

Sonic Choreosophia

A cross-disciplinary investigation on sound and movement practices

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Declaration

I hereby declare that the work in this dissertation and the work presented in the accompanying portfolio have been carried out by myself except as otherwise specified.

Signed,

Tommaso Perego

Abstract

This thesis is the account of cross-disciplinary research that explores spatial audio experiences in multimodal contexts. The practice of arranging dynamical modifications of spatial attributes of sound to create impressions of movement through sound has been applied to dance choreography and theatre. Using wave field synthesis and ambisonics technologies for spatial audio sound playback, two projects have been created: *Stranded* (2013), a joint choreography for three dancers and sonic movement in collaboration with choreographer Jalianne Li, and *I Hear You See Me* (2014), an audiovisual installation featuring participatory theatre, sonic movement, and motion graphics, in collaboration with theatre artist Silvia Mercuriali and visual artist Simon Wilkinson.

These works are the outcome of a complex collaborative exchange between the author and the mentioned artists and a comparison at multiple levels (aesthetic, technical, cultural) between the different disciplines involved, and propose alternative reflections about spatial audio composition. For example, the choreographic ideas of Li, the aesthetics and movement studies of Rudolf Laban, the works and writing of choreographers Mary Wigman, Merce Cunningham and Pina Bausch have all been used to evaluate the kinetic power of sonic movement and its strengths measured against the clarity and immediacy of a dancing body. The participatory strategies of Mercuriali's theatre, the composite works by Len Lye's, Oskar Fischinger's audiovisual experiments, and historical and contemporary examples from kinetic and installation art have all helped to bring forward a further reflection over a shift of function of sound, from essence of a composition to instrument for realising a kinetic idea.

Highlighting the necessity of a multimodal context when using spatial audio, but limiting the idea of a *Sonic Choreosophia* to a simple suggestion, this thesis thus documents a novel approach of using sound to create movement per se, and its potential for further development.

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Preface

This research is about sonic movement, which is the creation of movement perception by means of sound, or, in other words, using sound to create a sensation of movement. My enquiry is in the compositional methods, tools and technologies for creating sonic movement, including the analysis and design of spatial sound technology arrangements, of performance spaces, and of the different listening experiences. I have focussed on the generation and movement of virtual sound sources (VSS) and their interaction with the physiological and psychological mechanisms of sound perception. I have worked with unique but fixed spatial arrangements and technologies such as the Game of Life Foundation system for wave field synthesis (The Game of Life, 2010), and with freely configurable structures using ambisonic technology, also exploring binaural sound reproduction via headphones. The outcome is two sonic projects which explore contemporary experimental approaches to music production, focussing on the kinetic aspect of sound and on the collaborative engagement with other disciplines, for the development of novel practices and methods of interaction with dance, theatre and multimedia.

In Chapter 1 I discuss the salient aspects of my research methodology and timeline, whilst in Chapter 2 I introduce the theoretical and aesthetic context, and its inspirational motives. In Chapter 3 I focus on answering important questions regarding the technologies used, comparing the directions taken with the two main projects. I also describe how my methods of sonic movement creation and collaborative practice evolved considerably from one project to the other, in their organisation and application. In Chapter 4 and 5 I describe the two main projects: *Stranded* a joint choreography for three dancers and sonic movement, and *I Hear You See Me (IHUCM)* an audiovisual installation for sonic movement, visual projections, and participatory theatre. These two chapters consist of detailed artistic descriptions, interviews with audiences, feedback collected from collaborators, and the individuation of the different kinetic ideas realised and their significance. I have also included the analysis of several relevant preparatory works, some of which are published work, and others simply attempts or drafted ideas that took more important developments later on. In Chapter 6, finally, I describe the practice of sonic movement creation as my artistic enquiry into spatial audio, and I draw conclusions regarding the significance of its results for my artistic development, its cultural implications, and about its potential expansion in collaboration with other disciplines.

Chapter 1

Research context

1.1 Virtual sound sources

Virtual sound sources (VSS) are a perceptual phenomenon by which the “listener perceives an illusion of a single auditory event” (Pulkki, 1997: 457), although produced by two or more coherent signals. This phenomenon relates to our mechanisms of binaural perception: we are able to distinguish the different arrival times and intensities of a sound to our ears (by detecting atmospheric pressure disturbances), and the spectral differences that appear between the two sounds as a consequence of the different paths taken, and through this to localise the sound source (Blauert, 1997). By intervening artificially on this mechanism, distributing a sound from more than one loudspeaker source, and manipulating the sound’s spatial cues we are able to create the illusion of a virtual source.

In two-dimensional amplitude panning (intensity panning) such as in domestic stereophonic amplifiers, or professional mixers for example, the illusion of a single auditory event “can be placed on a two-dimensional sector, defined by locations of the loudspeakers and the listener, by controlling the signal amplitudes of the loudspeakers” (Pulkki, 1997: 457). A similar effect can be extended to the three-dimensions by increasing the number of loudspeakers and channels and by using more complex panning techniques (*ibid.*, and Gerzon, 1973). A virtual source appears then in an area formed by the interaction of two or more loudspeakers and of size and shape dependent by the loudspeakers number and positioning, the listener’s position, the type of sound, and other psychoacoustic factors. This area can be termed, as in Rumsey’s Spatial Audio, the ‘sound stage’ (Rumsey, 2012: e.g. loc. 358, 802, 816, 1149, Moylan, 2007: 49-50).

The ability to generate the impression of a sound source in a location and its movement from one location to another can be considered in itself as a powerful kinetic tool to explore artistically, which is the aspect that interested me. The position of a virtual sound source, within the limits specific to each perceptual sector, can be changed and moved towards, away and in certain cases around and above the listener. Even the path and duration of this movement is often taken into account as an interesting acoustic effect. VSS can be employed in music composition, soundscape design, sound installations, acousmatic music, or in general in any form of electroacoustic music or sound production that is projected via loudspeakers sound systems, and they have been

created and used through different loudspeakers setups for various application in theatre, music, film, dance, art and sound art. The effects they produce are generally referred to as surround sound, spatial sound, 3d sound, movement of sound and more recently as sound choreography (Eckel *et al.*, 2012). I have chosen to use the term 'sonic movement' instead, as movement is the subject of my investigation, realised by means of sound.

1.2 Locating my practice

The context of my practice is spatial audio, multichannel audio, and electro-acoustic composition, but I have been influenced also by other sonic art practices such as acousmatic music, soundscape composition, and installation art. Using sounds obtained from several sources, I focus on the loudspeaker as the medium for the playback of digital or analog-digitally processed sounds, and in this sense on the loudspeaker as an instrument, able in various configurations and combinations to achieve different musical results. It is then through multichannel spatial audio composition, and the use of several loudspeakers combination effects (with their acoustical and psychoacoustic implications) that I have found myself working on movement, researched not as one of the elements of the sonic composition but as the aspect through which everything else connects. The development and nowadays accessibility of technologies for spatial sound have also helped my interest growing to this point. My aim became to create artistic work based on the impressions of movement realised through sound. I have chosen to refer to this practice with the term “sonic movement”, to clarify and distinguish its focus from the other more general and already in use terms, such as spatial audio, spatial sound, surround sound, and 3d sound.

An attempt to identify a common artistic context for my practice of sonic movement is quite complex and would be inevitably approximate. The reason is that not all the artists use the same technologies, and their approaches and interests vary much. Because of this, differences easily arise on many levels, that make the artistic findings quite not relatable. Looking at movement research, I would mention two works for dance and ambisonic technology called *Night:Light* (2012) by Alban Richard, Raphaël Cendo, and Valérie Sigward, and *TranSonic* (2011) by Stan Wijnans. The former uses dance, live music from an acoustic ensemble, realtime ambisonics technology spatialisation with additional wave field synthesis, and light projections, the latter uses ambisonic technology and sensors technology to track dancer's movements and coordinate through them the perceived movement of sound. I have no record so far about works for dance that has been written with wave field synthesis, although, potentially, *Night: Light* might have used the WFS resources of Espro (Espro, 1978). In the archive of works written for the wave field system by the Game of Life Foundation, no work for dance and sonic movement has previously been made. The foundation, though, has an extensive archive of spatial audio compositions, which deal with spatial attributes in other and different ways: some works focus on the movement of sound as a physical sensation of spatial trajectories (A. Sauer), some on the sense of time felt within space (Y. Kyriakides), or on the subjective and perceptual (R. Henke), others with compositional issues like rhythm (R.

Funcken) and the spatial arrangement of the virtual sources themselves (K. Tazelaar, M. Negrao) (source: Roebroeks 2013, The Game of Life Foundation's sonic works archive, and Casper Schipper technician of the system). Overall, the use of movement of virtual sound sources and multichannel composition relates these different approaches to my practice, also in particular the study of interaction of spatial attributes with other musical parameters, and furthermore the inclusion of dance and other audiovisual stimuli (as in Cendo and Wijnans) seem to address certain aspects that are at the foundation of my own research.

Other kinds of sonic compositions, installations, or theatrical works that featured spatial audio and a more specific interest to the problem of movement have come to my attention. For example Natasha Barrett's installation *After Shock* (2011) is based on head tracking sensor technology to detect changes in orientation of the listener, synchronising the sound spatialisation perspective to the wandering of the participant in a pre-defined space; *Osmose* by Char Davies (1995), *Cosm* project by Graham Wakefield (Wakefield, 2008), and *Papasangre* (2013) by Somethin' Else (Somethinelse, 2013) are, in different forms, a recreation of a listener's journey through immersive, multi-perspectival worlds of audiovisual and 3d audio suggestions. Theatre works such as *Etiquette* (2007) by Rotozaza, my own works with Mercuriali such as *Wondermart* (2009) and *The Eye* (2012) - about which I will talk about more extensively later on in the text and in the appendix- and *The Ring* (by Rosenberg and Neath, 2012) all explore aspects of audio or spatial audio perception synchronisation with physical and visual stimuli in different forms. For example *Ring* (2012) by David Rosenberg features darkness as the major element in support of the spatial impressions given by binaural and three-dimensional audio recordings: the story unfolds in total darkness which greatly favours the effect of the auditory cues. *Etiquette* contains several physical and auditory connections to create illusions or suggestions, like for example diffusing the audio recording of a rainfall sound, when the participant is receiving on his/her hands some drops of water while keeping the eyes closed.

Although my approach and aim are to make compositions with spatial audio, I have significantly expanded towards cross-disciplinary and multimodal approaches. I made this choice by thinking that multimodality is essential to a more comprehensive idea of movement perception through sound. I have thus developed my projects through the relationship with artists of different disciplines, and the methodologies I have employed have been the outcome of a collective decision and collaborative effort, a true product of a unique mix of different artistic forces. I share several elements with sound design and scoring for dance, interactive theatre, and installation art. I also get close to kinetic art's explorations (Popper, 1968), and the influential works by Marcel Duchamp, Fernand Léger, Vasarely, Lenn Lye, Oskar Fischinger, especially those that featured light and sound, and more recently by Ray Lee *Siren* (2009) or *Stylus* (2013) by Trope (Trope, 2013), which I'll discuss more thoroughly later in Chapter 2.3.3. Practices such as virtual or augmented reality (as the mentioned *Cosm* project

by Wakefield) have also been influential, although my focus remained to explore kinetic sensation via the preparation of fixed effects rather than exploring generative techniques, and artificial intelligence interactivity.

1.3 Methodology

This text documents a practice based research (Nelson, 2013; Biggs and Karlsson, 2010) and its contextualisation. It describes two projects that consist of two compositions for sonic movement conceived, planned and realised through two main collaborations: with choreographer Jalianne Li for *Stranded* (2013), with director Silvia Mercuriali and video artist Simon Wilkinson for *I Hear You See Me* (2014). Each collaboration started from an initial engagement on the topic of sonic movement, mainly unfamiliar to the collaborators since they have never worked with it before, or not intensively. Subsequently, we designed ideas accordingly to the possible interaction between our respective disciplines, and the individuated performance spaces that could accommodate them, preparing and exchanging materials for a few months. Then we organised several sessions in the performance spaces, where we tested the different ideas and suggestions.

To document the research I have included video recordings of the different performances, photos, and relevant audio files [please see Appendix I and III for details]. For *Stranded* I have managed to document the entire performances from within the audience space, wearing a video camera and binaural microphones, to render the sensation of being in the space [Appendix I, a.1.1, a.1.2, a.1.3]. For *I Hear You See Me* instead, because of the inaccessibility due to the darkness and the intimacy of the performance, and because it is in double roles, I have prepared a video documentation with a split screen of a montage of video recordings from different performances and the motion graphics [Appendix I, a.2.1, a.2.2].

A description of preparatory works is added, mostly included in the text (Chapter 3.4, 5.6), except for those that fall outside the PhD timeframe, which are discussed in Appendix III. All works are compositions publicly performed or simply drafted projects or experiments, and constitute important steps in experimenting with technologies and towards defining the methodology itself of working with collaborators for integrating spatial audio in interdisciplinary contexts.

A core part of my investigation consisted in the elaboration of the feedback from audiences (their first-hand impressions of the performance), interviews with collaborators (with Li, Mercuriali, and Wilkinson, and also with the dancers who participated in all the performances of *Stranded*), and with scholars and practitioners in the field.

Through the feedback, quoted where possible, which provided themes for reflection, I have been able to reconstruct the creative process and formulate the ideas organised in this text. Even when not directly quoted, these interviews have still been fundamental in shaping the ideas and the content of my work. For example the interviews with Charles Bascou, designer of Holo Edit software for sound spatial trajectory manipulation (Bascou, 2012), with Wouter Snoei about his WFSCollider software (Snoei, 2012), with choreographer Douglas Wright (Wright, 2012), and dancer Kilda Northcott don't directly appear anywhere but have served significantly to point my research in the right direction [for more information, please see Appendix I, note on interviews].

1.4 Collaborative practice

I have been considering how multimodal integration within our multi-sensory system of perception (Coen, 2015: 2-3) could be beneficial to sonic movement's creation strategies and appreciation. Engaging in collaborations with dance, theatre, and multimedia was then functional to this purpose because interdisciplinary arrangements could offer complex multimodal stimuli exchange. The multimodal integration concept refers to the fact that:

our perceptual streams are far more interwoven than conscious experience tends to make us aware,
(Coen, 2015: 3)

and the design of performances for one sense only, like hearing in sound performances, would miss out many aspects of perception that contribute to the formation of the sensation. The perception of movement in itself is a multimodal integration of vision, hearing, and proprioception (Murray, 2012, Walk and Pick, 1981). Using sound spatial attributes to generate movement sensations most often engages the hearing but not as much, neither sufficiently, other fundamental sensorial factors. Confusion about movements, sources position, and trajectories is likely to arise in those circumstances (in general Blauert, 1997: chapter 2.1 and 2.5).

To further clarify, I am considering here the psychophysical aspects of perceptual streams and not their phenomenological interpretation. I am aware of the discourse on significations by Merleau-Ponty (1962), and the subtle characteristics of the experience of sound as analysed in Voegelin (2010), and in particular I have also thoroughly explored the relationship of music and motion as discussed in Clarke (2005, chapter 3, in particular loc. 652), as part of an in-depth reflection over and analysis of sonic movement. Before any interpretation though, what mattered to me was to establish the concepts of intersection, exchange, and constant progress as observed in how our senses operate.

In my earliest practice with spatial sound, some elements have recurrently come to my attention for they changed considerably the sensations evoked by the movement effects: the synchronicity of sonic movement with visual inputs, the activity of the listener and its related attention levels, the listener's orientation in the space. These elements seemed to be of a certain importance in the appreciation of sonic movement, for they marked different modalities of perception and the quality and quantity of inputs reaching the perceiver.

By synchronicity with the visual input, I refer to the accompaniment of the spatial auditory perception with visual elements, which could be objects, bodies or light moving in the space, or also self or other listeners' presence and actions. These elements affect the perception of sound, and in particular of its spatial attributes, and the explanation can be found in multimodal integration processes (Coen, 2015: 2-3, Butterworth, G. In: Walk and Pick, 1981, Lickliter *et al.*, 2000: 260). Visual input could provide situations in favour or contrast to spatial hearing perception (Blauert, 2005: 111-118), and for the composer to control it means to be able to access important and influential parameters for the composition of sonic movement.

The synchronicity of the visual input to the perception of spatial attributes changes goes alongside with the listeners' activity. By activity I mean those actions the listeners would perform (passively, or actively) while listening, that could affect (positively and negatively) their level of attentiveness to the sound and spatial attributes changes. In loudspeakers sound diffusion performances, the dull, uninteresting sight of a performance room made out of loudspeakers and walls, with no performers to watch, makes it difficult to keep the focus for a long time on one sense only. Also, environmental distractions, such as those due to the vicinity to other people, affect the attention levels. Darkness is often used as to protect audiences from these unwanted interferences.

Finally, the orientation and motion of the body while listening have great importance when spatial audio is used (Blauert, 1997: 177-190), and spatial audio is particularly sensitive to seating arrangements: the orientation of the listener plays an important role in the formation of acoustic artefacts in respect to a particular sonic movement, affecting the clarity of the movement and consequently the overall construction of the perception. Even a slightly offset position of the listener can cause larger imprecision or greater resolution in sound localisation. This ambivalence could be a disadvantage, but also an advantage in artistic terms since strategically it could be handled for creative purposes.

These three elements raised many questions about sound reproduction through loudspeakers. When the sound's spatial attributes get used so extensively to become the primary part of a sonic composition, the absence of

visual references during the listening is an issue that needs to be addressed. The orientation in space of the projected sounds, and consequently their perceived movement, is constrained by a certain listening etiquette or custom, which limits its reach. That has to do with the sound system and the position of the listener within the system, in particular with the sound stage (Moylan, 2007: 49-50) that inevitably forms between the listener and the loudspeaker technology, through the sound and the performance space.

I have therefore reconsidered my practice and expanded my sound making by including coordination with other stimuli, including sonic movement in a dance choreography, interacting with light projections, or with other participants on stage. I have realised two different contexts where listening is not used exclusively but treated as part of a complex multimodal system of perceptions. Visual input is included in support and dialogue with the perceived changes of spatial attributes of sound, to enhance the sense of place of the performance, control psychoacoustics ambiguities, and invent cross-disciplinary interactions; the listener's experience is reinterpreted and activated through changes of perspective, multimodal stimuli, and proprioception.

Under this focus, a collaborative practice meant for me an opportunity to expand towards extra-sound territories for the realisation of a system in which I could produce original sonic work, experiment with multimodal integration, and explore unusual paths of creativity. Through collaboration, my approach to electroacoustic and loudspeaker sound reproduction has changed. As opposed to making considerations on my own on how sonic movement should be designed, I have tested it by presenting it to other 'ears', in a progressive refinement of ideas, through critique and evaluation on a very practical basis: how sound effects are effectively heard in the space? The collaborative process promoted a dialectical interaction of opinions, and I took on board the experience of other disciplines: many examples from dance works, scholars' reflections, my preparatory work with dancers and choreographers [Appendix I, a.1.6, a.2.3], kinetic art in the plastic arts, motion graphic and examples of the application of multimodal design. From this debate, I have matured the necessary knowledge that supported my practice.

