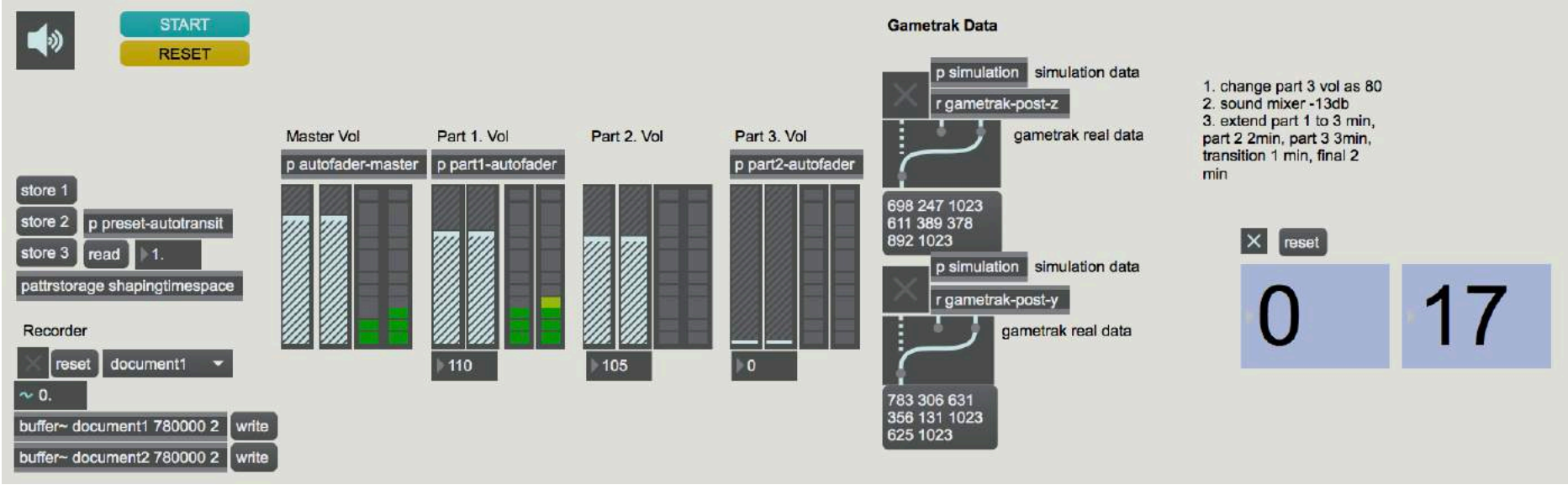
Appendix F

This is additional information for Section 2.3.2. *Temporal*. This is an additional explanation to loading the Max patch in /3.Max_vvvv_patches/2.3.2. Temporal/Temporal_Max/0.TOP-Temporal.maxpat.