1.4.1 Dance

Dance is an inspiration and reference when making performances based on movement. Directly from dance comes the experience of movement as a communication intermediary between the dancer (and choreographer) and the audience, where the dancer acts as the "ideal instrument of expression" of emotions, feelings, and narratives (Wigman, 1966: 21). When composing movement ideas to be expressed by sound, a powerful challenge is to achieve the same level of artistry of the bodies dancing on a stage, with their complexity and articulation of communication, and their nuances of structure and composition. From dance comes the

awareness that emotions could be combined and structured into complex flows, evoked by movement's plasticity, and symbolism.

I have taken inspiration for relating the two disciplines of sonic movement and dance, from many different examples: from Rudolf Laban and his theories about movement construction, perception, and aesthetics, with which he has put forward the idea of dynamic nuances, "action-moods", a direct link between movement and the intention of the choreographer and of the performer (Laban, 1966: 55), or from the suggestive styles and interpretation by Mary Wigman, Merce Cunningham, Pina Bausch, or New Zealand's choreographer Douglas Wright. Often, to distinguish the character and style of choreographers or composers, I have been looking at the relation movement-sound, whether it is like the body being the intense and word by word representation of music like in *Arc Trilogy* (2000) by Douglas Wright (Wright, 2000), or like music and dance being paired by chance operations as seen with Cunningham, David Tudor and John Cage for example in *Variation V* (1965) (Cage, Cunningham, 1965).

I have been questioning the nature of my interest in the kinesis produced by sound, the relationship between movement and sound in sonic movement, whether it could be compared at all with what dance can represent, also given the absence of the most remarkable element of communication which is the human body. There is probably no direct translation of how movement is created in dance and with sound, as they are two very different media. In particular, the body is different from sound, whereas sound in its sonic movement is at the same time the one that moves and the one that musically accompanies the movement. The perceptual characteristics of sound imply then, comparatively to dance and body, different ways through which a movement sensation could be built and structured.

In general, visual feedback is absent when perceiving changes in spatial attributes of sound. With loudspeakers sound playback there are no visible performers, and the individuals experience movement through sound perception, at the resolution of the auditory system (Blauert, 1997). Compared to vision, audition is more imprecise in detecting location and distance (*ibid.*: p37-39, Voegelin, loc 33), but on the other hand, provides all round, almost tangible sensations at times (the concept of resistance in Lusseyran, as I will discuss later in Chapter 2.2.2). In dance, there is a much more direct relation between the movement generated by the body and the body's spatial position and speed. In the most widely used theatrical form, although dance has its origins in the ritual (Turner, 1982), the viewer receives direct, immediate sympathetic feedback, as the body is the common

element between the performer and the spectator. As to overcome these differences, in our everyday perception, a constant mutual exchange of information runs between vision and audition, and our system optimises the best information needed at any one time (Haverkamp, 2013).

I have used dance as the visual counterpart to sonic movement, to partner into a sonic choreography. When working with the dance choreographer, I have spent considerable time looking for a balance and definition of the joint choreography of sound and body, working on the intelligibility of the sonic movement's structures for the dancers, and on their meaningfulness for the audience. 'Dancing with sound' was quite an appealing idea that immediately sprung to mind, as soon as we were in the diffusion space. We organised a way to make dancers dance with sound.

Movements perceived in sound, through the reactions or simultaneous actions of the dancers, seemed to acquire more sense and depth, and remained more clearly into the memory and imagination of the dancers and audience, to the point it has been possible to elaborate and develop them into a joint choreography. An interesting development of a dance performance, this also, and at the same time, became a system of reciprocal support against the complexity of perception, in an artistic exploration of the contemporaneity and cooperation of vision and audition.

1.4.2 Visuals

In the same spirit and function, I have also used other visual inputs beside dancing bodies. I have been expanding, supporting, and at times contrasting the effect of the sensation of movement produced by sound with visual projections of motion graphic and light effects. Light, differently than dance, transfers energy and dynamic nuances that suggest movement even in the absence of a body. Light can indeed trace and follow another moving partner on stage, or being a moving object itself to synchronise with sound, but can also become anything, as it can pass from being an object in space (any picture, shape of form can be realised), to being an enveloping shade or a blinding effect.

Using light for movement creation, as seen in motion graphic, film, but also painting and sculpture, has been considered by Popper as a practice of Kinetic Art. Popper explains that:

the last group of important works within the overall field of Kinetic art is concerned with light and

movement. Works of this kind can be traced back to three distinct sources: the colour-organs, the cinema and the mobile theatre set. [...] Luminous movement is displayed, almost universally, on a surface such as a screen or wall, and may be accompanied by music. It was effectively around 1920 that the changes in colour and form in various types of work were summed up in what was a genuinely new art.

(Popper, 1968: 245)

The use of light to produce movement marks a continuous expansion and development of movement practices since 1860, in which:

innovators in the plastic arts have exploited an ever increasing range of new materials and techniques, and that through a series of aesthetic investigations which have led them to the very highest categories, they have transformed the image of movement in art into a genuine art of movement.

(*ibid.*: 246)

Popper distinguishes two main types of work on movement in Kinetic Art, those that exploit virtual from those that use real movement. Virtual movement, proper of the Plastic Arts, is intended either static or kinetic as long as it realises its "aesthetic value when the spectator has responded in accordance with its intention" (*ibid.*: 93). In particular, psycho-physiological phenomena are of this kind. That is, in simpler terms, the movement implied by a picture framing a dancer in motion, for example, or also the sensation of movement originating from illusory optical effects. The real movement involves instead "real modifications in space [...] [different from those] which merely indicate the presence of space in a symbolic or illusionistic way" (Popper, 1968: 93).

When working with sound to create movement sensations, I have found that referring to such a distinction could become very useful to set the grounds for an in-depth analysis. Clarke's enquiry whether the event-detecting "nature of the human auditory system" could lead to sensations of movement, challenges sound making with spatial audio in many ways as:

there are some interesting questions about *what* listeners perceive as being in motion; and that the varieties of motion specified in musical sound together constitute a crucial component of listeners' perceptions of meaning in music.

(Clarke, 2005: loc 641)

It seems that, then, sound shares both the definitions of virtual and real movement. I have discussed these aspects more thoroughly in Chapter 2.2.3 and 2.4.

The experience of kinesis through light shows that movement doesn't just resolve into geometrical patterns, trajectories or shapes in space, but can be the result of complex interaction between the real (physically perceived in space) and the virtual (Illusions, static effects, psychological). Dance shows that the kinetic emotion has its roots far deeper than in the plasticity of the figure and gesture (Laban, 2011: 82-95). Dance and light have thus brought a widening of perspective on movement conception, which suggested the rightfulness of an interdisciplinary approach.

Not necessarily, and not all the times, sonic movement has to do with geometrical placement and motion within a space. Sound can contain motion in itself for example either by illusion effects (Deutsch, 1999) or auditory streaming segregation effects (Bregman, 1994) or by semantic-symbol, psychologic and physiologic effect as the perceived motion in field recordings of alive and moving sources (Smalley, 2007, Barrett, 2011). Works by Varèse and Stockhausen were about physical or illusory movement of sound, as effects obtained through and across the instrumental (or orchestral) groups (e.g. Gruppen, 1955-7), or through the physical placement of the loudspeakers and the rapid switching of sound through them, according to specifically composed paths (Poème électronique, 1958). Two channel stereophonic sound has been until very recently the most widely diffused technique for creating spatial sound effects (Rumsey, 2012).

In my practice, I have used virtual sound sources diffused by a multichannel diffusion system, to recreate the psychoacoustic illusion of changes into spatial attributes of sound. I have come to work on synchronising or juxtaposing, contrasting or supporting different kinetic perceptions, for exploring sonic movement through the physicality of dance but also through the immateriality of light, focussing on the listeners, their perspective, and participation.

1.4.3 Theatre

As a further step into my exploration of movement, I have approached experimental theatre practices (e.g. *Autoteatro* by *Rotozaza*, Hampton and Mercuriali, 2007). I wanted to use text and storytelling in my work, to

interact with light, body and sonic movement. To do so, I have focussed on the point of view of the listener, constantly changing the sound stage (Moylan, 2007: 49-50), shifting its role from simple spectator to participant (Small, 1998, Rancière, 2009).

Sonic movement is made with sound, a set of kinetic suggestions from the balanced manipulation of its inner and spatial qualities. Dance and visual projections both rely respectively on body and light to create an experience of movement, each of them articulating movement sensations through their vocabulary and materials. By combining sound, body, and light, I have been looking into enhancing the experience through cross-reference and mutual support. In this fashion, though, the listener's physical presence was still left untouched by the interaction of vision and audition, separated from the sonic and visual experience, left in silence, immobile. Theatre has provided the link for involving the listeners as protagonists, by introducing participation.

The experimental theatre techniques by Mercuriali, called *autoteatro* (Hampton and Mercuriali, 2007b) and pioneered when she was co-director of *Rotozaza* with Ant Hampton, transformed theatre as we know it into a self-led discovery and game of roles, engaging the listener in actions and reactions enhancing participation, attention, and immersion:

autoteatro works, so far, by participants following a series of instructions, often via headphones, which lead them into alternating roles of performer and audience. In *Etiquette* (2007) [...] - the first *autoteatro* show and the last under the name *Rotozaza* - the starting point for this was conversation; we figured that when couples get together in a cafe, there's always someone speaking and the other listening - actor and audience - under the implicit contract that those roles are regularly swapped. When we want to sound like engineers, we talk about 'mechanisms for self-generating performance'. [...] You're alone with each other in the awareness of the performance happening, and yet you're in public space, surrounded by others oblivious of anything taking place. As always, the private and public spheres rubbing together create a certain thrill.

(Hampton, 2015)

I thought of *autoteatro* as a subtle way of increasing attention and directing the listener/participant's effort without disrupting the enjoyment of the performance. Attention is increased through instructions, the role playing and the ambiguity of being at the same time actor and spectator. That is an alchemic factor that works positively towards

engagement and participation. Through the separate practices of Hampton and Mercuriali, *autoteatro* has been used to explore very different human interaction contexts or places, as in *Bench* (2010) or *Quiet Volume* (2011) by Hampton, where an encounter on a bench or in a library starts up a dialogue between participants, or in *Wondermart* (2009) by Mercuriali where a supermarket space (intended as a 'non-place' as from Marc Augé's book: Augé, 1995) is explored: two people's actions are synced in their independent journey through the aisles of a supermarket until both meet, spend some time together, to separate again in the end. The personal involvement of spectators, through scripted but unexpected encounters, create that thrill which I have intended to use for promoting participation in my work.

I remember the beginning of Rotozaza's show *Etiquette* (2007), when the instruction of placing a finger on the table produces, in the headphone via syncing, the sound of a piano chord: I have felt an intimate connection between my action and the sound, that also expanded over giving an immersive and enthusing sense of being in the story, as its involuntary protagonist. On a smaller scale than what usually happens with dance, these interactions with sound are lived in first person, intimately. I have worked in this direction within the context of spatial sound, looking for realising a sense of intimacy by changing through instructions the listening position (using standing into sitting and lying down), getting closer and towards the sounds, while maintaining the accuracy of the auditory perception.

With using text I could also introduce concepts, symbolic references, to enrich the sonic experience, exploring the psychoacoustic factor of our familiarity with sounds, important in spatial hearing (Blauert, 1997), and some auditory illusion effects (e.g. Deutsch, 2013) as part of the kinetic construction. The influence of these elements seemed to me to have always been underestimated in spatial composition.

I have thus expanded my palette of kinetic effects with words, story, actions, light and body. I have also gained control over the listening orientation, as, through the *autoteatro* strategy, the listeners themselves become those who initiate the interaction sound and body. The visual and auditory combinations - as with dance- produce feedback to the listeners about to where the movement is and what is doing, the conjunction with the narration and the theatrical dramaturgy draw them into the story, and the instructed actions into a personal, intimate exploration of the sonic movement's kinetic artefacts. Adapting a Hampton's quote, I would say:

to create a balance of participation and surprise, and an awareness of being both in and under control [...] as readers/ listeners/ do-ers/ participants, we [...] enable the strange, triangulated dance between [ear], eye and imagination.

(Hampton, 2015)

With dance, I have been trying to bring the audience to the same space as body and sound, with the participatory strategy, I have changed the listener/spectator into an actor/participant. Through the mechanism of being in control or under control, I could direct focus and attention towards what is each time most necessary for the kinetic experience. The participants, involved intensively by the instructions and the sounds, almost overwhelmed at times, would go through a more enthusing and demanding way of listening -if compared to the average spatial sound performances-, listening, looking and acting embedded into a *sensorium* experience.

1.4.4 The collaborative exchange

Through the collaborative work, I have engaged in direct creative discussions with artists of different disciplines. Their reactions and reflections have served simultaneously as a critique, reference, and a creative stimulus. They have helped me getting into focus the shape and structure of the work and indirectly influenced my practice. From our discussions and comparison of experiences, I could gather valuable information about the kinesis of sound and how to control the dynamic changing of spatial attributes in the best way for each context. Similarly and interestingly, their personal reflection on the role of sonic movement in their work and its inclusion have also challenged and influenced their practices in return.

Jalianne Li, the choreographer I have collaborated with for *Stranded* (Chapter 4), deeply investigated the role of sonic movement in her choreographic organisation, and for the first time she had to think of sound as to a spatial partner in the choreography, as one of the dancers, rather than just focussing on timing or pitch as before.

In choreographing, I don't necessarily think of the correlation of where the dancers are on the stage with the sound, but on this occasion, I had to, and that was a very different way of thinking.

(Li, 2013)

Jalianne's contribution has been influential for me to re-work my practice methods, in particular with assessing the perceptual issues in the space (Perego, 2013: 1). When I have first introduced Jalianne to sonic movement,

she asked me to play her sounds creating a straight trajectory in the space, but that did not result in the expected listening experience, as the sound was perceived all round from the loudspeakers and not at the intended point in space. She could not hear the sound in the position and trajectory that I have meant it to be, suggesting that, for it to be a working movement perception for the dancers to dance with, it had to be much more precise and convincing.

Jalianne's requirements brought me to reflect on my practice and how I was thinking of movement created with sound. I have realised that relying on the software system for making and displaying trajectories wasn't enough to understand precisely the type of sensitivity at play. The physical, pragmatic outlook of the choreographer in the space was something missing from my practice of composer and inspired me to push my understanding of the phenomenon of kinesis further. From that moment on, I could not just simply plan ahead how sounds would appear, but had to go and test them directly in the space.

Silvia Mercuriali and Simon Wilkinson, my collaborators for *I Hear You See Me* (Chapter 5), had their own views on how to relate to sonic movement. Silvia imagined the body and its actions, and how they would affect the perception of sound; Simon focussed on how to enhance and transform it, by syncing to video and interlacing with images. From earliest attempts, Silvia has immediately found connections with some interesting literature: Murakami's novel *Hard Boiled Wonderland and the End of The World* (1985) suggested her idea of the shadow, to be used as a powerful metaphorical link between body motion and sound. She thought of using the real shadow of the participant, accompanied and moved by the body under the projections' light as if mirroring the relationship between the sound and its movement. As the shadow belongs to the body in the novel and will have to be stripped away, likewise sonic movement could be joined and synchronised to images and actions or used freely and independently.

The first time they both proposed to me the plot of their ideas, I was struggling to think how I could create sonic movement in that scenario. The story of a man and his shadow, the intense feeling of mystery and isolation spreading out of Murakami's novel, it was far too much for me to handle and make sense of kinetically. I wanted to be able to keep sonic movement as the central motor of the work, and I wasn't sure my message went through with them clearly. Far more straightforward was, in fact, working with dance on the idea of a joint choreography, on a simple and well defined sound stage. In this case instead, the kinetic seemed disguised, hidden behind a story, unfolding through physical apparitions, themes, and events, with a sound stage appearing very

complicated to realise. A different idea, of a private and intimate experience of kinesis, central to the work structure but flexible and transformable whichever circumstance required it, was starting to grow, and afterwards took the form of the arrangements of changes of perspective within the show itself, through participant's motions.

It is for these types of interior conflicts, adaptations and trial and errors that I consider my work as truly collaborative. A reflective, recursive exchange between the collaborators and me has been the perfect scenario for the exploration of the interaction between vision and audition, concerning sonic movement creation. Strong ideas about the performance of sonic movement have flourished, pushing my practice further into unexplored domains. Creating exclusively for the auditory sense would not have engaged the full spectrum of perceptual mechanisms, and would have isolated or blocked out those elements which I believe are instead beneficial to movement realisation. Limiting the multi-sensory out of the performance design could mean neglecting a significant part of the experience.

1.5 Intra-sensory

In my preparatory work with dancer and performance artist Noora Baker (Chapter 3.4.2) I have studied a simple back and forth movement of virtual sound sources. When associated with a dancer's similar motion, it could automatically clarify the kinetic of sound, more efficiently than when experienced with audition alone. While learning to practice with sonic movement, I have come to the conclusion that instead of demanding to the audience to make complex deductions based on solely auditory cues, I would have been more successful by providing other visual (body, light), semantic (text) or physical (own body movements) cues, that is creating a context to facilitate intra-sensory experiences.

I have decided that the way to follow was to construct my sonic work step by step in a multi-modal way. I have thus organised a context in which vision and audition would act simultaneously (happening at the same time, but not the same suggested movement) or synchronised (the same movement and at the same time) to sonic movement. Synchronicity was the general starting point for multimodal connection; simultaneity was the most open to kinetic development. One method applied with Noora was, for example, to start from synchronisation of her body movements with the sound, and then slowly evolving into simultaneous events.

The logic I have followed was that spatial hearing properties of sound should be generated not only from acoustic cues but by a complex set of stimuli composed of spatial hearing, physical and psychological elements, but also

other cultural, sensual, and cognitive factors.

[Multisensory stimuli] add depth and complexity to our sensory experiences, [...] and enhance the accuracy of our judgements of environmental events in a manner that could not have been achieved using only independent channels of sensory information.

(Stein et al., 2004: 27)

Several cognition studies confirm that the combination of vision with audition is an opportunity for development and artistic investigation. For example, when cross-modal effects in attention and speech perception, the quality of the visual scene, and spatiotemporal interaction have been studied, findings showed that:

vision and audition both contribute to the response to the surplus of information in our environment. [...] Every sense organ embodies a theory as to which information about the environments promises an evolutionary advantage. Every sense focuses on a small selection from this nearly infinite variety.

(Daurer, G., as found in Daniels et al., 2011: 329)

This view is also supported in Blauert (2005: 108-138) and by Chion (1994: 35 ff, 223). Interestingly, not only every sense could intervene to help the deficiencies of the other, as it happens in multimodal integration, yet some properties can be considered amodal or intersensorial, which means multiple senses can perceived them at the same time.

The psychologist Heinz Werner examined such phenomena in detail as early as the 1960s. When we say that a tone is strong or weak, that a pressure is strong or weak, we are no doubt referring in all cases to a property that is the same in all these sensory domains. Recent research has shown that there are doubtless many more properties than psychology previously assumed that, like intensity, can be called intersensory. These properties are intensity, brightness, volume, density, and roughness. According to Michel Chion, these and other amodal qualities are in fact at the centre of our perception.