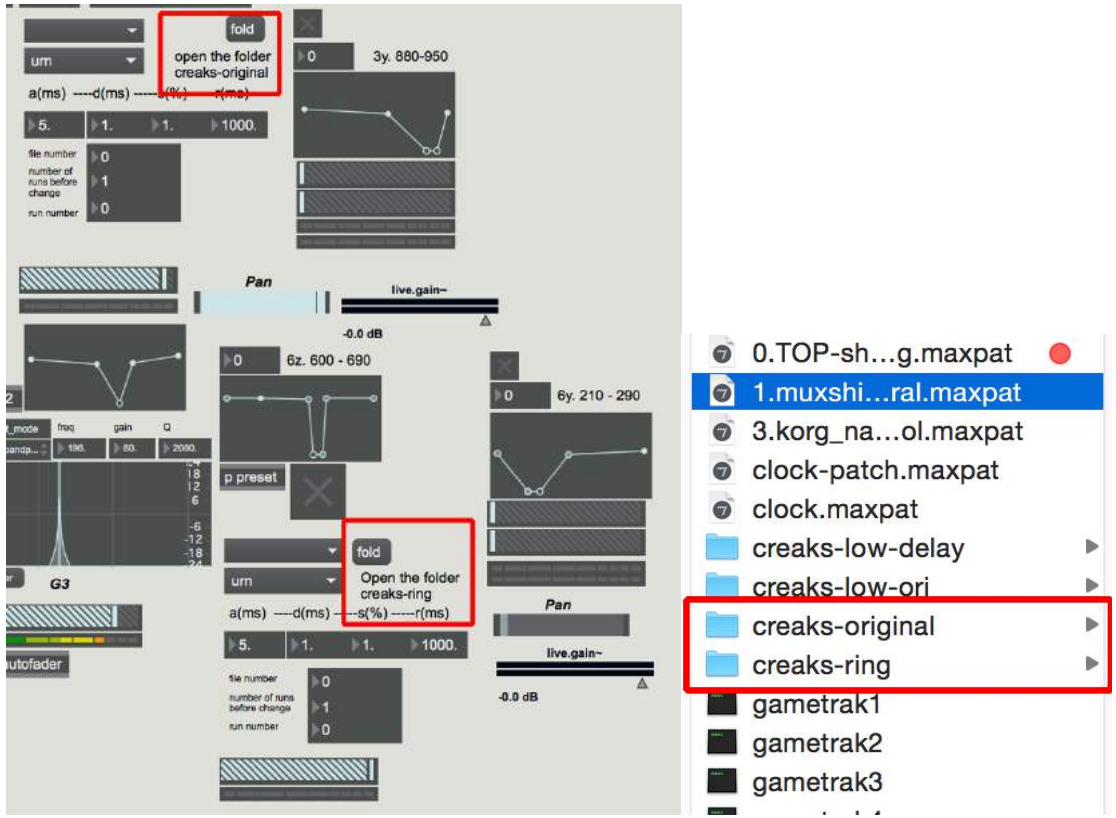
First, the Gametrak data was received using the same interface patch I created for previous projects in 1.muxshield_master-temporal.maxpat (see Appendix B). I created a switch with which I could control whether the simulation or the real Gametrak data flowed into the main Max patch.



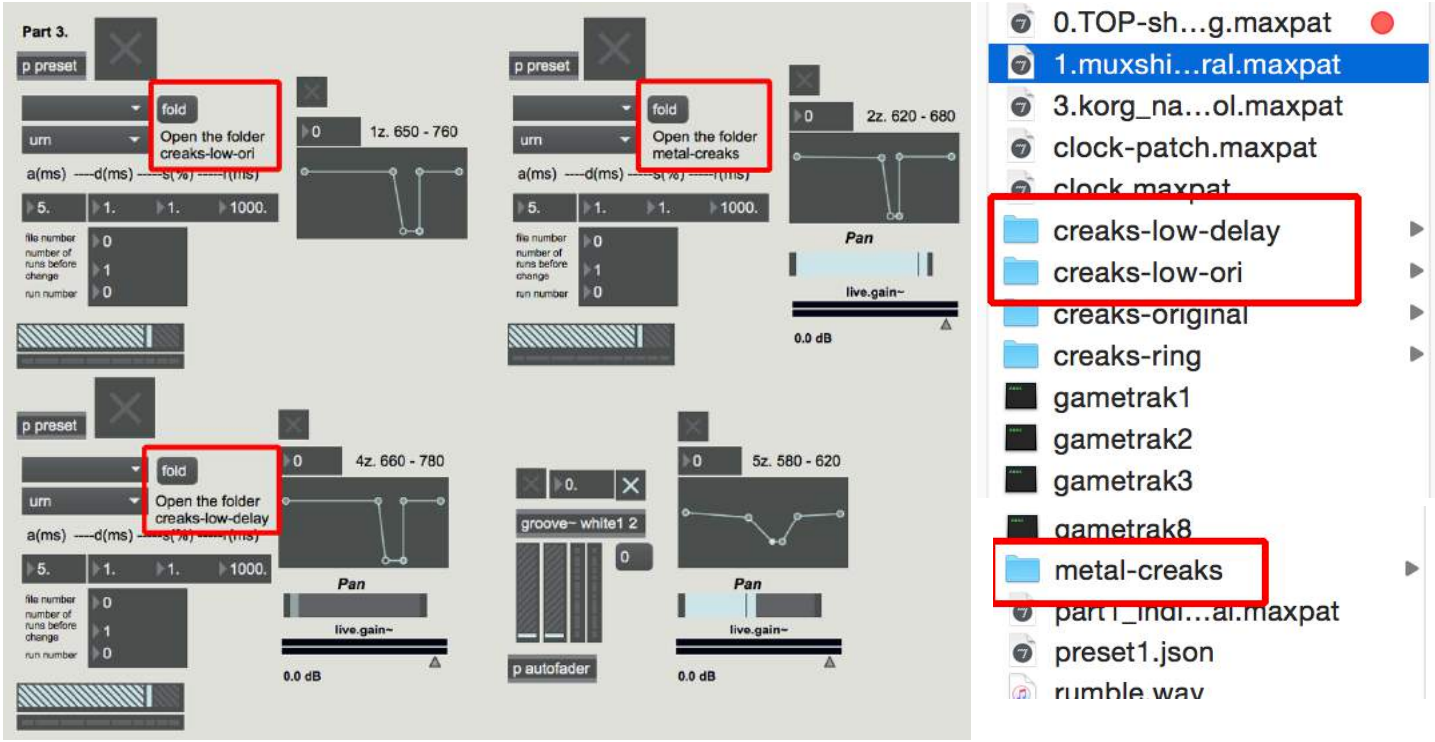
Below is the first part of the main Max patch 0.TOP-Temporal.maxpat. It receives the Gametrak data from 1.muxshield_master-tempral.maxpat and maps it to control some sound parameters in this patch. I sometimes also used the MIDI controller 'nanoKONTROL2' from Korg to test the patch without Gametrak controllers (the controller patch is 3.korg_nanokontrol.maxpat). I created a switch with which I could choose whether to receive data from the Gametrak controllers or the MIDI controller.



In the main Max patch 0.TOP-Temporal.maxpat, the right audio folder for each poly~ sound player should be dragged and dropped as indicated in the patch.



The right audio folders for the rest of poly~ sound players should be dragged and dropped as indicated.



Appendix G

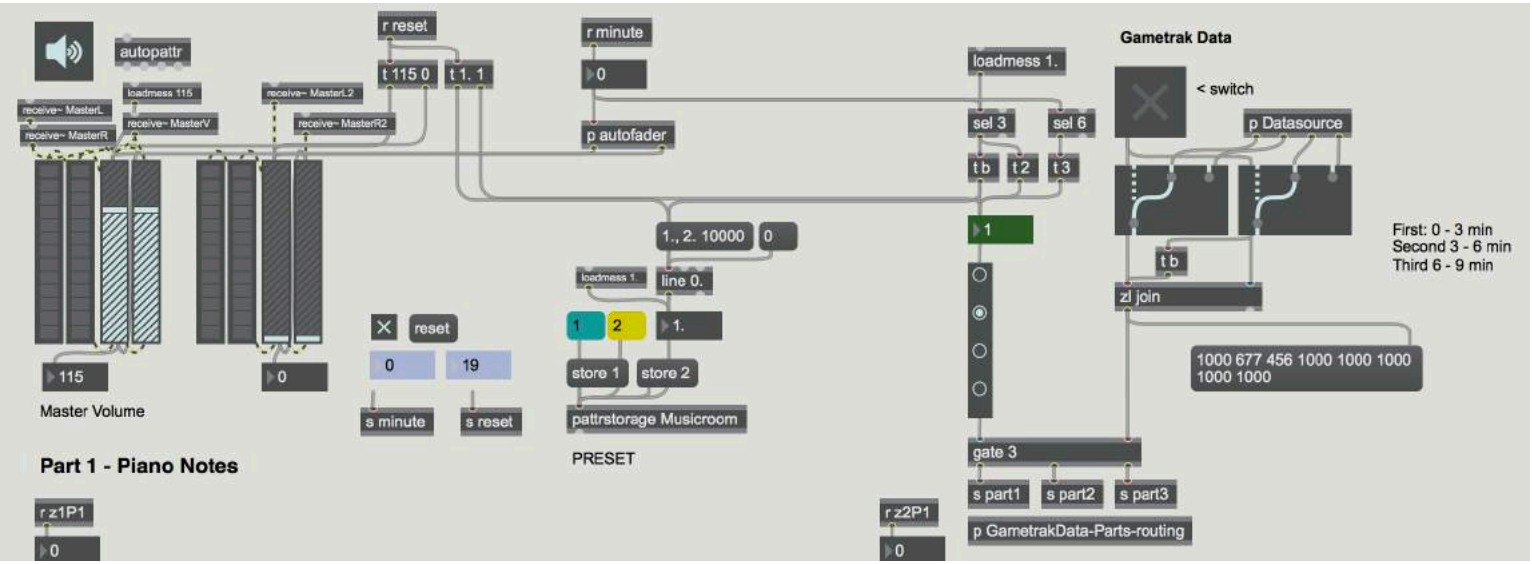
This is the original text from the chapter “The Earth” in *A Life for Dance*.