(Daniels et al., 2011: 332-333)

Daniels continues (*ibid.* 333) by reporting in more detail about amodal processes and how they could be found among “all people at all times”, confirming furthermore the important aspect of sensorial interconnection, of so

called “primeval synaesthesias”.

Multimodal integration and intermodal analogy [...] are, of course, just two elements in the interaction of hearing and seeing. We should recall that our perception is characterised above all by the complex interaction of all the senses in countless independent processes on different levels and by means of massive parallel processing.

(ibid.)

It is within this context that I have decided to accompany sonic movement with dance, and then to add participation and motion graphics. Electroacoustic practices that adopt or target a “reduced listening” (Schaeffer, 1966) appear in this perspective ineffective for sonic movement appreciation. Opting out the vision (hence the self-definition of 'acousmatic'), and mostly any sense other than hearing, cannot contribute to spatial resolution nor inform on the orientation of each kinesis for particular seating arrangements, perceptions left entirely to the auditory system capacity and subjects' culture and skills.

Murray Schafer proposed the idea of sound event -a broad term to include many semantical factors, such as sound's symbol and those references and links to related cultural elements, believed as important as the actual acoustical structure of the sound-, as opposed to Pierre Schaeffer's “sound object”, defined a "specimen of laboratory" (Schafer, 1977: loc. 2636). The acousmatic developments of P. Schaeffer's ideas, and the composition practices that have been developed since have gone on a different explorative route than the one I wanted to follow for studying sonic movement.

Instead of fixed media diffusion practices, I have looked more into installation art and augmented and virtual reality examples. From these, many elements resonate within my practice, in particular, those about the role of the audience and its function in the activation of the work of art:

installations should not illustrate a situation, but should be geared toward visitor's first hand real experience. [...] A wholly immersive environment in which the space existed for the viewer to activate as an engaged and absorbed participant.

(Samaras, L. in Bishop, 2005: 27)

As with Corsten Hollern's "machines or devices", they are "intended to synchronise with the visitors in order to produce something with them" (*ibid.*: 48). To show how these type of works are conceived to recreate an intimate and personal situation each time, they often need to be reconstructed on specific site and adapted to the different space available. For example Paul Theck' works are reworked for each venue they were shown (*ibid.*: 28), or, as well, Janet Cardiff's *Aural Engulfment* or *Room* (*ibid.*: 99).

Sonic movement needs to be activated by the listeners through their presence and attention. For doing so, the sound design, the sound stage, and the listening experience should be considered as a whole, a unity of unique recursive exchanges.

Today -despite the valuable contributions of neurology, physiology, psychology, sociology, and so on - we understand only a small portion of these connections, only rarely do we attempt to emulate our perception and integrate information from different strands into a harmonious overall picture.

(Daniels et al., 2011: 428)

Whether our perception and interpretation of what is art -the swerve (as in Greenblatt, 2012), the artistic glimpse, or "lucky find" as Stravinsky called it (Stravinsky, 2008: 53)- should source from multi-sensory connections or from a listening reduced to its essence, this is an ongoing issue in spatial audio, music composition, and sonic art in general. Using concepts taken from semiotics, the connotative and the denotative (Garuti, 2015) seem again in opposition. Guattari's *ecosophy* concept though suggests that humanity, willing or not, shapes and is shaped by the world as a whole, not for just a few of our experiences (Guattari, 2008).

Sensory integration, i.e., fusion of information from different modalities into a coherent percept, is characteristic of living species. Only when senses provide conflicting cues must they compete for contribution to the final percept.

(Pulkki, and Karjalainen, 2015: 1)

I have thus tried to stay within these lines for the inspiration of my sonic and kinetic work.

1.6 Performance Space Design

Different sound reproduction systems result in different listening situations and sonic movement designs. Each of

the two spatial audio technologies I have used defines a listening space, with unique characteristics, allowing a certain range of sensations of movement and multimodal stimuli. The choice of technology for me implied a creative choice, went along with the experimentation of the different listening arrangements that could be realised for each technology and affected the design of spatial sound and the performance space.

The acknowledgement that a system could only allow certain artistic strategies for sonic movement came from the direct practice with different arrangements. In basic terms, wave field synthesis' and ambisonic's sound differ, respectively, for the absence and presence of a centre of the sound field (Malham, 1998: 1–12, Snoei, 2012). Within a sound field reproduced with wave field synthesis (I will refer to it from now as to WFS), no particular area presents a better resolution than the others. Ambisonic instead is characterised in its basic form by a loss of resolution the further away from the centre of the loudspeakers' space. As shown by Sascha Spors' study (Spors and Ahrens, 2008), at least in the laboratory, ambisonic and WFS still reproduce spatial attributes of sounds with noticeable differences even when using higher order ambisonic (HOA), which should instead equal the WFS resolution. What mattered to me were the different results obtainable with each of the two technologies in defining the most effective listening area possible for an individual listener or groups of listeners, and consequently the way their characteristics could determine what type of sonic movement to realise.

I have worked with ambisonic for the creation of performance for one individual (*Wondermart* and *The Eye*, respectively Appendix II aa.2, and Chapter 5.6.1) or for a group of listeners (*Axis Mundi*, Appendix II aa.1). With the latter setup, I have also tried to include dance within, as in *Untitled, Two on a white surface* (Chapter 3.4.1). I have also experimented with overlapping two applications of the same technology (3d sound in binaural through headphones, from opposing perspectives) with choreographer Noora Baker (Chapter 3.4.2). As I explain in Chapter 3.4.1, the sonic movement for *Untitled, Two on a white surface* was designed to accompany and emphasise the dancers' motions, but not to be directly involved in interactions with them. The dancers, also, were placed in the middle of the performance space and the audience around them. For these reasons, on that occasion, ambisonic technology has worked well. I have realised though that for expanding my movement ideas, increasing the interaction with the dancers, and allowing them to move anywhere in the space, a WFS system could have offered more solutions than ambisonic, especially for arranging audience and dancers within the same space.

I have seen a compelling and artistically relevant relationship in action between the sound, the listener, the technology and the performance space, which is overlooked when organising a performance of sonic movement for an audience seated in a 'proscenium' arrangement. For example, with circular arrangements of loudspeakers around the audience, and a seating arrangement that impose a unidirectional frontal orientation to the listeners

(chairs all aligned in one direction), have consequences over the artistic interpretation of sonic movement. After all, sonic movement is about spatial orientation and is made with sound, which is perceived all round.

Another important part of my reflection is occupied by the cultural implications of the use and method of employment of a particular technology (Perego, T., 2013). Reproducibility (how a composition is diffused and recreated) acts on creativity (the inner impulse for creation), and produces compromises, yet it doesn't often attain to a logic pertinent to the artistic idea, rather to the commercial or to convenience. These factors have, in my opinion, a strong influence of how listening behaviours form, and my point has been to include them in my review of diffusion systems and performance strategies. Musicking (Small, 1998), making music seen as an activity, becomes a cultural question, about whether we act and use technology for a commercially profitable activity or for communicating artistically, connecting with the emotions and views of people.

1.7 Conclusion

The work I am presenting has been thus centred around the collaborative practices of dance, theatre, and multimedia, which worked as a necessary counterpart to the creation of my ideas on sonic movement, bringing additions and stimulating reflections, through an enriching exchange. I have focussed on the realisation of kinesis perception through sound manipulation, studying the role of an inter-sensory environment- built around diffusion technologies for spatial audio- in the facilitation of the perception of sonic movement and stimulation of interesting artistic ideas. The next chapter proceeds more in detail into the idea of sonic movement and its significance, exploring the different perspectives through which I have reached to this idea and practice.

Chapter 2

Sonic Movement

2.1 Introduction

I am interested in the sensation of "movement per se" (Horrocks, 2013: loc. 1513). My idea consists of creating a kinetic sensation by generating changes of sound's spatial attributes such as velocity, distance, spaciousness, width and locatedness (Rumsey, 2002: 655-656). The motor and energy for the creative construction and its further development is the perception of kinesis, with each produced emotion progressively unfolding into a new one. I am not interested in using spatial attributes of sound to extend the sound parameters for compositional elaboration, e.g. using spatial attributes of sound as a simple property of the particular texture or sonic material. I want instead to concentrate on how to create varied and elaborate movement sensations and combinations through sound.

Within the current sonic arts context (especially soundscape composition, electroacoustic, acousmatic, and avant-garde composition), spatial audio quality evaluation is one of the many topics of an ongoing discussion about sound and space (Rumsey, 2006: 1-2, Bates, 2009: 2-5, Barrett, 2010: 1-5). Some of the main themes are the integration of spatial parameters in music composition (e.g. Ives, Brant, Stockhausen, Boulez), the research of identifiable effects (e.g. Stockhausen in Cott, 1974, Gottfried, 2014, Barrett, 2010), the research of a common terminology to describe these effects (e.g. Smalley, 1998), the definition of sound spatial quality (e.g. Rumsey, 2002) and its poetic (e.g. Smalley, 2007, Barrett, 2010), and the technological discourse (for example Gerzon, 2004, Ahrens and Spors, 2008, Wiggins, 2004, Pulkki, 1997). The interest of composers, engineers and scholars in sound spatial attributes is, therefore, vast and has a broad scope. Different spatial audio technologies have come of use for the production of surround sound via loudspeakers and consequently research, different practices, and industrial applications have flourished.

I am considering movement per se as a new and potentially resourceful paradigm for creation. Influenced by different theories and practices of electroacoustic and surround sound, from interactive and installation art to theatre, dance and multimedia, my primary motivation is that sound localisation, in particular as felt dynamically in the space, produces the impression of movement - the sonic movement. Sound-making thus acquires new meaning and prospective applicability. My practice has become an artistic and collaborative attempt to create

kinetic art (in its broad sense, of movement artistic creation) by using sound, beyond preconceptions of sound genres or styles.

There are a few examples of spatial sound approaches I would like to mention that closely refer to my practice or from which I would like to depart. Edgard Varèse was one of the first composers that described the potential 'revolutionary' effect of spatial parameters used in combination with pitch, dynamics and timbre in a musical composition.

When new instruments will allow me to write music as I conceive it, the movement of sound-masses, of shifting planes, will be clearly perceived in my work, taking the place of the linear counterpoint. When these sound-masses collide, the phenomena of penetration or repulsion will seem to occur. Certain transmutations taking place on certain planes will seem to be projected onto other planes, moving at different speeds and at different angles. There will no longer be the old conception of melody or interplay of melodies. The entire work will be a melodic totality. The entire work will flow as a river flows.

(Varèse, 1998 as found in Bates, 2009: 155)

In the performance of his *Poème électronique* (1958) in 1958 at the Philips Pavilion, he first realised his fascinating kinetic ideas. The Philips Pavilion was a particular space invented specifically for giving form to these new sound ideas. The movement of sound across the building's arched walls was created by switching from one loudspeaker to the next, along specifically designed paths that Le Corbusier and Xenakis devised with Varèse's composition in mind. It would activate the whole space through resonances and reflections, in combination with and parallel to the visual projections, colours, and light so that all contributed to the final impression, independently and interactively. Le Corbusier's idea reported by Xenakis was to create:

a first ever 'electric game', electronic, synchronic in which light, drawings, colour, volume, movement and idea form a whole exciting show, yet accessible to the crowd.

(Xenakis, 2003: 101, my translation from Italian)

It is hard to trace a line to distinguish the role of the kinetic effect of the sound from the role of the visuals and the other sensations the show had offered. The Pavilion space was shaping not only sound movement's trajectories but also its resonances at the different zones where visuals interacted with sound. Vision and audition were

united in one global process, where the kinesis of sound was used in connection with visual input and the suggestion of the place, enhancing the multi-sensorial sensations of the audience for a unique experience. I am concerned here with the multi-modal aspect of The Pavilion's experience, in particular the audiovisual, an important theme of my practice.

Iannis Xenakis' example of spatialisation brings forward another theme, which is about the distinction between virtual and real movement also similarly found in kinetic art (Popper, 1968: 93, 251). Xenakis creates the illusion of motion through the illusion of continuity between instrumental groups:

spatialisation does not relate to the measurable aspects of the performance space (distances, angles, symmetries), but rather is expressed through internal, microscopic differentiation in the orchestral sonorities. [...] In *Pithoprakta* (1955) various categories of sound create stationary or moving clouds of sonorous material. [...] The movement occurs in pitch and time, but may lead to a rudimentary form of spatial motion--motion confined to the expanse of the stage.

(Harley, 1994: 281)

'If the instruments are seated in the conventional order of the first violins followed by the second violins, violas, and cellos -all placed in a semicircle on the stage - the movement in pitch also becomes a spatial movement. But if the first violins are placed to the left and the second violins to the right, this effect is lost'.

(Xenakis in Harley, 1994: 281)

Another example is *Metastaseis* (1953-1954) and the idea of glissandi, thought as:

analogy with curved lines [...] considering them as sonic traces - of motion, of gesture or of time itself.

(Iliescu, 2006: 1)

If Varèse's work was one of the first multi-sensorial experiences with spatial sound, and Xenakis touches the ambiguity of interpretation intrinsic to the movement made with sound, Karlheinz Stockhausen's work is the expression of the parametric interpretation of spatialisation which is still nowadays widely in use. In his *Kontakte* (1958-1960), *Gruppen* (1955-7), and also *Trans* (1971) Stockhausen has been hierarchically classifying sonic

parameters in the following order: pitch, duration, timbre, loudness, and location (Harley, 1994: 152-156). He conceived sound-spatial trajectories and movements functionally rather than connotatively or symbolically, as permutable elements in the compositional strategy in line with his serialist orientation. He asserted though that the previous spatialisation methods were antiquated because they didn't associate with serialism. On the other hand, he also said that a serialism pushed to the extreme causes a music standstill when all the sound parameters are changed so quickly and at the same time that music seems paradoxically not evolving at all (Harley, 1994: 152-156). Stockhausen thought that he could use spatial distribution as a distinctive element to counteract this issue:

it is possible to articulate longer pointillistic structures by having them wander in space, by moving them from one place to another [...] one easily perceives two layers of one and the same sound pattern.

(Stockhausen, in Harley, 1994: 153)

I can create with my hand – up to six or seven revolutions a second. And you can draw a polyphony of two different movements, or let one layer of sound stay at the left side, then slowly move up to the centre of the room, and then all of a sudden another layer of sound will start revolving like mad around you in a diagonal circle. And the third spatially polyphonic layer will just be an alteration between front-right and back-left, or below me and above me, above me and below me, alternating. This polyphony of spatial movements and the speed of the sound become as important as the pitch of the sound, the duration of the sound, or the timbre of the sound.

(Stockhausen as in Bates, 2009: 143)

Permutability of the spatial ideas suggests that the kinetic effect is subordinated to the musical structure, rather than being the musical structure's motor and life. About *Trans* (1971), Stockhausen describes:

'I hear the sound of a weaving chair'. God knows how I came to that idea, I've never thought about the sound of a weaving chair [...] I heard this noise in the dream, every twenty seconds, a shuttle of weaving chair passing loudly through the hall from left to the right, shooting through the air. And with each shuttle sound the string players were beginning the next upward movement of their bows, all synchronously, and then in the middle of the duration between two shuttle sounds, they started a downward motion. Another shuttle sound, and they played a new note. The first shuttle sound opens the

chromatically dense wall at a certain interval, closes it with the next sound. It opens, it closes. I knew it should last at least half an hour - always these periodic shuttle sounds and the string players changing the notes.

(Cott, 1974: 53)

The 'shuttle' sound of the weaving chair is part of the musical structure and helps to articulate the musical events as its location triggers changes in the 'the chromatic wall'. That is for me an example of a functional, permutable idea of kinesis -not a generative and connotative- upon which the content and characteristics of the whole sonic event are based. This distinction between a connotative and denotative approach in the creative experimentation with spatial audio is for me crucial to determine the focus of a spatial sound work.

Moving forward to more recent times, the interaction of sound and space in music composition has created many niches of explorations. For example, I am thinking of Chowning's *Turenas* (1972), Bayle's *Déplacements* (2011-2012), and also Wishart's *Encounters in the Republic of Heaven* (2012). The installation work *Aftershock, Crush-3* by Natasha Barrett (Barrett, 2011) is also to be noted because it contains elements of virtual reality and explores proprioception. Barrett uses the space as navigation, linking the evolution in the visuals to the position of the listener within a space and its body's position modifications such as head position tracking. Sounds describe the new scenes that appear one after the other during the listener's navigation and exist in the space, or create space with their presence. Sonic movement is used to variate content as it helps to shade sonic material, one layer above the other, used as an element of distinction and variation of the musical structure according to the movements of the listener/viewer. The proprioception stimulated by the navigation and the kinetic of sound are related to each other for the purpose of navigation and exploration. In general, they are directed to generate the sensation of spaciousness and immersion within the sonic materials. The synchronicity of vision and audition also creates a multi-modal exploration of sense. However, movement seems not yet used through sound to express a kinetic force by itself but kept subordinate to the spatial exploration.

My idea of pursuing movement per se is based on considering the experience of kinesis as a whole, therefore also analysing and redesigning the listener's experience, activity and the performance space. In my opinion, the technical and mechanical methods have not much changed. Similar loudspeaker reproduction arrangements are used; the quadraphonic setup has been popular for a long time (Bates, 2009: 35-38), many technologies have adapted well to reproduce sound in that fashion and compositional practices have suited it. Even when new

systems have been developed, still the idea of designing a space as flexible as the freedom of the kinetic artistic invention is replaced by the convenience and economy of resources. Because of my interest in the connotational aspect of movement through sound, and by being exposed to interdisciplinary experiences, I have gathered that conventional aesthetic approaches to sound could not work. Creating movement per se required a change of perspective, switching from an intellectual-only perspective to a view that embeds proprioception and multi-sensorial sensitivity. As a matter of fact, considering listening a perceptual act separated by other senses would have been quite an old-fashioned, restrictive approach.

In the subject of kinetic art, the body is the primary source of creative inspiration. Much European kinetic art exploited the intellectual appeal of technology, mathematics and geometrical forms. Many experimental films [...] place too much emphasis on cerebral aspects, and this tendency [...] [is] encouraged by academic forms of art criticism.

(Horrocks, 2013: loc. 1710)

As found in Len Lye's thoughts about kinetic art, the idea of 'figures of motion' gives me insight into this complexity:

by 'figure', Lye meant 'form or shape', but what interested him was form as something performed, something that involved a process.

(ibid.: loc. 1555)

Form is thus read as an unfolding process, an idea of art and experience of spatial sound that departs from simply referring to musical parameters and structures and that has its roots in psychoacoustics, cognition and sensual multimodality. Kinesis is not just a serial component located in a specific point at a precise time but the unfolding of sensations, based on the kinesis of the stimuli. It develops through proprioception not for simple exploration but for natural engagement. Emphasising the bodily and the sensual of the kinetic experience as opposed to the intellectual was the approach I thought could reveal what I felt missing in the discourse of electroacoustic and spatial music, found at times contradictory and inadequate to fully embrace the complexity of the experience.

For example, when concerned for best sonic movement reproduction, trying to impose a proscenium-like stage

could turn out very restrictive to the kinetic imagination and construction. The head is locked in one direction, the sight assumed to be discarded or better avoided (by closing the eyes), obstructions from the neighbouring listeners shadow the perceived sonic image. To unlock these problems one needs to work on the sound stage, its formation in the ears and its extension and dynamical evolution for every single sonic motion, which means working on the listener and their perception at any one time. In this light, I believe the listening arrangements, the activity of the listener, and how the spatial sound is created and organised respectively are weak areas of exploration in current spatial audio research.