> When as a child I roamed about in the mountains, woods and meadows I always felt as if I received answers to questions which I could ask nobody but the earth. This time even heaven spoke to me. Heaven and earth are father and mother of man, I thought, and I rejoiced to be a human being and jubilantly raced the rapid brooks down into the valley.
>
> All this I experienced as a child and I shall never forget it.
>
> I remember a room in my grandparents’ house which became decisively important later in my life. It was a large oval-shaped music room with golden wallpaper and white doors and standing in a niche there was a life-sized marble figure of a youth holding a lyre. I was free to use this room as I liked. I began to try out various familiar tunes on the grand-piano until at last melodies of my own came to me. The golden room became the scene of strange dreams. The marble-god was to me the most noble image of and earthly creature and I often felt as if the lyre emitted soft sounds and that my melodies came from it to me.
>
> One day it became a roar, reminding me of my adventure near the giant’s eye. I saw a solemn throng of children of the earth, transparent, luminous human souls. They called beseechingly to the demon of heaven. They tried to rise higher and higher, nearer to him, into the clouds. But the giants on earth seized them and they crashed down in terrible confusion into the deep valleys.
>
> The earth groans and the spirits break into a chant:
>
> “Demon, Demon, create thy creature!”
>
> Then the song of the demon rings out. He creates the soul of the animal.
>
> Yet the song of the animal eluded me. I imagined it should be wild and strong and gigantic, but the marble-god behind me had become silent.
>
> (Laban, 1975: 16–17)