We must understand how the listener's mental processes give rise to the experience of meaning. In electroacoustic music as in everyday life, these mental processes unite the peripheral auditory system with human spatial cognition.

(Kendall, 2010: 228)

Accepting into the picture that the concept of kinesis is an unfolding process with roots into the proprioceptive sensitivity of each individual, the 'site-specific' intuitions and exploration of Varèse, the dreamful serialism of Stockhausen, Xenakis' reference to virtual and real movement or Barrett's proprioceptive exploration (as well as Char Davies in *Osmose*) are all examples of how elaborate the process of creating kinesis through sound is, and how complex are the relations between sonic movement invention, human perception characteristics, and the choice and use of technologies and performance spaces. Drawing from perceptual and motional studies, aesthetics, dance choreography and kinetic art (in particular those works with light), I have been able to work on forming a kinetic idea with sound, placing at its centre movement and the way it unfolds and generates emotion. I will explore the different expressions of movement through sound, body, and light and how sound and sonic movement designs interrelate in my practice as media for artistic communication.

2.2 The Perceptual Context

I have based my practice on a niche of electro-acoustic sound composition which is the movement of virtual sound sources (VSS), mainly and simply the reproduction of monophonic sources of sound (dynamic point sources) via wavefield synthesis (WFS) and ambisonics first order (over a cubic array of eight loudspeakers). The restrictive choice of investigation is in the interest of clarity and simplicity (which hopefully is not too limited so as to become uninteresting) and also as a result of this being the first attempt at studying and performing sound as a kinetic expression tool.

I have tried to use a terminology that reflected my practice in an unambiguous way, hence I have chosen the compound 'sonic movement' to refer to it instead of the often used 'sound movement'. Generally, 'sound' is just the name we give to a perception, to the detection of vibratory oscillations of our eardrum membrane caused by variations in air. When used to describe movement, the term 'sound' is at least ambiguous since it is used to refer to both the source of sound and what is heard. For containing this ambiguity, the term is not sufficiently descriptive of the sensation of movement. What is in fact needed is a distinction between the movement of the source (physical or virtual) and the perceived changes in our auditory perception (the auditory event) - that is, variations in the spatial attributes of an auditory event- to effectively make sense of what is movement heard through sound. As said by Blauert, the word 'sound' could be used:

to describe the physical aspect of the phenomena of hearing -particularly in the compound 'sound event'. Terms such as 'sound source', 'sound signal', and sound wave [...] [can] be used to describe physical phenomena that are characteristic of sound events. What is perceived auditorily [...] [can] be denoted by the adjective 'auditory', as in the term 'auditory object' or, preferably, 'auditory event'.

(Blauert, 1997: 2-4)

It is problematic, Blauert continues, to infer a causal nexus between a sound event and an auditory event. The compound 'sonic movement' then appears to me a more appropriate term to bring the attention on movement, which is made through sound.

2.2.1 The idea of change

In psychoacoustics:

localisation is the law or rule by which the location of an auditory event (e.g. its direction or distance) is related to a specific attribute or attributes of a sound event, or of another event that is in some way correlated with the auditory event. Examples include the relation of the position of the auditory event to the position of the sound source; the relation of the direction of the auditory event to the interaural sound level difference of the ear input signals; and the relation of the direction of the auditory event to the amplitude of the head motion.

(Blauert, 1997: 37)

Our binaural system of hearing, an ongoing process of evaluation, keeps us aware of the positioning of potential sound sources relatively to our listening point and orientation. We continually evaluate the differences between ear input signals, to localise the position of an auditory event and its changes as we and things move. The sensation (and memory) of movement is created in the first instance via spatial displacements of the perceived auditory event towards a certain direction, at a particular speed, and of certain timbre, pitch, dynamics, or texture. It is possible to say that a change in the auditory percept, that relates to spatial attributes and occurs consistently enough over time, forms a sensation of movement. Movement could be in fact thought of as the changes we detect through the comparison of successive percepts.

Warren and Shaw use the Swedish term "skeende" to define the meaning of "event" in psychology. More precisely the term:

refers to the ongoing aspect of change, emphasising flows and repetition as opposed to boundedness, which might be captured by emphasising a beginning and an end. Calling something a skeende emphasises that it is a temporal occurrence, a process.

(Mace, W., in Warren and Shaw, 1981: 55-67)

The idea of constant change in skeende reflects well the nature of sound, of vibrations continuously activating our senses, a fitting image to represent the flow of appearance and disappearance of the acoustic stimuli. It emphasises the known temporal quality of sound and that the listening, the individuation of the source, and the detection of sonic attributes (such as the spatial attributes) are constantly evolving processes, modelled from our perspectives.

The other essential element in this process is the subject's completion. The idea of motion as a succession of static images (and their comparison) has been studied from 1824 by Roget, Exner, and Max Wertheimer who explain:

if seeing motion is due to an 'illusion' -if physically there was only a stationary event, and later a different stationary event at a certain distance from the first- then, based on the two sensations of stationary events, a subjective completion must somehow have occurred along with them, subjectively including

the intermediate positions.

(Wertheimer et al., 2012: 103-104)

'Skeende' and 'subjective completion' add together, one defining the flow of sensations, the other the ability to make sense of it.

At a cognitive level, the organisation of sensation and perception happens in audition similarly as to other perceptions, like in vision and touch. For example, the basic principles of the Gestalt School (such as continuation, closure, similarity and proximity) suggest how, under certain conditions, people tend to organise elements into groups or unified wholes. These are found in audition too, in particular grouping, similarity and proximity, as Diana Deutsch and Al Bregman have explored (Deutsch, 1999, Bregman, 1994). Bregman, notably, has been comparing auditory streaming segregation and integration to apparent motion in vision and worked around the analogy of the auditory stream in acoustics with the object in vision. The following example from Bregman's experiments shows how the perceptual system organises differently the impression given by an input stream when experienced at different speeds:

listeners were presented with an endlessly repeating loop of tape which were recorded a sequence of six different tones, three high ones and three low ones [...] When the cycle of tones was presented very slowly the listeners heard the sequence of high and low tones in the order in which they occurred on the tape. However, as it was made faster [...] the listeners did not actually hear the tones in the correct order [...] instead they heard two streams of tones, one containing a repeating cycle of the three low pitched tones [...] and the other containing the high ones. The single sequence of tones seemed to have broken up perceptually into two parallel sequences as if two different instruments were playing different, but interwoven parts. Furthermore it was impossible for the listeners to focus their attention on both streams at the same time.

(Bregman, 1994: 17, 21-22)

These observed cognitive processes that define aspects of the organisation of our perception of sound undoubtedly have an important role in the way we conceive and approach the design of spatial audio. When changes to distance and velocity (direction and speed) of a sound source are perceived and connected between each other, they form peculiar images in our minds. For example composers have been creating the following

storm of ideas to colourfully describe their spatial hearing sensations and to synthetically give a poignant description of their sonic and spatial concepts: circles, sonic surfaces, sound masses, shifting planes, penetration, repulsion, speeds, angles, melodic totality, flows, revolutions, polyphony, polyphonic layers, revolving, polyphony of spatial movements (Bates, 2009: 141; Cott, 1974: 44), invading thrusts and streams, momentum, gliding flight, floating lines, spirals (Bayle, 2015), immersed, sunk, floating (Davies, 2003: 4-5).

In my practice though I have struggled to find, for the plasticity of these images, correspondence in the effective hearing. It seemed to me that a circular path used as trajectory could either not correctly appear as a circle at the hearing or could not combine with other patterns occurring at the same time or in relation to it. I have always felt the perception of the spatial designs entailed a more complex balance between perceptual inputs, not exclusively auditory. In fact, if these ideas seem naturally possible, then in their practical realisation (and in particular with technologies that use the combination of loudspeakers to create a kinetic impression) they require more in-depth consideration.

I have been using ambisonics and wave field synthesis technologies to create the sensation of movement by manipulating the position of a virtual sound source (VSS), which the system would produce consistently and in relation to a given or predefined listening position or listening area, involving many psychoacoustic challenges. Firstly, if I created straight or curved trajectories in space, only when certain optimal acoustic and psychoacoustic situations occurred the correspondent movement of the VSS would appear exactly as the design. Kinetic paths are always approximate by subjective and external factors, and the perceived location of a source doesn't necessarily correspond with the physical sound emitters, but could be more often generated by several combinations of several loudspeakers. Secondly, sound spatial attributes are not only given by the source (virtual or real) emitting a sound and moving around, but from a different range of attributes corollary to the source's position or speed, and related to the emitted sound itself, for example, its pitch, texture, and also its symbol. Thirdly, the position of the listener and his/her orientation in the space relative to the movement, to its quality, to sound's type and quality, and to the type of technology contribute to the final percept. These factors affect our daily perception, but with VSS they are more dominant, due the artificiality of the context and the lack of natural references for the acoustic and psychoacoustic effects of sound propagation.

The degree of control of the composer on all these elements makes a difference in the final artistic outcome. I have tried to use the notion that perceiving is an activity of adjustment, comparison, a continuous mental process

of disambiguation and orientation, based on cross-modal and multimodal interaction (Haverkamp, 2013: 50-61). If a gap between the invented abstract design and its practical rendition and reception in the playback space occurs, it would be based on the level of sophistication of my interpretation of these factors.

A hint to approaching a broadened practice of sound, perceptual rather than intellectual, came from focussing on its fundamental acoustic and physical principles of vibration.

2.2.2 (Unfolding) Form and Shape

A very short time after I went blind I forgot the faces of my mother and father and the faces of most of the people I loved. [...] In the absence of their faces I had the voices of my parents ever present in my ears, and after the accident, the shape of people and their appearance still concerned me, but in a different way. [...] For my part I had an idea of people, an image, but not the same as the one seen by the world at large. Often I saw them in a way diametrically opposed to that of others. The furtive boy I saw as shy, the one they called lazy as struggling all day long in imagination with an ardour which was the opposite of laziness. [...] People no longer seemed to possess [hair, eyes, mouth...]. Sometimes in my mind, me and women appeared without head or fingers. Then again the lady in the armchair suddenly rose before me in her bracelet, turned into the bracelet itself. [...] In reality, none of these sights is made to be described. They are so mobile, so much alive that they defy words.

(Lusseyran, 1998: 59-60)

This passage from Jacques Lusseyran's book *And there was light* (1998), refers to the loss of visual imageries. When they are inaccessible or forgotten, we remain, whenever a sound is perceived, floating in an undefined number of guesses, intuitions, a potentially revelatory experience without references to the past. When the direct significance of the visual image is lost, an external sound stimulus previously associated and mastered by that image re-activates those connections within our subconscious, alive and present, but now free. Lusseyran speaks of his relation to the vibratory nature of sound, capturing insights from vibrations' many different nuances; he speaks of a sensual approach to sound rather than conceptual. The visual shape is no more, there is resistance instead: the simplest idea of form, which we use to make sense of things, might lose its meaning. The old previously acquired ideas of form retake another entirely different meaning in the vibrational, tactile, electrical contact between things and senses:

if my fingers pressed the roundness of an apple, each one with a different weight, very soon I could not tell whether it was the apple or my fingers which were heavy.

(ibid.: 25)

I have found Lusseyran's impressions resonating within the cognitive discourse of Rudolf Arnheim:

only if one realises that all visual form is constantly endowed with striving and yielding, contraction and expansion, contrast and adaptation, attack and retreat, can one understand the elementary impact of a painting, statue, or building and its capacity to symbolise the caption of life by means of physically motionless objects.

(Arnheim in Whyte, 1966: 199)

What a striking similarity this has with the continuous moulding and transforming of impressions, those forces that shape our auditory perception, that we call sound. Continuing its example with plastic arts, Arnheim states:

since visual dynamics is not inherent in the physical object -where are the forces which constitute it? Gestalt psychologists refuse to describe them as an effect of empathy, that is, a mere projection of previously acquired knowledge upon the percept. [...] The sensations of push and pull are the conscious counterpart of the physiological processes which organise the percept in the neural field of the optical sector, [...] the cerebral cortex, the optic nerve, and possibly the retina of the eyes. According to this theory, visual dynamics is not a secondary attachment of the stimulus, due to accidental, subjective associations, but rather precedes the 'geometric' pattern of shape and colour in that this pattern is the result of organising forces, of whose activity the observer is partially aware. The theory would seem to explain why in actual experience the dynamic, or expressive, aspects are the most powerful and immediate qualities of the percept.

(ibid.)

Evidence of these unfolding processes of perception, of resistance and organising forces, can be found in the classic example of the optical illusion of Rubin's vase (figure-ground) of Gestalt psychologists (Figure 1). We observe either the faces or the vase profile at any one time: when one is in focus, the other exists as a weak

undefined background. This effect also found in audition (Bregman, 1994: 12-13) is called the exclusive allocation principle. It suggests forces' struggle and competition to capture the psychological attention of the subject.

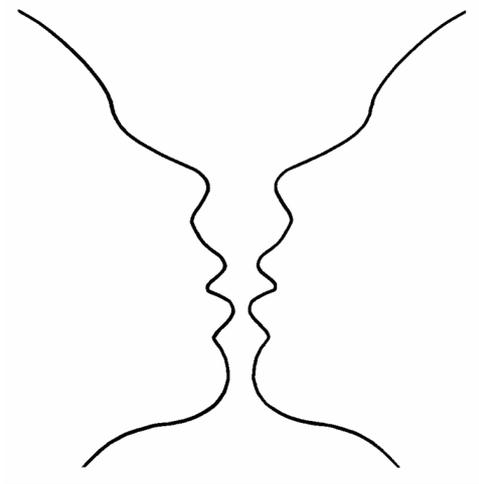


Figure 1: The figure-ground Illusion (Rubin's Vase n.d.)

The experiments by Bregman on auditory streams, on perceptual illusions by Deutsch, or the confines of auditory localisation blur described by Blauert (Blauert, 1997: 37-50) have shown similar behaviours of forces fighting for equilibrium. That is maintained until specific conditions are met, but could suddenly turn in favour of one or the other depending on the circumstances. For example, stream segregation or integration happen only at a particular speed, as Bregman analyses, and if that speed is not maintained the impression changes immediately (Koerte's law, Bregman, 1994: 21-22). I am also thinking at the psychoacoustic interplay of inter-aural time and level differences, and at the curve of our loudness response for each frequency perceived. In Arnheim's example, the faces or the vase win or lose over each other (in Haverkamp, 2013: 188, this is described as "physiologically caused by the inability of the eyes to find fixed points to focus upon") accordingly if a certain threshold or resistance of the forces involved is trespassed. In sound too we group different streams, depending on the various dominant perceptions.

Because of the complexity and number of forces sound is composed of, the sensation of sonic movement similarly is a result of a delicate balance between even more forces. The sound attributes are joined by the sound spatial attributes, and the space, the technology, and the listener are the variable context in which they manifest. These cognitive observations and examples should suggest that the artistic creation cannot bypass the fact that the auditory system is excited by a very complex set of stimuli, which overlap, interleave and sometimes interfere with each other, in particular in spatial hearing mechanisms. In my view, these technological or perceptual factors

have to be addressed at the moment in which the idea is created, not dealt with after the composition is made. Technology and perception are thus essential elements and materials of the creative act.

Rudolf Laban's idea of equilibrium adds to this interpretation. He opens his *Choreutics* (1966) by saying:

the personification of objects, and the belief that inorganic nature lives have their source in the intuitive awareness of the universal and absolute presence of movement. [...] What we call equilibrium is never complete stability or a standstill, but the result of two contrasting qualities of mobility. [...] Our own movements and those we perceive around us are basic experiences. Forms of objects, as well as the shapes assumed by living organisms, wax, and wane uninterruptedly. Yet forms of objects and living beings, when in quietude may suggest a 'standstill' in the big unceasing stream of movement in which we exist and take part. This illusion of a standstill is based on the snapshot-like perception of the mind which is able to receive only a single phase of the uninterrupted flux. It is our memory which tends to perpetuate the illusion created by the 'snapshots'; and the memory itself waxes, changes and vanishes.

(Laban, 1966: 3-6)

The nature of our concept of form is questioned by exposing it to the enigma of motion and vibration. Laban's equilibrium, Arnheim's organising forces, Lusseyran's idea of 'resistance'... a greater complexity stems out from these interpretations, greater than simple geometrical patterns or shapes developed as ideas for some sort of musical counterpoint.

Any description of form in the static terms of sheer geometry, quantity, or location will fatally impoverish the facts.

(Whyte, 1966: 199)

Paraphrasing Arnheim's thought

in daily life as well as in art, [sound] functions as a part of the total mind.

(Whyte, 1966: 203)

2.2.3 The illusion of movement

Some psychological and cognitive effects related to the perception of sound can influence the perception of movement via auditory cues. In the first instance there are specific kinetic attributes that we gather from particular mechanisms of sound perception, whether in the formation of the sound event or the auditory event or in the sound materials. Sound contains elements which already suggest kinetic ideas: through their symbolic reference and:

via the analysis of auditory characteristics -such as timbre, dynamic, and fluctuation- it is possible to deduce the fundamental processes of movement simply on the basis of sounds. A piece of chalk which is dragged across the chalkboard simultaneously causes a screeching sound that contains information as to the movement. This also applies to the sound of running water, the rustling of flying birds and of the leaves from trees, the shuffling of footsteps, and to various technical sounds.

(Haverkamp, 2013: 184)

Thus meaning and symbol in the auditory cues can cause kinetic sensations. Murray Schafer has described:

a signal is a sound with a specific meaning, and it often stimulates a direct response (telephone bell, siren, etc.). A symbol, however, has richer connotations. 'A word or an image is symbolic,' writes C. G. Jung, 'when it implies something more than its obvious and immediate meaning. It has a wider 'unconscious' aspect that is never precisely defined or fully explained'. A sound event is symbolic when it stirs in us emotions or thoughts beyond its mechanical sensations or signalling function, when it has a numinosity or reverberation that rings through the deeper recesses of the psyche.

(Schafer, 1993: loc.3469)

It is the symbol that reverberates in the phenomenon of 'familiarity' as studied in psychoacoustic:

familiarity of the [...] subject with the signal plays an important role in localisation between the distance of the sound source and that of the auditory event. For familiar signals such as human speech at its normal loudness, the distant of the auditory event corresponds quite well to that of the sound source. [...] For unfamiliar sounds localisation with respect to the distance of the sound source is largely undefined.

(Blauert, 1997: 45-46)

Another interesting factor is also that:

adaptation and learning are observed in studies of directional hearing in the median plane and particularly in studies of distance hearing. This means that localisation may change as a function of time.

(ibid.)

I gather, then, that within the many connections that automatically generate with an auditory cue, some access the subconscious linking to kinetic ideas, whilst some others help or contrast specific localisation cues essential for identifying and understanding a sonic movement.

Diana Deutsch demonstrates that when subjects are exposed to an intensive and binaurally offset repetition of a word in a different language than their own, they hear other words in their language or even in other languages, instead of the actual word's language (the phantom words effect, Deutsch, 2013). This effect is possibly linked to the familiarity with sound or with meaning. Although a pattern has been found, a full explanation of the phenomenon doesn't yet exist. Deutsch also showed illusions and paradoxes like the exchange of ears in the perception of a scale by alternating tones from ear to ear (Deutsch, 1974), or the glissando illusion (Deutsch, 2013), that could carry kinetic meaning. Bregman too has described examples of apparent motion effect (Bregman, 1994: 174). Along the line and rules that govern the grouping of movements of seen objects, a deep connection between the kinetic impression and the principles of auditory grouping could then be found.

Other cognitive processes have a role in the kinetic impression. For example:

the connection of tone and pitch and spatial height, which is of great importance to musical notation. [...] Wellek [Albert] interpreted this perceptual relation as a primeval synaesthesia permanently anchored in humans". In notation, "as a rule, an increase was represented by an upwardly pointing line and a decrease by a downwardly pointing line.

(Haverkamp, 2013: 390)

These, so called, 'sensorial anchors' create peculiar problems of localisation in spatial sound. Other examples

are that of pitch alternation and separation (Clarke, 2006: loc. 722) which can cause apparent movement sensation as "closely associated with rhythm and tempo" (Clarke, 2006: loc. 652).

2.2.4 Proprioception

Proprioception is "the neurological ability of the body to sense movement and position" (Collins, 2015) and is influential to the perceived kinesis. A consolidated fact in psychoacoustics, it is hardly considered in the electroacoustic production which makes use of spatial sound. In spatial hearing, the localisation of a sound source is strictly connected with head movements. When we hear, with just even the slightest head motion, we act on the inter-aural mechanisms removing ambiguities on the percept (Blauert, 1997: 12-13, 43-44, 178 ff.). Freedom of head motion for establishing the perception of movement is arguably more determinant in audition than in vision, given the lower resolution of the auditory mechanism and the need for a bigger range of movement to be able to distinguish changes of angle in the perception (Blauert, 1997: 38-39). The fact that the average electroacoustic music concert listener listens with relative immobility, looking more or less in one direction, with movements also limited by the presence of other people in the room, is telling with regards to the quality of his/her auditory experience of kinesis.

The body produces hints that can affect the sense of orientation and self-motion (Israel and Warren, 2015). These hints are provided through proprioceptive sensory information as opposed to exteroceptive which includes vision (one of the most significant exteroceptive inputs regarding movement) and audition (as well very important for movement). An example of exteroceptive information can be found in car design, where sound itself is used as the conveyor of motional information:

[...] the representation of the parameters of movement by virtue of the auditory characteristics is of similar importance. This applies to the sound of the entire automobile as well as to all components, which convey information as to the proper functioning to the driver acoustically, and whose properties can be correlated to the parameters of movement [...] Sound contributes to the perception of movement. In particular, the sound of the motor includes information about the acceleration in the traction mode as well as delays in the coasting mode [...] of the power train. The sound of the tires correlate with the velocity of the vehicle via the wheel speed, but they are, nevertheless, influenced by the interaction occurring between the wheels and the surface texture of the pavement. Wind noise appears while driving at a high speed -caused by air turbulence in the front and the rear of the

automobile and particularly affiliated with random noise of a high frequency. [...] When travelling at high speeds, the driver and his or her passengers tend to accept these sounds. Audible oscillations - fluctuations - of the acoustic properties, however, must be avoided, for they do not behave in a manner directly corresponding to the velocity of the vehicle.

(Haverkamp, 2013: 188-9)

Interoceptive information instead comes from inside the body and tells us about the position of joints, the force used by muscles and the orientation of the body in space. The vestibular apparatus are receptors that tell of head position and movement; receptors in the skin tell of pressure, temperature, touch; muscles spindles tell about the length of muscles, Golgi tendons about muscle force (De Leon, 2015). For example, when a body senses a force contrary to its motion (e.g. the wind while running, or driving a bicycle), it receives information about the direction of its movement and the movement of the force from the cooperation of the senses. Even the eye's position produces proprioceptive shifts (Lewald, 2008: 1).

Taking in consideration proprioception and adopting this extended view of sensitivity could lead to a very different concept of spatial sound performance, making obsolete the idea of current listening arrangements. I will consider these elements more in depth in Chapter 4 when I will talk about the performance space design, and in Chapter 5 when describing my second project *I Hear You See Me (IHUCM)*, in which I have been working on making the listeners move their physical position within the loudspeakers' space along with the score (making them stand, sit down, lie down, or rotate on their axis).

2.3 Movement outside sound

The electro-acoustic literature has been busy with perceptual, semantic, and technological issues, dealing with trajectories, envelopments, realism, and distance (...) of spatial sound. Only recently it seems to be turning towards a more ecological and comprehensive view of the experience of movement as physically originated from sound. Interestingly in this paragraph Kendall notes:

electroacoustic music embraces a multiplicity of approaches to multichannel reproduction, and, whatever one thinks about the aesthetic issues, the technical schemes or the compositional methodologies, every approach ought to be informed by the realities of spatial perception and also acknowledge that listeners are making meaningful sense of spatial events. No viable approach to spatial

audio can ignore how the listener perceives and thinks, nor can it limit its considerations simply to the physical acoustics of reproduction. We need to engage spatial audio in all of its intricacies. Any approach to spatial audio appropriate to our time ought to be based in knowledge of human perception and cognition.

(Kendall, 2010: 237)

Since I think of the kinetic effect as the central core of the composition rather than a feature of sound, spatial attributes are essential but functional in my practice in that they allow me to recreate the movement experience. This experience has to include, as also Kendall suggests, the listener's experience into the kinetic creation, placing intra-sensory considerations at the base of the artistic elaboration. By collaborating with the different disciplines of dance, theatre and motion graphics, I have put in discussion and comparison the experience of sonic movement -previously almost exclusive to the sound discipline- with other disciplines' kinetic concepts and artistic paradigms, thus entering unknown territories. Having to make sonic movement ideas live in a space together with dance or visuals and theatre has been a productive challenge, broke through my own vision's limits, and opened up new ideas.

2.3.1 Laban's Action Moods

My first interest has been to look at dance experience of movement. Immediacy of communication characterises movement in dance. Rudolf Laban connects this immediacy with archetypal and primaeval instincts of human beings. Body awakes memories of gestures, the sense of harmonious or grotesque, a sense of style or fashion (Laban, 2011: 82-95). Through the body, movement communicates with the viewer powerfully and sophisticatedly. Laban studied:

the significance of movement in the life and dance of our times. [...] [and] outlined a comprehensive account of movement phenomena and of factors generating them. He defined common denominators of all types of movement, such as behavioural and symbolic, and provided the means of differentiating them through description, classification, and notation.

(Maletić, 1987: vii)

Maletić further describes that Laban's concept of Effort:

is linked with emotion and with the human psyche, as well as with functional and/or operational intentionality. While Eukinetics focussed on the expressive qualities in dance ([...] one may also speculate that Laban devised the term to differentiate his work from Dalcroze's and Steiner's), Effort is concerned with all human movement and its term indicates that, unlike energy which exists in all nature in many different forms, Effort can only be found in living organisms and is clearly linked with motivation/ intentionality. [...] The term Effort differs from its current usage as denoting activity which requires substantial expenditure of energy. Laban sees Effort as the inner impulse -a movement sensation, a thought a feeling or emotion- from which movement originates; it constitutes the link between mental and physical components of movement.

(ibid.: 178-9)

The pervasive idea of effort and its archetypal link to meaning is realised by the dancer on stage. Feeling, emotion, and intention, are embedded in the gesture of the performer:

the natural sequences of the dynamosphere [the space in which dynamic actions take place] consist of chains of dynamic actions, with their corresponding inner moods. As they are of a purely expressive nature, originating from within the person and containing mental and emotional qualities, we might indeed refer to them as 'action-moods'.

(Laban, 1966: 55)

[There is] a connection between outer movement and the mover's inner attitude. This attitude is not only shown in the choice of a certain path or the employment of a certain limb, but is also characterised by the choice of dynamic stresses. Movements can be executed with differing degrees of inner participation and with greater or less intensity. They may be accelerated by an exaggerated desire to reach a goal or retarded by a cautious doubting attitude. The mover may be entirely concentrated on a movement and use the whole body in an act of powerful resistance, or casually employ only part of the body with delicate touch. Thus we get different dynamic qualities. [...] An observer of a moving person is at once aware, not only of the paths and rhythms of movement, but also of the mood the paths in themselves carry, because the shapes of the movements through space are always more or less coloured by a feeling or an idea.

(ibid.: 27)

I have included Laban's ideas in my discourse. I have been attracted by the idea that sonic movement could be individuated through the dynamic nuances it creates with its mode of approach to the listener, by approaching fast, slow, or by the type and shape of the motion, its force, style, and geometry. Defined by those attributes, the sonic movement could become a gesture with a definite character.

Laban formulates the four regulators of intensity as being force, time, space, and flux (or lability), and their respective polarities are described as weak-strong, fast-slow, extended-narrow, and mobile-rigid.

(Maletić, 1987: 78)

Considering the same four regulators with sonic movement is possible. 'Force' and 'space' could be in the dynamics of the displacement, 'time' and the type of 'flux' might have to do with the sonic material. Ultimately, differences between the characteristics of sound and body make them express movement in different ways.

A dance starts from the body. It is the medium through which each idea is expressed. When body appears, its composition and structure already transmit a kinetic message. When it contracts and moves, the kinetic message articulates accordingly to the body's look and characteristics. Similarly, the sonic movement exists through sound, but sound creates a larger context of reference, less direct than the clear and immediate presence of the body. A sound event, in Schafer's sense (Schafer, 1993: loc. 2687-3042), activates references and connections at multiple levels as vast and numerous as those that body might suggest (Laban, 2011: 82-95), but from more heterogeneous sources. The experiential (e.g. familiarity), semantic (e.g. symbol), and physical relationship of the listener with each sound tell us that the substance of sound's kinetic effect is thus in the construction and connection of its sonic attributes (e.g. of pitch, timbre, or texture), its spatial attributes (e.g. the perceived location, velocity, distance, spaciousness), the cognitive processes associated with each subjective reception and the cultural context.

Another useful idea is that of relative inner acceptance or resistance. Close to the concept of affordance in Gibson (Gibson, 1979: loc. 2706), in Laban I have found that:

the human faculty of perceiving reality [...] leads to various modes of experience and to externalised activities. This is expressed in the fundamental concept of mental or inner attitudes of resisting of

accepting the physical conditions influencing movement or fighting against or contending with the motion factors of space, weight, time, and flow in both a qualitative and quantitative manner. These choices create a polarity of opposing Effort elements of direct versus flexible/indirect, strong versus light, sudden versus sustained and bound versus free.

(Maletic, 1987: 100-101)

Somehow here recurs the idea of a sensorial encounter with forces perceived in the visual and auditory domain, or exclusively auditory as from Lusseyran's experience (in this chapter, 2.2.2).

With a movement, with a gesture, a link between viewer and performer is created. Sonic movement puts in place multiple levels of communication through intra-sensory connection, provided by the technological, perceptual, and semantic.

The psychological forces that determine artistic form operate essentially in the perceptual process of "the particular sense of the discipline, and "in the area of motivation and 'personality'. [...] Actually they interact all the time. Also a more complete presentation would require consideration of further psychological levels, notably thinking and memory.

(White, 1966: 198)

As Laban states:

motion and emotion, form and content, body and mind, are inseparably united.

(Laban, 1966: viii)

2.3.2 Body, Sound, Energy

The interpretation of the relation of body and movement differs significantly between choreographers, and a journey between dance artists' ideas can illustrate how movement's meaning and expression are extraordinarily sophisticated.

For choreographer Mary Wigman, a body transmits an "'inner charge', a 'climax of the flow of energies', a 'rhythmic force' which 'pulsates' through the dancer":

dance is a living language which speaks of man -an artistic message soaring above the ground of reality in order to speak, on a higher level, in images and allegories of man's innermost emotions and need for communication.

(Wigman, 1966: 10)

In the centre of the space [the dancer] stands, eyes closed, feels how the air weights on her limbs. The arm rises, groping jerkily, cuts through the invisible space body... Then space grasps for her ...The great invisible, transparent space spreads itself undulating formlessly: a raising of the arms alters, shapes it" (Mary Wigman in: Reynolds, 2006: 67-69). "[...] Pain, fear, menace, terror, despair, indignation it is all that and it is not all that because it is not in the least pantomimic, it is only dance, pure dance, absolute dance.

(ibid.: 62)

I have been fascinated by this dramatic unity, communicating at multiple levels just through the dancer's presence in the space. Also for Martha Graham, "movement in itself" was to become the sole protagonist of the performance, as explained in Reynolds's (Reynolds, 2006: 95). She aimed to affect the spectator directly through kinaesthetic sensation rather than through conceptual or narrative content, which she described in terms of "an attempt to interpret life in a literary sense":

'it is my hope that audiences will eventually stop seeking the literary meaning in my dancing, stop transmitting the significance of movement into word sequence'. Emancipation of movement she prospected, through the 'tensions produced by the material form of the medium itself'.

(ibid.)

As a matter of fact, Graham's dances were written in most cases only in counts, to which only later the music would have been written for and orchestrated, freeing themselves not only from literature reference but from music as well.

Alongside the body, another concept is central in dance creativity and this is 'energy'. The term is found related to movement to express the dynamic qualities which are embedded in its perception and production. It signifies an

interest more into the effect (the kinetic sensation) rather than into the medium (the body). Reynolds observes that:

uses of energy in movement and their transformation are central to dance practice and analysis. This transformation comes about through kinaesthetic imagination. Kinaesthetic imagination is an activity whose aim is given in movement itself, and is not fully transparent to the agent. It is both a response and an active resistance to constraining patterns of energy usage that are culturally dominant, and that shape the kinaesthetic experiences and habits of individual subjects. This potential to transform uses of energy in movement places dance at the forefront of culturally significant forms of artistic practice.

(Reynolds, 2006: 1)

Merce Cunningham, when describing his work reveals that:

there is an ecstasy in dance beyond the idea of movement being expressive of a particular emotion or meaning. [...] The function of techniques is not to exhibit virtuosity for its own sake, not to give the opportunity for 'wilful and rhapsodic self-expression' but rather to enable the dancing body to become 'a channel to the source of energy.

(Reynolds, 2006: 140)

The function of the body, as seen in Wigman's or Graham's, has changed in Cunningham in favour of channeling energy to produce states of 'ecstasy'. That is particularly evident in his use of music. Cunningham worked on time structures with John Cage in *Sixteen Dances for Soloist and Company of Three* (1951), and *Suite by Chance* (1953), combining dance with music only on a numerical or time base (fixing the beginning and the end of a piece in time, or counts), rather than on the research of the dramatic and expressive.

The non-metrical structure of Cage's music may have been an important factor in enabling Cunningham's choreography to break away from dramatic structures of conflict and resolution, cause and effect, climax and anti-climax. Cunningham sees the famous 'chance' principle, inspired by the 'I Ching', and espoused by him and Cage, as having enabled him to transcend the limits of his individual motivations to discover new choreographical methods. [...] One thing must not necessarily follow another. Or rather, anything can follow anything. We see it on television all the time. In the 20th century,

this new continuity is part of the life we live'.

(Jordan, 1999: 62)

'Movement phrases are combined and recombined, and scale and pacing are in constant flux. The scrim in front falls into slowly falling lines, in sharp contrast to the dancers' quick, irregular movements'.

(Scarry, 1999a, as found in *ibid.*)

'[The chance] method might lead one to suspect the result as being possibly geometric and 'abstract', unreal and non-human. On the contrary, it is . . . no more abstract than any human being is, and as for reality, it is just that, it is not abstracted from something else, but is the thing itself, and moreover allows each dancer to be just as human as he is'.

(Cunningham, 1997: 87)

Cunningham's example is thus another artistic interpretation of kinesis. If Laban's and Wigman's approach were holistic and Graham's fragmented, Cunningham's was punctual:

in Cunningham's work dance is itself a source of energy. In both Wigman and Graham, energy was frequently intensified by combining potentially contradictory effort qualities, such as strong outward projection executed with bound flow (either used continuously or in order to cut movements off before completion). Conflicts between free discharge and containment or curtailment of projected energy through bound flow increase tension and maintain high levels of potential (unexpected) energy. Cunningham uses bound flow to a far greater extent [...], frequently combined with strong resistance to time, in the form of very rapid movements. He also cultivates more complex contrasts in effort qualities, such as combining direct and flexible use of space, both in the bodies of individual dancers and in group of dancers." (Reynolds, 2006: 141). Cunningham dance proceeds in this fashion by "constant 'cutting'" to produce "high excitement and concentration of energy" and replace rhythmic progression towards a climax.

(*ibid.*: 145)

I have also been attracted to Douglas Wright's combination of athletic, powerful movements and intimate interpretation of music in *Arc Trilogy* (1999-2000), or Pina Bausch's engagement of the:

human subject as present in her body rather than a means to achieve an illusive quality of beauty through a developed technique.

(Climenhaga, 2012: loc. 2469)

All these examples indicate the direction of my exploration. I have looked into sonic movement to find this range of differences, this ability of interpretation and organisation of kinesis, in such an extent of variations. The kinetic experience for choreographers, a world of ideas and sentiments, is as important as its organising mechanisms. I have questioned whether in sonic movement would ever be possible to achieve such power and variety of kinesis.

2.3.3 Looking at everything

Leaving dance aside for a moment, another medium that has been used for compelling movement effects is light, either alone, or, as relevant here in combination with sound. The advent of optical sound made possible sound's synchronisation with visuals in motion. A work such as Léger's *Ballet Mécanique* (1924) shows two intense sensations of movement: in the rhythm of the music and for the type and quality of dynamism in the images. The interaction between the two is used by Léger to "try the spectator's patience" (Betancourt, 2013: 52) in line with the Dada art desire of attacking the audience. By using two elements of vision and audition, Léger produced a joint kinetic sensation which is what attracted me. The encounter of the visual with the acoustic stream creates something new as it was with dance. Marcel Duchamp in *Anémic Cinéma* (1926) used words in combination with the moving spiralling images on film. Those words' sounds, as mentally read by the viewers, were meant to be resonating in their minds and activating in combination with the kinetic effects of the images the artistic concept.

The relationship between the visual and verbal elements of this film is intricate; the complexity of the meaning contained by this formulation is belied by the simplicity of the film itself [...] [Duchamp's] names for the specific illusions used in the film was 'rotoreliefs'. These early examples of kinetic art were originally designed for exhibition on the spinning turntable of a phonograph. Once set in motion, they visually pulse between positive and negative space. Duchamp has identified this apparent movement as 'cinematic blossoming'.

(ibid., 2013: 64)

The 'verbal' introduces directly meaning and significance to interact with kinesis of the images. Again different dynamic elements are united to perform a third one entirely new.