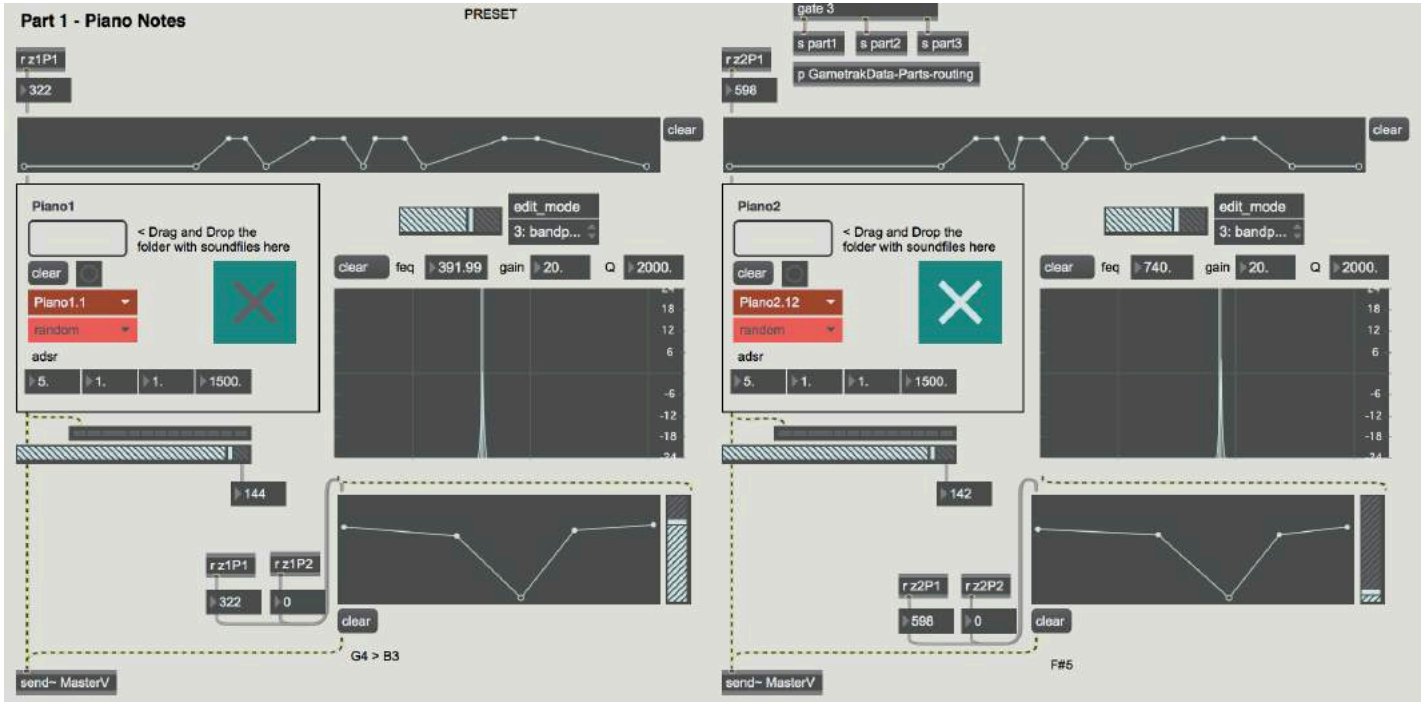
Appendix H

This is additional information for Section 2.4.1. *The Music Room*. This is an overview of the workflow of the Max patch in /3.Max_vvvv_patches/2.3.1.The_Music_Room/MusicRoom_Max/0.MusicRoom_main.maxpat. First, the Gametrak data was received using the same interface patch I created for previous projects (1.muxshield_master_musicroom.maxpat).

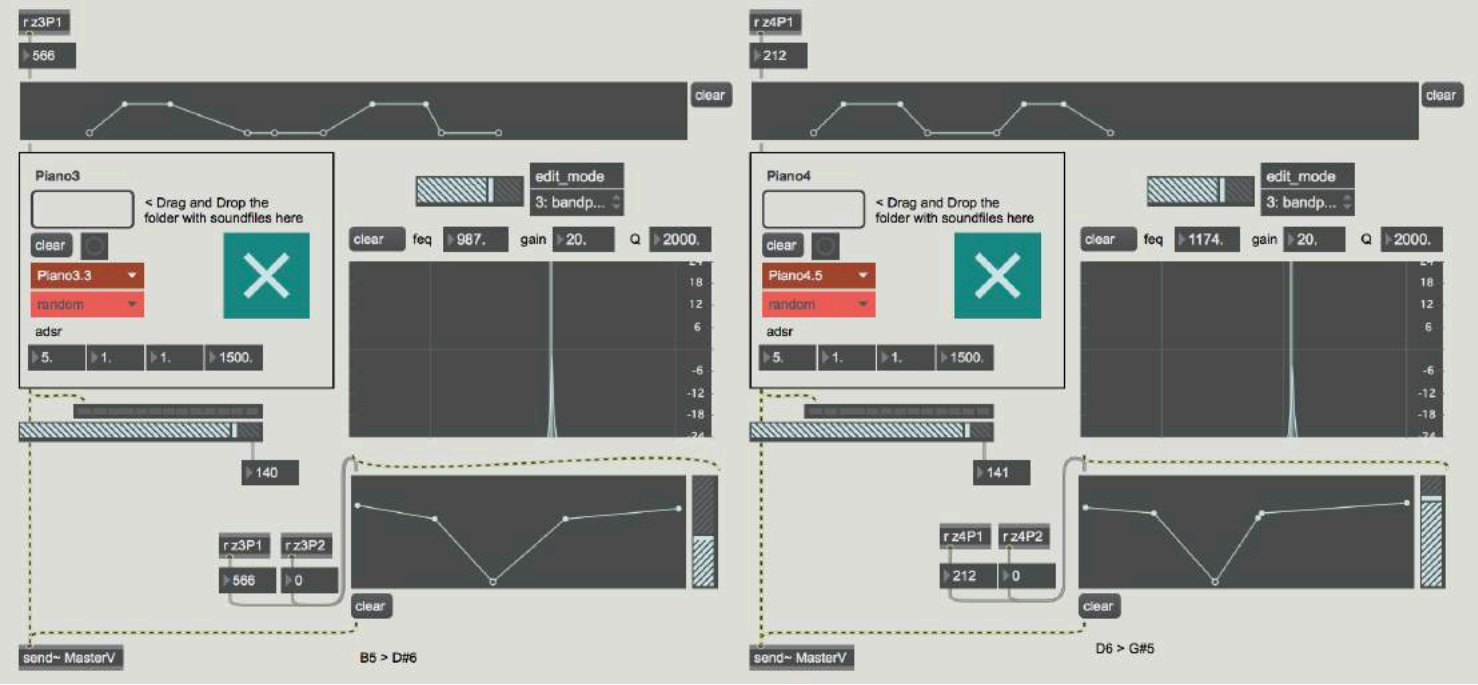
Below is the first part of the main Max patch. It receives the Gametrak data and sends it out to the different parts of the composition according to the clock.



This is the first part of the composition. I loaded the piano notes I recorded with poly~ objects to be triggered randomly. Each poly~ sound player needs to be loaded with the correct audio folder. For instance, for the sound player Piano1, the folder ‘piano1’ in /MusicRoom_Max/soundfiles should be dragged and dropped. I used function objects to map the triggering position depending on how much the Gametrak controllers were pulled. Along with the piano notes, I also created the very narrow bandpass filters with white noise, so that they played sustained background sound with subtle changes depending on the Gametrak data. At minute 3, the bandpass filters start moving to different frequencies.

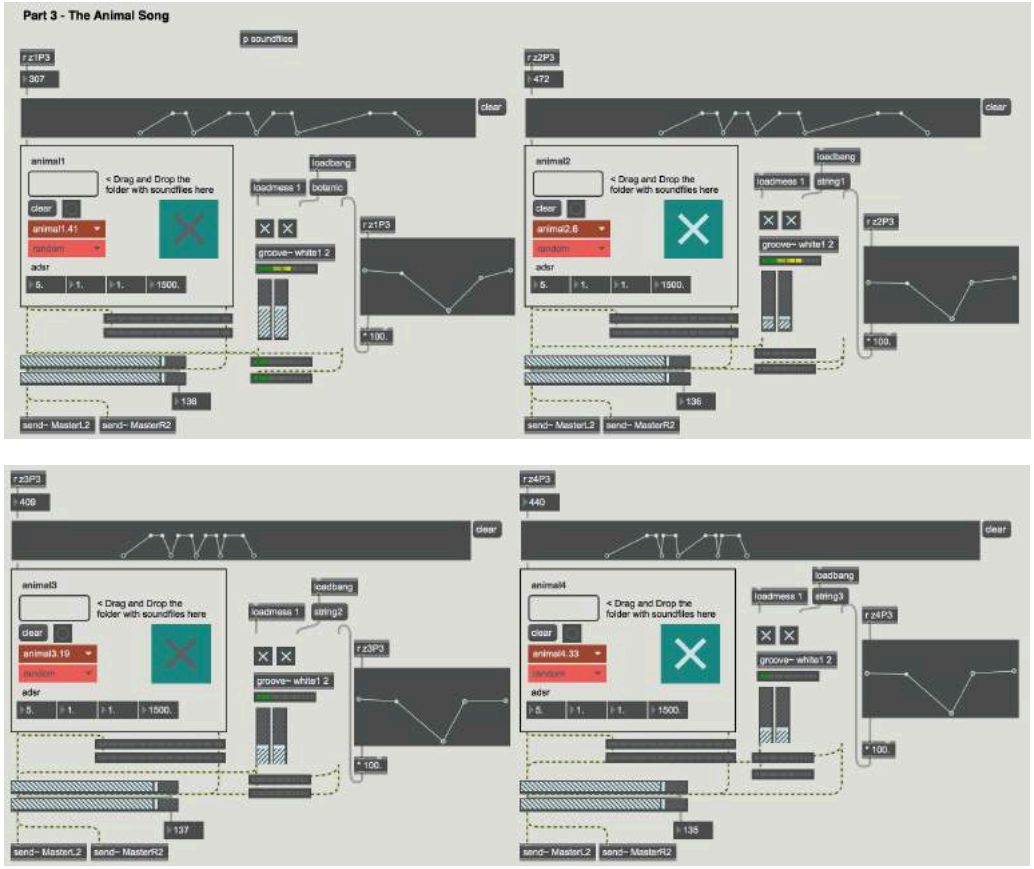


This is the rest of the first part of the composition.



This is the second part of the composition. I loaded the reverbed piano notes with poly~ objects.

This is the third part of the composition.



Appendix I

This is the full take of *The Music Room* before it was edited as the film version – https://vimeo.com/214839917/26e71b8c0d.

Appendix J

This is the uncut version of the improvisation in different sizes of kinesphere for *Queen of the Night* – https://vimeo.com/273756478/8c9b2d817b.