Oskar Fischinger's work shows his realisation of the importance of this third element in producing a new type of artistic expression. He "arrived at the connection of abstraction-in-motion and sound after almost a decade of experiments with automating and reducing the labour required to produce animations" (Betancourt, 2013: 79), and worked with pitch, musical dynamics, timbre to connect sound with vision:

'painting in motion, combined with music, or painting without motion: that is the problem...' motion paintings gives to the painter a new potentiality. He must develop and become something like a 'visual-motionist', creating not only in space but in time. Within sixty seconds or sixty minutes he must present not only one static, frame-able two- or three-dimensional creations of a virtual nature, but he must also create sentence after sentence of moving, developing visual images changing and changing, in continuously different ways. At times, these may be composed of successive ideas, bringing new life into images. Forms are basic, but changes develop from the orchestration of forms and line and colours. This is a tremendous new world- a tremendous new tool- a challenge to creativeness comparable only to music.

(Keefer, 2012: 152)

The "orchestration of form and line and colours" is for Fischinger the process of engaging a new research of expression, a new artistic reality. Fischinger looks for complex audiovisual temporality, where "musicality [...] extends beyond the patterns of temporal relations its formal elements mark off", and for:

varying relations of synchronisation between auditory and visual streams. [...] Attention wanders from image to sound, to sound and image, to image: attention and distraction at play. The result is a superabundant measuring of poetic insight.

(ibid.: 153-155)

[...] Concerto by Bach[,] is like a smooth river flowing on the side of open fields- and what you see- is not translated music, because music doesn't need to be translated on the screen- to the Eyes music is in itself enough- but the optical part is like we walk on the other side of the river- sometimes we go a

little bit farther off (away) but we come back and go along on this river, the concerto by Bach.

(Oskar Fischinger as quoted in *ibid.*: 155)

The holistic sense that pervaded Laban's ideas is felt again, as intuitively was also present in Cunningham's kinetic experiments, hidden behind the visible presence of body and stage. Light, as seen through Fischinger, brings a further potential for kinetic expression. Like dance, it can interact with sound but also has the potential of becoming anything, able to transform for example from a precise line running across space, into an indefinite shape over an area. Light also can engage sound and exchange in kinetic dialectic, confirming the importance of vision for the perceptual determination of movement, and for its expressive enhancement.

One must continue to look at everything [...] it's the movement of things and people which provides distraction and even consolation.

(Edgar Degas as quoted in Popper, 1968: 13)

This quote, in the melancholic light of Degas' view, has nonetheless inspired my intention to look at everything perceptual, the fundamental criteria on which I have based my practice. Although the sensation of sound has localisation, stability, and width homogeneity (Rumsey, 2002: 656) and its motional power has velocity and shape, those are not the end target of the kinetic work of sonic movement, rather just the tools for its realisation. I have set out to find how the spatial attributes could produce the sensation of grace, aggressiveness, obfuscation, sharpness, enchantment (...), by elaborating their location, distance, spaciousness from a listening point, in combination with the actual sounding materials and in interaction with light and body. What mattered to me was not the mere fact of movement's presence but the "means of displaying an infinite variety of 'fundamental patterns' in such a way as to bring out the beauty of movement as such" (Popper, 1968: 143). That is an important addition to current sonic movement practices as it gives access to the expressive and resourceful world of kinesis, still yet to be fully experimented with sound.

The element of movement has now assumed an important place in the research of contemporary artists. [...] If we turn to remote sources of kinetic art - inspiration from nature, from art itself, and indeed from psychological states of mind - the variety is immense. Artists have derived inspiration from -or at least determined their choice of method in response to- intellectual and imaginative tendencies such as the dynamic philosophy of vitalism, the mathematical calculus of movement and other theories of the

relationship between time and movement, also from the notion of progression as a factor of movement. They have considered both ancient and modern theories relating to order, repetition, combination and permutation. [...] Of a more permanent nature are the natural manifestations of movement which have influenced the kinetic artist. Phenomena connected with light -especially the cycle of night and day- with wind and air, gravitation and weightlessness [...], the movement of water- from the smallest drop to the scale of the ocean- fire and smoke, atoms on the microcosmic and stars on the macrocosmic scale [...]. Particular mention should be made of biological movement, from that of the smallest organism seen under the microscope to the immensely varied movements of man and the animals.

(ibid.: 93-94)

I have thus gained a sense that for realising an acoustic experience of movement via auditory perception and sound diffusion systems, I needed to look into more flexible and comprehensive approaches.

2.4 Conclusion

In this chapter, I have tried to outline what is the sensation of kinesis I could produce with sonic movement, how that could come about perceptually and artistically and which forms and expressions it could take. For this purpose, I have made several comparisons with dance and kinetic art, comparing how sound could be used as the material for kinetic exploration and taking inspiration from their realisations. This investigation should have served the purpose of partially setting the context for the description of the practical work in Chapter 4 and 5. Another important aspect, which I shall discuss in detail in Chapter 3, is the use of technology and its role in shaping a performance and listening space. So far I have shown what is, in my opinion, the gap in current explorations of spatial sound, that is the indecision in taking a position regarding the experience of movement. Whether a more denotative or connotational position is taken, the modalities through which movement is experienced have to be considered in full even if that implies to research outside the specific context of sound making. I tried to emphasise a different hierarchy within the creation of kinetic processes: a priority of the physiological and psychological over the phenomenological, of the holistic over the geometrical. This is not a systemic proposition, rather a suggestion for seeing things from another angle. This idea came from the collaborative practices I have put in place in which I have been challenged by the reality of making sonic movement interact with dancing bodies and lights in space (that is, visual projections, as mentioned in Chapter 1.4.2 and as will be re-addressed in Chapter 5), from different listening points and custom-made perspectives.

Chapter 3

The Sound Stage

3.1 Introduction

A surround sound technology could be in general defined as a system including the loudspeakers, the software for encoding sound spatial attributes (designing the spatial trajectories or behaviours) and decoding them (making them audible through sound). This system creates, through the loudspeakers, the impression of virtual sources, on which sonic movement is based. Sound sources are organised and perceived within the space delimited by the loudspeakers, usually surrounding an audience.

This chapter is focussed on the role of technology in the creation of sonic movement and of performances made with it. Technology is acknowledged as the main medium through which sound could manifests (as it playbacks sound, with the many differences and modalities of application), and as the delineator of the space (through loudspeakers) in which the performance can happen. I will discuss the place in which the sounds come alive, and the space where the listeners experience the artistic designs, by outlining my journey through various attempts and experimentations.

I have learned that sonic movement is about balancing multiple relationships between sound, the listener, technology, and the performance space. Auditory perception, movement perception, audio visual interaction, and their relation to multimodal and proprioceptive stimuli are the essential elements of this discourse, that so far I have introduced. For each of the collaborations I have initiated, I had to study which technology was best supporting it, basing my judgement on technical and artistic reasons.

Several differences in the application of technologies to each planned creative work create complex artistic problems. When choosing systems for spatial sound, one could not assume that they will create the same auditory conditions, even though they are similarly based on making trajectories of virtual sound sources. I will try to show in this chapter for example how the artistic idea of making a joint choreography for dance and sonic movement could be best realised with wave field synthesis technology (WFS) rather than with ambisonic, because of technological differences. Later in the text (in this chapter and for example in Chapter 4.7, 4.8), I will add more details on how psychoacoustic or multimodal issues, the technical configuration of the loudspeakers

system, or acoustic artefacts negatively affect the accurate perception of quite simple sonic movements, in the location defined by the software. In general, each particular application of technology to an artistic project affects essential factors such as the position of the audience in relation to the achievable resolution of perception, the type of multi-sensorial stimulus that can be provided for each circumstance, and the flexibility of orientation of the listener. As seen earlier, in particular in Chapter 2, all these constitute the basis for the appreciation of movement.

3.2 The sound stage

A concept that could be useful to discuss more thoroughly here is that of the sound stage. I have already used the term in Chapter 1.1 to describe the perception of a virtual sound source as a balance between the loudspeakers number and positioning, the listener's position, the type of sound and other psychoacoustic factors. Then, I wanted to indicate that there is a clear difference between the playback diffusion system and the sound stage, and that is because the sound stage depends on the listener's position and orientation.

Accordingly to Moylan the compound sound stage is used to describe the quality of an audio recording, mostly its depth and richness. Moylan describes it as:

the perceived area within which all sound sources are located. It has an apparent physical size of width and depth. The sound sources of the recording will be grouped by the mind to occupy a single area. [...] Stage width (sometimes called stereo spread) is the width of the entire sound stage. It is the area between the extreme left and right source images and marks the sound stage boundaries. [...] Imaging, [...] the lateral location and distance placement of the individual sound sources, [...] provides depth and width to the sound stage. The perceived locations and relationships of the sound sources create imaging, as all sources appear to exist at a certain lateral and distance location within the stereo array.

(Moylan, 2007: 49-50)

Rumsey (2012: loc. 358, 802, 816, 1149) extends the use of the term sound stage from the stereo array to surround sound arrangements of loudspeakers.

In music making, the reproduction via loudspeakers of a sonic composition could then be considered a creative act in itself, for it creates a sound stage composed by unique imaging, caused by the type of playback technology, the listeners' seating arrangements, and ideated by the composition and its relative strategy. I

consider this concept central to sonic movement practice, and I believe that, alongside technical considerations, also an aesthetic reflection on the role of loudspeakers and loudspeakers sound playback technologies is necessary.

For my two projects, I have chosen two technologies which allow two distinct types of sound stage and artistic approaches, because of their technical differences. For *Stranded* I have used the 192 loudspeakers system by The Game of Life Foundation (The Game of Life, 2010), featuring wave field synthesis (WFS), controlled by the WFS Collider software based on SuperCollider (McCartney, 1996), developed by Wouter Snoei. For *I Hear You See Me* I have used an implementation of first order ambisonic for a cubic rig of eight loudspeakers [Appendix III aaa.1]. Each of the two technologies presents different sound stages, as different are the accuracy in creating virtual sound sources, the resolution at which sound spatial attributes and their changes can be perceived, and the listening arrangements that can be planned.

Within the variable perimeter of The Game of Life's system, for example, most commonly of 10 by 10 meters, listeners can localise a virtual sound source approximately with the same resolution, from wherever they are sitting. No advantage point affects the resolution of the spatial image, although one listener could be closer or further away from the exact location.

Wave Field Synthesis is based on a physical description of the propagation of acoustic waves [...] [via] technical approximations of acoustical monopoles and dipoles by appropriate loudspeakers. These loudspeakers cover the surface of a suitable chosen volume around the possible listener's positions. They are excited by appropriate driving functions to reproduce the desired sound field inside the volume.

(Benesty, 2008: 1110)

In comparison, ambisonic systems are designed for one listener assumed to be listening in the centre of the diffusion system. This aspect of ambisonic is presumably derived from its original purpose, which is "of recreating accurate three-dimensional sound stages from original recordings" (Robjohns, 2001). David Malham stated that the simple, basic version of the ambisonic system can only create an accurate sound field at one central location and that there is a gradual increase in the level of errors as the listener moves away from the centre and as the frequency increases. If carefully implemented over larger areas, or by combining ambisonics with either the

holophonic system or wave field synthesis (Malham, D., 2003: 1), resolution can improve. In the sweet spot:

the derivation of the panning laws relies on some idealisations. It has been assumed there is only one listener and that the position of the listener doesn't change. This ideal position which corresponds the origin of the coordinate system is called the sweet spot. Outside of this distinguished position, the assumptions for the panning laws do not hold. [...] For listeners outside the sweet spot, the localisation of virtual sources degrades.

(Benesty, 2008: 1102)

The sonic difference felt between a technology reproducing many sound fields -as many as the possible positions within a volume- and another creating one sound field for one central area, has caused a lot of stir in the technical and artistic sectors interested into spatial audio creation. The topic of the sweet spot in ambisonic and the absence of a sweet spot (or anti-sweet spot) in wave field synthesis systems has been widely discussed (e.g. Huang and Benesty, 2004: 323-324, Malham, 1998: 167-177, Baalman, 2010: 209-218) and is considered the main relevant technological difference between the two systems,. The substantial difference between wave field synthesis and ambisonic appears to be that, for ambisonic, the psychoacoustics more than physical properties of sound are considered (Huang and Benesty 2004: 323-324).

Regarding the ability of the two systems of producing a high-resolution sound stage in all the areas covered by their loudspeakers system, one would argue though that using a higher order ambisonic (HOA) would make the difference with WFS to reduce considerably. Research has shown (Spors, 2008, Daniel, 2001, cited in Baalman, 2010) that although presenting many similarities at high levels of resolution:

WFS and HOA are not similar even when discarding spatial sampling and that the sampling artefacts of both approaches differ significantly from each other.

(Spors, 2008: 13)

My method has been to take the time to practice in the spaces and decide what system to use for my particular creative idea. I did not want to compose for WFS or ambisonics per se, but I wanted to design an experience, through the characteristics of each technology. After considering more closely the sound stages of the two technologies, my impression is that ambisonics recreates a spherical sound field around a centre point, and that

is where the spatial resolution is higher, with no artefacts. If I left the centre of the space, progressively I could not precisely recognise the sonic movement I have just played. Instead in WFS, such problems didn't occur, and I could relatively identify the gestures from any location (although with the exceptions and artefacts related to The Game of Life System space, to be discussed shortly). I have regarded then WFS and first order ambisonic as different creative contexts, and thought to use their differences to my advantage: I had two fundamentally different sound stages, for which I could differently experiment the practice of creating sonic movement. Two separate sound stages offered two distinct forms of listening and artistic experience as well.

Recalling a concept laid out in Chapter 2.2, between the sound event and auditory event there is a gap for which a particular attempt in creating a form (in an artistic sense) may or may not take place as expected or at all. Sound making and sound listening are linked at the heart of sonic movement production, and this responsibility - which includes the application of technology- lies within the composer, the first listener of the work.

My position has been to explore the kinetic impression produced by sound over two different technologies, establishing what types of sound stages could be created. That could also fit into the artistic expression and context I wanted to create. Blom says that through movement and kinesis it is possible to create form:

forming is as basic to art as it is to life. Form is present throughout nature, in all forces of the universe, in all the stages of life.

(Blom, 1982: 83)

My effort to integrate the understanding and knowledge of the application of technology to the realisation of artistic ideas goes along this line.

3.3 Examples of listening experiences

I believe the amount of emphasis placed by a composer on audience's seating orientation reflects the perceptual orientation of his/her musical thinking. That includes the active involvement of the composer into deciding and structuring that part of the experience, as well as the passive acceptance of consolidated forms of public consumption and display. Along this line could be found differences between composers in invention and artistry in creating sound movements in space.

The two Pavilions, the Philips in Brussels 1958 and the German's in Osaka 1970 are very early, and not so often repeated in such scale, examples of how sonic movement creation is considered as a whole experience of sound and performance design. The Philips Pavilion for example:

contained within its unusual hyperbolic paraboloid structure a long unbroken projection surface with elaborate lighting and projection equipment and an eleven channel multi-track tape system which could be routed to over four hundred loudspeakers. The main musical element of the program consisted of Edgard Varèse' tape piece *Poème Electronique*, which was synchronised to the visual effects and dynamically distributed through the space in nine different 'sound routes' using a switching system controlled with an additional tape track.

(Bates, 2010: 139)

In times when synaesthesia was de rigueur, with the advent of film and optical sound including colour music and visual music experiments, Le Corbusier (Charles-Édouard Jeanneret-Gris, 1887-1965), the commissioner of the project, wanted to convey all these experiences in one single event. He emphasised the idea of an electric poem realised through the architecture and multiple visual and auditory stimuli. In the Philips Pavilion, the audience could experience the spectacle by walking around the building, immersed in sound -spread over loudspeakers placed all around the walls-, lights, and projections. (Xenakis, 2003: 99-101).

About the planning of the Osaka 1970 German Pavilion, Stockhausen stated:

new halls for listening must be built to meet with demands for spatial music. My idea would be to have a spherical chamber, fitted all round with loudspeakers. In the middle of this spherical chamber, a platform, transparent to both light and sound, would be hung for the listeners. They could hear music, composed for such adapted halls, coming from above, from below and from all directions.

(Stockhausen, 1975: 67-82)

The seating arrangement directly reflected what type of listening experience was desired, linked to the style of the compositions that would have been played. Stockhausen emphasised that the listening space should be kept free of any obstacle and distraction, experienced freely within the space, from multiple perspectives, a space designed specifically with the listener's experience in mind:

we are used to sounds which have been fixed to objects that have produced sounds, like instruments or human voices. And we have lost the ability to fly like birds, to make flying sounds in a concert hall. That's why there's the stage and the people who are all sitting. And the movement of the sound has no importance whatsoever. The sound travels in the hall by itself, bangs against the walls and hits the ears, but the sound source is never travelling. It's only in a forest that you can still experience this, where birds are flying. With the airplane this has come back, and with modern traffic, where a car is passing by and the sound makes the typical doppler effect, or whatever. [...] Every animal and hunter is very attentive to where sounds are coming from. [...] Every sound moves the molecules of the air and needs its space. [...] There should practically be for every sound a different area where this sound lives and also enough space where it can travel. [...] For the first time in the history of mankind we have the means to make sound travel, which means real stereophony, putting speakers everywhere in a hall. And up to now this has hardly been the case. If we have speakers, we have them on the stage, and it causes a lot of problems. [...] At the World's Fair in Osaka where I together with an architect constructed this completely spherical hall which seated 550 people on a sound- transparent platform in the middle of the sphere, and there were speakers everywhere.

(Stockhausen as in Cott, 1974: 43-46)

These early examples were for me clues into how the emergence of spatial audio, and in my case of sonic movement practice, required a redesign and new ideas about the performance space. In *Stranded* (Chapter 4), I wanted the audience not to be anonymously grouped in one section of the space, and have put emphasis on each listening position, through arranging the spatial composition to differently evolve around, across, close and far away from each of the seating points. In *I Hear You See Me* (Chapter 5), I have adopted a different strategy, developing from the experience of *Stranded*. Paying attention to the listening experience has been my attempt to address the balance of those complex elements constituting sonic movement practice: auditory perception, movement perception, audio visual interaction, and their relation to multimodal and proprioceptive stimuli (as mentioned earlier in Chapter 3.1).

As a help in revisiting the listening experience through the desire I had for a new sonic experience -a new 'musicking' (Small, 1998, also see Chapter 1.6)-, I have looked into installation art practices. I have been interested in how, in installation art, the viewer has a specific part and function within the artwork: he activates it. I wanted the listener to similarly turn the composition alive with their presence and interpretation, as a centre

through which all the stimuli, and in particular the multimodal, could intersect and activate the kinetic sensation.

Installations should not illustrate a situation, but should be geared toward visitor's first hand real experience, [...] a wholly immersive environment in which the space existed for the viewer to activate as an engaged and absorbed participant.

(Lucas Samaras in: Bishop, 2005: 27)

In Allan Kaprow's realism of *An Apple Shrine* (1960), or *Words* (1962), the pragmatic ideas of John Dewey resonate and inspire the idea that human beings are essential to the activation of a piece, if actively:

inquire into and interact with [...] [the] environment [...] being thrust into new circumstances [...] having to reorganise [their] repertoire of responses.

(Bishop, 2005: 24)

Paul Thek's processions explored similar ideas, such his *Death of a Hippie* (1966-7), where the viewers could enter into a three-tiered pyramid and file in the construction like mourners (Bishop, 2005: 28).

I have been particularly interested in this aspect of installation art, as it exemplifies how the artist's designs, the symbolic references, and the materials used are all calculated for the actual experiential action of the viewer. This interpretation made me reflect on the nature of listening and to its value in the successful reception of a work.

I decided to create an experience that existed through the participation of the listener, which needed definition and work as much as the actual sonic composition. I wanted to emphasise the importance of including in the compositional effort the invention (or at least adaptation, as in *Stranded*) of the performance space. In this sense, the final design could not be abstract and reproducible in other forms and situations, but would be unique and site specific. In this way, I could ensure that all the required stimuli, and subtleties of the artistic communication, would be addressed within the composition design, and maintained in the performance. It is for these reasons that technologies and their characteristics assumed a critical role in my practice.

3.4 The process towards *Stranded*

The choice of making work for sonic movement has been a lengthy development. Drawn to the idea of movement

and its significance, several attempts into doing work for solo audio didn't satisfy me for they lacked the necessary form and richness that I desired. They all account to quite numerous but only tests. After having moved towards multimodality, inspired by dance choreographers, and fascinated by Laban theories, my goal was to realise a project with ambisonics and dance, due to the accessibility of that technology, and the immediacy of dance as an interactive partner to sound. I have done several works in particular with choreographers Lexi Bradburn and Nadine Maclean (see Appendix II), Alice Bariselli and Noora Baker which I consider preparatory to this research. Each of these works has furthered my understanding of the practice, investigating on dance and sound interaction, discovering and solving technological issues, and establishing methods of collaboration. With some of these choreographers I have been and still am engaged for the creations of dance shows, and I often meet for research and development sessions.

3.4.1 2011

With Alice Bariselli I had the chance to apply in a performance context my sonic movement ideas. For the project *UNTITLED - Two on a white surface* (2011), performed at Bonnie Bird Theatre at Trinity Laban Conservatory of Music and Dance in 2011 Alice devised to have two dancers dancing on stage below a projection from the ceiling. The audience would have to be accompanied on stage and stand or sit around the dancers in the dark area around the projection for the duration of the show. I planned to build a cube of loudspeakers around them, at the corners of the stage to include the dancers and the audience. In this fashion, the sound would have surrounded every person in the space (Figure 3.2).

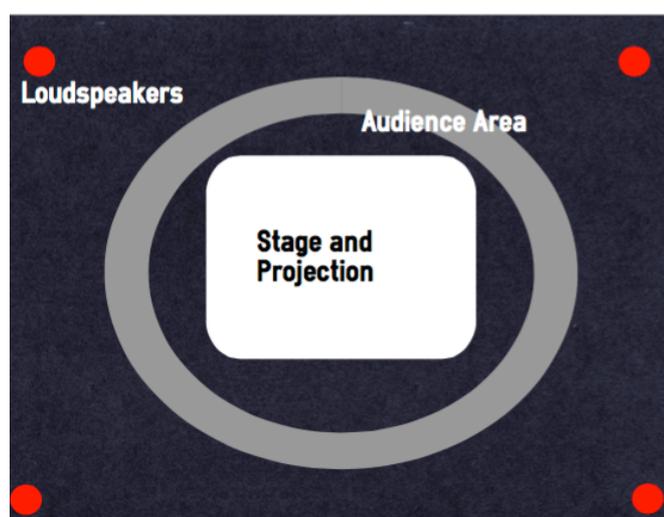


Figure 3.1. Infographics of *Untitled - Two on a white surface*, by Alice Bariselli (2011)

We initially studied the connection between sound and body gestures by working on the idea of breath. Alice

used breath as a source for the creation of movement quality and dynamics. Breathing, considered as a continuously moving impulse in the body and the primary source of all movements, suggested a specific movement vocabulary. Alice's composition is based on a set of repetitions suggesting the rhythm, the sound, and the waves of the breathing action. Associated with this concept, she used the idea of erasure as a method of composition, inspired by, accordingly to Alice's sources, the works by Robert Rauschenberg (*White Paintings*, 1951 and *Erased de Koonings Drawing*, 1953). By using erasure, the work is developed through:

a series of 'cancellations' [that] may generate the presence of new material arising from deconstructive acts (the continual 'rubbing out' of gestures, mark and relationship). The point of stillness, reached through gradual erasure of the movements, reveals the pure presence of the living bodies in space and demonstrates stillness as a 'silence full of sound'.

(Bariselli, 2011)

In this context, I was to apply my sound ideas. I have used the rhythm of the breathing and the mechanism of erasure to inspire the type of sound and its length. I have created different textures and timbres with high internal rhythmical instability, although maintaining a long unravelling shape, slowly growing from nothing into a powerful stream and then into rest again. The sonic movements were designed to reach the audience, and then reach their climax when over the dancers to subsequently fade, or, inversely, to grow from the dancers outwards towards the audience. Sounds were also crossing out and circling the space. My interest was not to use sonic movement to interact with the dancers but to emphasise the breathing rhythm of the dance. Movements were generated from the rhythm and extensions of breathing patterns, into which the dancers organised their phrases. Sounds were tied to these rhythms and their spatial trajectories for the duration of the patterns, as if they could, with an almost tactile impression, help the dancers' bodies expand beyond their reach.

Every aspect of the work linked together seamlessly, for example in the projected film the editing of the images has been realised by following the score used for the choreographic composition. Alice describes:

the performance's white floor, with its texture, is perceived as a living frame where moving images coexisted, creating a visual, tactile and audial stimulation on the viewer's perception.

(ibid.)

As a very first approach to sonic movement and dance, this work explores solely individual kinetic elements, in particular, the duration, density and strength of the movement and the rhythm of the gestural pattern, either in the breath, the bodies and the sounds, and their direction and expansion in the space.

One of the main issues of the work has been to understand how to use spatial technologies in conjunction with a dance performance. If the audience was to be placed in the best listening spot, that must have been within the perimeter of the sound projection space. I could have divided the projection space between dancers and audience, or kept the dancers outside the spatial sound projection area, which would have embedded only the audience in the sound. Both these ideas did not satisfy me. The ambisonic technology used in *Untitled, Two on a White Surface* helped me designing the best compromise between the sound stage and the dance stage, all placed at the centre of the projection space, concentrically (Figure 3.2).

Technology, performance space (dance and sound stages), listeners position, and the creative combination of sonic movement and body movement are all themes that I developed further in the first project *Stranded*.

3.4.2 2012

With Noora Baker, I have explored what was my intention in my earlier attempts with the project *Deuce* and as realised via sound post-production over Nadine Maclean's dancing footage. In three research and development sessions, we worked on the idea of a dancer moving in front of a listener wearing headphones (as shown in the infographic of Figure 3.3). While both could hear the sounds, the spatial kinetic rendition was only given to the listener. We have tested using headphones also with the dancer, to share the same spatial rendition as the listener-viewer, but the sonic movement orientations were conflicting with body's and head's orientation as the dancer was moving.

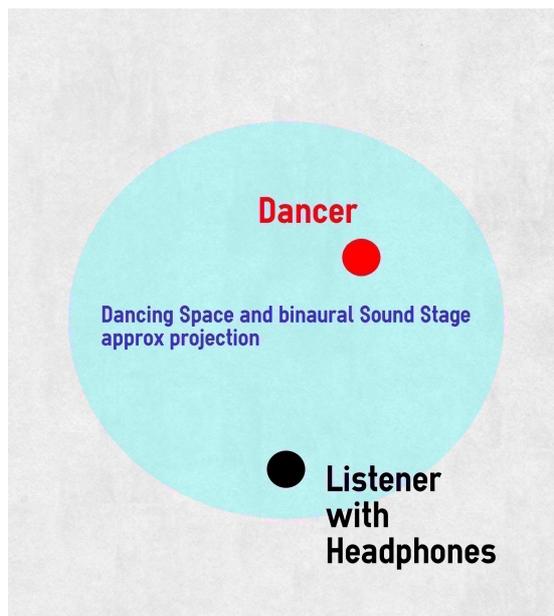


Figure 3.2. Infographics of the stage and sound stage disposition of project with Noora Baker.

The dancer could move in front of the listener, right and left, back and forth, closer and far away from his or her location. The sonic movements were organised accordingly to these identical dynamics, mimicking the energy and motion of a pendulum. Immediately that simple movement created an attraction between the dancer and the sound from the perspective of the listener. From this initial laboratory sketches, we worked into expanding the sounds (from just simple synthetic sounds) into more complex textures maintaining the idea of the pendulum. We had to suspend the activity, for Noora had to move back to her country. Hopefully one day we could continue our project.

3.4.3 Sound stage comparisons

Although I have made several attempts in these preparatory works, I came to the conclusion that it was not possible to achieve such a complexity of contemporaneous spatial perspectives by using ambisonic, at least at the resolution my resources allowed me to employ. The possibility of working with the powerful WFS system by The Game of Life Foundation gave me the chance to make a piece for dance and sonic movement using wave field synthesis.

The project *Stranded* (Chapter 4) consists of 20 people being spread over six different orientations, to emphasise the fact that in the WFS system's two-dimensional space, any direction the sound will take will be perceived by the audience, relative to each seating location. We have also multiplied the points of view by moving dancers and sounds and relating them in space through the choreography, which created new relative perspectives. The

potential perceivable positioning of the virtual sound sources is put in relation to the position of the dancers' bodies, creating further spatial relationships. I have designed and worked on the wider stage of the rectangular area of the space, yet taking into account the perspective of each spectator, using the paths along which the dancers would pass, and the gaps between the chairs as part of my sonic movement design. I could then say that the WFS system creates many different sound stages, as many as the listeners, (confirming earlier Benesty point in 3.2, Benesty, 2008: 1110).

In previous concerts of spatial music with the Game of Life System, the discourse of the sound stage or the multiplication of the sound stages is not often taken into consideration, neither from composers in the first place, neither from the organisers of the events. Although nothing is written about it, by attending to their concerts, following the performances of the system, and speaking with the main technical staff, the most common scenarios are to place the audience facing in one direction only (la biennale di Venezia channel, 2013), or sometimes concentrically (Kanaal van cooperativeguy, 2011).

My artistic ideas to develop sonic movement with dance have then directed towards the employment of WFS technology. Still, many other aspects emerging from the practice have been untouched and needed to be investigated. By working with ambisonics, I had this opportunity. I have found more suitable to do with ambisonics a performance directed to the experience of one person, focussing on the perception from a specific listening spot. In concerts where ambisonic is used, such as during the International Symposium on Ambisonics and Spherical Acoustics (Ircam, 2010), or Acoustic Engineering Society conference in York (AES, 2012), or MuSA 2014 (2014), several chairs are organised inscribed in the perimeter of the loudspeakers, most often facing one direction. The general consideration appears to be that the listening area is large enough to diffuse spatial sound attributes at quite good resolution even to listeners at the edges of the area. It is, instead, quite often not the case, certainly not with the first order ambisonics which I have used.

For *I Hear You See Me* (Chapter 5) I have organised a listening area for one person only, which most of the times is found in the centre of the diffusion system. I didn't want the listener to be tied to a unique orientation, but rather to explore the all round characteristic of sound. I managed to make him stand, sit, walk, and lie down in different locations always around the centre, but playing with the orientation. The sound stage of ambisonics in this way has been explored from many perspectives, to which I have adapted my ideas of sonic movement design, without interfering or offering a compromised listening situation to the listener, but a unique and specifically

designed experience.

3.5 Music as an activity

The interpretation of the sound stage that informs my practice also finds a context, beyond the technological implementations, in cultural reasons, which could give more depth and further clarify my purpose and aim within the Sonic Art domain.

John Blacking stated that:

musical systems are derived neither from some universal emotional language nor from stages in the evolution of a musical art: they are made up of socially accepted patterns of sound that have been invented and developed by interacting individuals in the contexts of different social and cultural systems. If they have been diffused from one group to another, they have frequently been invested with new meanings and even new musical characteristics, because of the creative imagination of performers and listeners.

(Blacking, 1987: 21)

For Blacking music is the expression of a cultural and social context, part of the biological evolution, in a Darwinian sense (*ibid.*: 22), as anything else.

Music can communicate nothing to unprepared and unreceptive minds, in spite of what some writers have suggested to the contrary. The power of music as music must depend in the last resort on people's perception of specific patterns of melody, rhythm and texture, and on the bodily sensations and responses that these elicit. But in making sense of music, we are also influenced by other communications that reach our senses, by the social experiences that performance can evoke or actually requires, and especially by the quasi-ritual association and concentration of human bodies in time and space and the varying degrees of intensity and energy generated by the performers as participants in a social situation. In many cases, the use of music as a symbolic focus of attention and social interaction is more significant than any of its intrinsically musical characteristic.

(*ibid.*: 30)

Likewise, the uses of technology continuously developed throughout the years, as much as its function (Sterne, 2003: 90). As technology progressed, different habits developed and uses, artistic and practical, relatively to music making or music consumption. The acoustic communication purposes that the telephone and the radio fulfilled were also describing social interactions:

while the telephone remained a device for person-to-person conversation and therefore maintained its intimate contact with users' mouths and ears, radio and the acoustical phonograph were soon modified to allow their recreated sounds to fill the rooms in which they were heard, enabling communal listening. [...] By 1925, radio receivers were no longer complicated contraptions whereby solitary auditors listened through headsets to intermittently broadcast signals. A rapidly growing industry now mass-produced products that any consumer— even the most technologically uninformed— could purchase, take home, and enjoy. [...] Radio listeners were not only acoustically connected to distant companions simultaneously enjoying the same program, they were now also able to share that program with others in the immediacy of their own home. The old headsets were replaced by electroacoustic loudspeakers that projected the sound out into the room, enabling an entire family to listen together.

(Thompson, 2004: 237)

A loudspeaker system is an instrument in my hands. Making music through it required me to reflect on its technical aspects as much as on the listening it affords (in Gibson's sense - Gibson, 1979). The historical account of the social impact of technology has fed my artistic reflection. Since in Sonic Arts the various artistic expressions always take new and complex forms, especially when the creation of virtual sound sources is involved, I wanted to carefully assess the technology and listening arrangements to use as an essential part of my compositional media.

Sometimes the idea of musical genre carries in itself some expectations, that certain type of music for loudspeakers should be playing back sounds over a certain listening arrangement, revealing a passive approach to loudspeakers artistic control, which composers might end up following.

Many interferences, unfortunately, come in between the interaction of the artist with technology, and in fact:

how composers, performers and listeners create and respond to music depends not on any single

factor, such as personality, but on how they place themselves and their musical activities in relation to other activities.

(Blacking, 1987: 43)

As Michael Gerzon observed, the efforts and research for quality in sound reproduction through loudspeakers over a two-channel stereophony -for example the many attempts in reproducing orchestral music recordings with the same quality and effect as the real thing- have been delayed by continuous interference of commercial pressures, in selling and promoting technologies regardless of the real and effective quality and realism of the sound (Gerzon, 1971: 1).

Consumer's habits, of purchasing and using technology, might have entered the artist's mindset and have been very influent in the decision behind the creation of a piece. How much part these factors related to technology take in the artistic expression?

In the artistic interpretation of the need for music, of exchange and communication, I believe one should be free:

to be a thinking and concerned member of a society [...] entitled to raise moral issues at the heart of even the most technical and professionalised activity [...] [to] enter and transform the merely professional routine most of us go through into something much more lively and radical; instead of doing what one is supposed to do one can ask why one does it, who benefits from it, how can it reconnect with a personal project and original thoughts.

(Said, 1996: 82-83)

By thinking of music as to an activity, as Small suggests in his book entitled "Musicking: the meanings of performing and listening" (Small, C., 1998), the creative discourse integrates with the technological:

music is not a thing at all but an activity, something that people do. The apparent thing 'music' is a figment, an abstraction of the action, whose reality vanishes as soon as we examine it all closely. This habit of thinking in abstractions, of taking from an action what appears to be its essence and of giving that essence a name, is probably as old as language. [...] To music is to take part, in any capacity, in a musical performance, whether by performing, by listening, by rehearsing or practising, by providing

material for performance (what is called composing), or by dancing. [...] Like any other building, a concert hall is a social construction, designed and built by social beings in accordance with certain assumptions about desirable human behaviour and relationships. These assumptions concern not only what takes place in the building but go deep into the nature of human relationship themselves.

(Small, 1998: 2-9, 29)

These ideas inspired me to think of the relationship between sound, listener, technology, and the performance space as a creative ground for realising a music making as a "lively and radical" (Said, 1996: 82-83) activity.

3.6 Unicity and sensuality: the composer's abstraction and the sensual experience

After these cultural considerations, their implication is immediately seen by looking at research in performance design.

I have had an obsession about not using the same things. One has to be on guard because, despite oneself, one can become invaded by things of the past.

(Marcel Duchamp in Cabanne, 1988: loc. 421)

In studying a performance design for an electroacoustic performance the idea of reproducibility at times conflicts with the pure instinct of creativity. The fact that an artist would like his work to be heard and replicated easily has some collateral effects, such as choosing a particular technical arrangement, which in turn affects the creativity.

In electroacoustic music or spatial audio for example, conferences' calls for work (e.g. for ICMC, 2015, or Insonic, 2015), whilst making an effort to accommodate many different needs, still mention 'electronics' or loudspeaker systems, without clarifying the characteristics of the loudspeakers' (and listening's) arrangements or their flexibility. Instead, they offer standard configurations (e.g. 8.1 for installations; 24 discrete loudspeakers and subs on pre-defined layouts), and sometimes also a pre-fixed duration for the works as if music should be heard and created similarly between composers. As mentioned earlier (Chapter 4.4), the idea of proposed 'genre' (e.g. acousmatic, installation) or categorisation of artistic works contain an implicit limitation, standardisation, or some expectation which goes against the freedom creativity should be granted.

Composers are not happy with the performance of their spatial compositions. Research by Nils Peters (2010) has evidenced that, between professionals, the preferred venues for performance of music using loudspeakers

systems are more likely to be traditional concert halls, specific venues for electronic art, and art galleries.

Most composers (76%) consider the loudspeaker arrangement in the performance situation as different from their studio environment.

(*ibid.*: 36)

Several problems of fidelity and reliability occur in the transfer of the recorded work from the composer's studio to the performance venue. There is an emphasis on time constraints, non-ideal loudspeakers' and audience's location, and sweet spot issues as the main causes that affect the final satisfaction about a production of a work (leaving aside technical/staff inadequacies and acoustic room conditions).

Accordingly to the research, while composing the works, composers most likely use two channels stereo loudspeaker arrangements, headphones and more rarely quadraphonic or octophonic arrangements. In this fashion, they prepare the works with completely different sound stages than those that would be recreated by the technology at the performance venue. This tendency in practice and its reasons have effects on the quality and meaning of the sonic movement design.

Loudspeakers sound diffusion composers find that, at venues, time constraints and lack of flexibility in rearranging the venue's technical setup accordingly to their concept, affect the resultant work quality (*ibid.*: 38, table 2.4). The work is created upon an idea of the composition leaving the final result always an incognito.

Every composer has his (*sic*) own ideal conception of the sound of his own works. Is it the sound-image of the studio in which the piece has been produced or is it an imaginary, unreachable sound-image?

(Tutschku, 2002: 14)

I believe most of this dissatisfaction depends on the particular choice, made by composers themselves, of working in a separate environment, with an unrelated sound stage, lamenting resolution or rendition issues afterwards. More likely, this particular approach to composition is guided by convenience and practicality, yet it reveals for me an unjustifiable lack of care for the listening perspective, as if it was a minor part, or of little relevance, in the process of creation. If some would argue that this is acceptable for sound design, that is for sure not the case for sonic movement design.

I guess the affordability of computer and audio systems, together with immense advantages, has brought the assumption that precision could be achieved in the transition from small to large scale (provided that the issues are only and just about scaling in size). That is like saying that an architectural model could just be scaled up and become a perfectly inhabitable building. In my opinion, on the composer's side, problems related to artefacts and unreliability in concert performances -evidenced by Peters' data- are caused by abstracting and not integrating the listening experience. In particular with complex listening situations such as performances of spatial music, the listener's experience in the performance space is central to the realisation of the work, as many of sonic movement designs depend on the specific balance between the characteristic of perception, the sound stage and the multimodal attention.

Marije Baalman brings forward the issue that each technology provides a different compositional context (Baalman, 2010). Her discourse covers the different effects a composer should be careful of, depending on the technology used, yet this still doesn't address the relationship between the listener and the technology as a compositional problem. Psychological, physiological and cultural issues are mentioned but not discussed in relation to their influence on the creation and reception of a work.

I have discussed issues with loudspeakers sound diffusion and reproducibility, proposing an alternative view, conceiving the relationship sound, listener, performance space as a whole creative act of design (Perego, T., 2013). The practice of sonic movement needs to create unique circumstances, sometimes inevitably irreducible to reproducibility aims, setting the issue on a cultural level about the implications of consumerism in the arts, and towards a reconsideration of music as a social activity, in Small's sense.

The 'composer's abstraction' for me then means creating a composition on specific audio systems, with their acoustic, and spatial characteristics, for then later transferring them (with really short rehearsal time) into larger unrehearsed and unplanned spaces, where the listener will be seated; I mean working on low-resolution renditions, or for smaller sound stages, that then have to be projected into higher ones. That is quite an unsuccessful path to take. Composers would never know exactly how in the real performance space their design would take form and, because the design is, in the end, entirely made on a smaller stage, the whole scope of creating music for such systems misses the point.

It is questionable how well compositions made for small systems (and thus usually also for a smaller physical space) scale up to large systems, and vice versa. It is unlikely that there will be a straightforward way of scaling up compositions to a larger space (both virtual and physical): a composer may have composed a piece for a small setup and have audio material on different tracks that are related to each other, which when they are scaled up in terms of single tracks - and in doing so moved further apart from each other - may lose their common sound impression.

(Baalman, 2010: 216)

To resume, Peters, Baalmam and Tutschku emphasise the issue between the act of composing, the technology and its final performance. On my part, I am stressing the importance of integrating the analysis of the listening experience and its design, and considering it part of the creative compositional act, especially when creating works based on the perception of movement through sound.

In *Stranded* we strived to examine these problems, through direct observations by myself, the choreographer and the dancers. I have worked and prepared my material in my home studio, on my equipment and then, from February 2012, I went to try and study it in the real space. After my tests, I went in the space again with the choreographer and realised which sonic elements could work, what was inspiring, and what instead failed to give us enough ideas, for it was missing clarity, depth, or just because playback from that powerful system just sounded dull.

Similarly for the second project *I Hear You See Me*, after testing preliminarily in my house over a full loudspeaker setup (not with projections), I went to Goldsmiths' Theatre and Drama Department to rehearse in their studios which allowed enough height for the projector to be installed (at least at four meters height). I needed to test the sounds with the lights and projections for understanding the effects on sonic movement when experienced with several other multimodal inputs. Those were not rehearsals at the final stage of the work, but it was the testing time I have taken since the very early stages and with little material, to check the essential artistic, aesthetic, and technical ideas.

The Choreography of Sound (CoS) project by Gerhard Eckel (Eckel *et al.*, 2012) in Graz reports that:

spatial audio technologies attempt to find a technical solution to create a spatial sound image. The

notion of the image suggests that there are objects which are depicted or rendered audible through spatialisation. An alternative way of thinking about the spatial in music is to compose sound such that spatial sonic entities emerge in the experience of the listener. [...] Rather than rendering sound for a sweet area, CoS attempts to create music which can be perceived from multiple angles or listening positions, each of them provoking a different experience, and all of them forming an integral part of the composition.

(Eckel et al., 2012: 1)

Eckel reports about the experience with Ligeti concert hall's system of the *MUMUTH2* building in Graz:

the ability of flexible speaker positioning very quickly shifts the roles and understandings of designing and using certain loudspeaker setups in general. Rather than achieving 'the ideal' setup mainly based on experience and estimation, the sensual experience and evaluation gains much more importance.

(ibid.: 3)

An antidote to the composer's abstraction is this sensual experience. A creative act performed by the composer-listener. CoS came to these conclusions after studying a very flexible, customisable performance space, which supports my view that the design of a performance space is an essential operation, a constituent part of the creative activity of sound making.

Creating in 'real world' conditions (Peters, 2010), based on the sensual appreciation of the place and conditions where the performance would take place, is the best approach I have gathered so far, without compromises with logics that don't really belong to art and creativity but come from other sources and needs.

3.7 Conclusion

In my approach, I did not build any specific technologies, but I have used two known technological structures. I have elaborated two new performance designs, trying to coordinate and control the sonic movement and the performance space, continuously feeding one into the other. I have created an experience, of sounds and movements as they sounded and were felt in the space, accordingly to each technological system chosen.

In the next chapters, I will present two realisations of these ideas, progressing from a performance space project

devised for *Stranded*, exploring contemporaneous multiple perspectives and sound stages, and elaborating into an individual, guided exploration of one sound stage from various angles in *I Hear You See Me* (Chapter 5). The idea of the sound stage here discussed should have given an insight on the relationship between the compositional act and the technology, for reaching the listeners in their listening, an activity as important as the creation of the work. It should also have shown the importance of this reflection for my practice and within the context of Sonic Arts.

Chapter 4

Stranded

4.1 Introduction

Stranded is a work for sonic movement and three dancers. It features a joint choreography of sound and body, in which dance is proposed as a visual and physical counterpart to the perception of sound sources' dynamic displacement. Changes in the perceptual localisation of sound are generated to give the impression of sound moving around the space, which the dancers could follow, relate to, and compose their gestures. Dancers move away from or come in contact with sound, elastically responding to its force of displacement and dynamics, as well as to its evoked feelings. These interactions, similarities, and contrasts between physical actions and sonic movements provide a rich reception of the kinetic gesture, via the references and suggestions that such encounters generate.

The work explores multimodality of motion perception, focussing on the interaction between auditory spatial cues and visual cues, provided by a subtle synchronisation and simultaneous display of dance and sonic movement. A sophisticated control of auditory cues, creatively arranged to generate joint kinetic effects is achieved by freely associating sonic movements to multi-modal stimuli. Body movements are organised not only with the sound attributes of pitch, timbre, dynamics but also in response to the kinetic power generated by the attributes of location, distance, and velocity. The dance senses and acknowledges the direction and strength of the perceived displacement of sound over the sound stage. The two kinetics of body and sound could be perceived as one stimulus, or as two separate ones, and produce additional sensations out of their interaction, all part of a choreographic construction. Spatial hearing characteristics, such as distance and lateral perception, could then be 'seen' by association with body movements and positioning in space. If a sound's trajectory interacts, crosses or reaches a dancer's movement, the composition will progress from there by developing explicit or implicit, symbolic or associative links between the various elements at play.

4.2 The wave field synthesis system

The dynamical modifications of auditory spatial cues, coordinated with the physical movements to generate the sensation of a joint kinetic effect, are made with the wave field synthesis (WFS) system by The Game of Life Foundation, The Netherlands, over a perimeter of 10x10 meters. This wave field synthesis system composed of 192 loudspeakers was built in 2006 by The Game of Life Foundation (Rotterdam, 1999), led by Arthur Sauer. It is the first mobile system ever invented for wave field synthesis, able to diffuse sounds in two dimensions within the

delimited space of an adjustable rectangular or square area. Wave field synthesis technology allows sound to be:

no longer simulated (like stereo and surround systems which use psychoacoustic principles to 'fool' the perceptual system) and sound reproduction [...] [to be] no longer based on psychoacoustic principles, but instead on purely physical principles.

(The Game of Life, 2010)

The acoustical conditions may vary depending on the distance between the walls and loudspeakers and the resonance of the room it is installed in, yet in any area of the projection space a virtual sound source can be reproduced, with less confusion on its location and more reliable resolution for any listening position as compared to ambisonics (as discussed in Chapter 3.2). In fact, the advantage of using this technology is that there is no preference for a particular area (a sweet spot) for perceiving the spatial effects (Spors and Ahrens, 2008: 1). This reason was a determinant in choosing this space for a dance performance.

The system is designed to be transportable, easy to use and accessible to anyone for free. The Foundation allows any composer to freely access and practice with the system, after an induction and booking and provided they can cover their own travel expenses to the system's location (usually in The Netherlands). This remarkable accessibility has helped generate an impressive archive of spatial sound works by international composers over the years.

The system travels around the world. It is used for workshops and inductions to spatial audio, and for performances of the spatial music archive. In special occasions, renditions of complex scores by avant-garde composers are performed, like Luigi Nono's *La lontananza nostalgica utopica futura* (1988) at Venice Biennale in 2013, curated by Erwin Roebroeks, featuring live instrumentalists interacting with real-time wave field synthesis spatialisation. I personally invited the foundation to Goldsmiths, University of London in November 2014 as part of the *First International Symposium on Sound and Movement Practices*, organised in collaboration with Goldsmiths Unit for Sound Practice Research and Trinity Laban Conservatory of Dance. This was the first time the system was brought to London. Works from the foundation's archive and two performances of *Stranded* were performed in the historical Old Laban Studios in Laurie Grove, New Cross.

4.2.1 The software

The *WFSCollider* (Snoei, 2015) software designed and maintained by Wouter Snoei runs the 192 loudspeakers, allowing the control of the sounds diffused in the space. All spatial attributes parameters are performed by attaching a trajectory to a unit generation engine (a sample playback, or real-time synthesis), which is a way of defining point by point in time where the system has to diffuse the particular sound, within the delimited space.

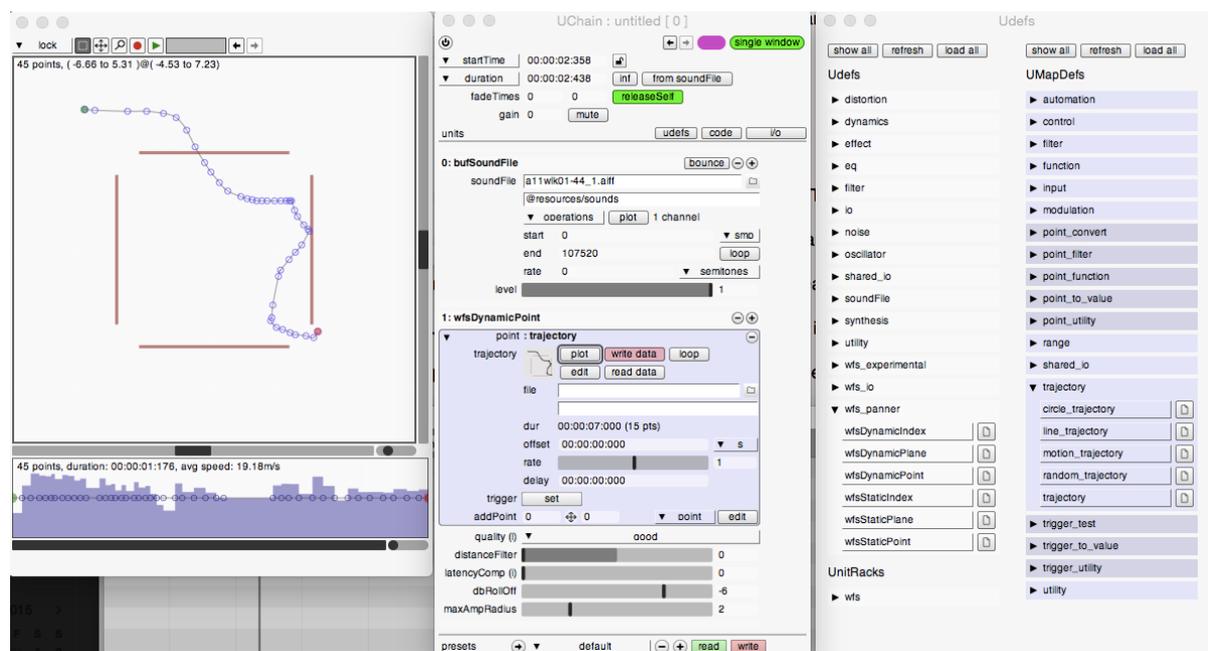


Figure 4.1. Screenshot of WFSCollider software: from left, trajectory edit interface, *Uchain*, and *Udefs*.

As shown in Figure 4.1, the *UChain* in the centre of the picture allows the sound playback system to connect to a dynamic point and attach a trajectory to that point. On the right is the *Udefs* dialogue, where it is possible to select the type of source, sound, and trajectory behaviour.

The graphical interface for editing the trajectory (on the left in Figure 4.1) allows the position of each travel point to be defined in two dimensions, the time at which it has to occur, and the geometry of the path chosen. Speed of motion is adjustable due to the ability to manipulate these parameters, which makes the tool quite efficient for projecting sound precisely over a defined space. The sound source's impression could be realised not only as a point source in space but also as a plane wave, or as a direct output from each of the physical loudspeakers. The solutions in the hand of the composer are many, and all smoothly controllable by the software. In my work I have used some of its features: mainly fixed and dynamic source points (which are respectively single static sources, and sources to which a trajectory can be assigned), and some plane waves.

4.3 My collaborator Jalianne Li, choreographer

My collaborator Jalianne Li and I initially worked together on a project, which ended up in a dance performance for Resolution! 2013- a festival of new dance at The Place theatre in London. The project was the creation of *In the Beginning* (2013), a choreography for eight dancers and two-channel sound [Appendix I, a.1.6]. Our shared interests and collaborative affinities put us together, later in the same year, for *Stranded*.

Jalianne's distinctive choreographic style is the study of facial movement. She developed this technique after moving from Canada to London and training for a year at Trinity Laban, and she continues to expand on it now, with her company *surFace Dance* (Li, 2015).

For my exploration of the face in choreography, I consider its movement in an abstract way. I want to use faces as movement focus, involving no interpretation whatsoever. What the viewer perceives, it's a combination of conventions.

(Li, 2013)

Jalianne challenges a subjective interpretation by designing facial movement as part of the body movement, creating complex sensations in combination with other gestures. She has a very expressive way of creating dance and is inspired by how a technique can be turned into an intimate personal tool for expression. She looks for and enjoys the use of narrative, but her style is a result of very different influences and connections, that produce a very modern and unusual feel, and at the same time spiritual and organic. In *Stranded* it turned out that the proximity of the audience worked perfectly to allow the attention to be on the choreography of the faces, as the dancers could move closer to each viewer in the space. Eva Chambers, one of the dancers of *Stranded*, commented:

I think the whole piece with the sound and sonic movement lends itself to a proximity and with the use of the face in the choreography it gets so detailed and intricate: you need to see it closer otherwise you lose it. With this type of loudspeakers system the environment is perfect: being amongst it, being able to experience it all together as one, as opposed to putting a dance on sound. [...] It was exciting.

(Chambers, 2013)

Between Jalianne and myself, the collaboration worked in total symbiosis, as we both had to discover a new

environment and new practical methodologies. I worked extensively in advance to try to provide sound examples for her that could work to convince her of my idea of using sound's spatial attributes to build a choreography. In return she brought a thorough rationality of application, scanning through each of the examples and commenting about the potential applicability to her choreographic style, to the space in which the dancers would have moved, and the possible artistic quality.

Before entering the WFS space in Den Haag, we started with the idea of doing something about tenderness, in particular, to communicate that feeling through kinesis. When we started rehearsing, though, things changed. Firstly the perceptual issues needed the highest priority, in particular because, if we failed to understand them, we wouldn't have any idea of what the audience could experience, and of how the dancers' choreography could be performed and appreciated. Secondly, playing back sound within a 10x10 meter system and 192 loudspeakers was a very powerful experience, and took time before we were confident on how to use it in detail. In some ways, the unfamiliar space, the size and design of the loudspeakers, as well as the system's sound production affected my approach to sound design and Jalianne's development of the movement vocabulary.

For Jalianne, sonic movement was an idea and sensation she had to deeply understand before being able to relate to it in the making of her new choreography. After our first experiments with the system we realised that sometimes we could have a sense of perfect alignment and direction between sensations and gestures, and at other times difficulties tracing perfect boundaries, or seeing a definite connection. Jalianne once described the combination of sonic movement and dance as appearing as the image of a fish in a fish bowl to the audience. The image of the fish is distorted differently depending on the refraction of the light through the glass or the liquid, and depending on which part of the fish bowl one may be looking through. Audience's reception of the position and kinesis of the dancers and sounds could quickly change from being very blurred to very precise, depending on many factors (Li, 2013).

The kinetic impression could live between the confines of clarity and blur, suggesting that this characteristic could be controlled for purposes of expression. Jalianne said about her practice:

sonic movement shaped how I approached the piece, how I decided spatially where everyone was, what movement they were doing. Some of the things I wanted to do choreographically changed accordingly to where the sound was going to be in the space. So we worked back and forth with the sonic choreography. Sonic movement affected where the dancers were, the movements they were

doing. I wouldn't have had the idea of moving into some locations if it wasn't for the sound moving through the space. We would have created an entirely different piece if it wasn't with sonic movement even if, paradoxically, it would have kept the same sound score. That is because you are taking into consideration the sound is coming from different sources, point in space.

(ibid.)

Jalianne's analytical approach has helped me to form consistently useful kinetic ideas and to produce the right sounds to achieve them. I will discuss this more extensively later on in Chapter 4.7.

4.4 Other artists' work

Looking at the work of other artists, I have tried to determine if the sound spatial attributes were used as an important part of the construction of the piece. The work *Night:Light* (2012) by Alban Richard, Raphaël Cendo, and Valérie Sigward performed at IRCAM Centre Pompidou in 2012 (Richard, 2012), uses dance choreography and broadcasts a musical ensemble live into the *Espace de projection* (Espro, 1978) using ambisonics setup and light projections. The work focusses on the idea of saturation by using lights and surround sound to transform the performance space and produce a "spectacle vivant" (ibid.). The composer Raphael Cendo explains his idea of:

'musique saturée' -derived from Grisey's so called 'spectral music'-, which is obtained "par la combinaison des paramètres musicaux traités et travaillés de façon précise, et grâce à l'investissement de l'interprète. Elle est le fruit de cette combinaison intime qui met en relation une exigence d'écriture et l'engagement du musicien.

(Cendo, 2008)

For creating a full sensual experience within the *Espace de projection*, Raphael Cendo has also adopted a new system, recently developed by the IRCAM, based on the ambisonic technology. As the term indicates, this playback system is a sonic network that entirely fills the space available, through a multitude of loudspeakers scattered all around the audience, a real vault inscribed on the walls and the ceiling. [...] This permits to create acoustic events in three dimensions, to trace almost perfect lines that continue within the space, while still being responsive to the acoustic features of the sound. A sensible space that liberates the imaginary.

(Szpirglas, 2012: 4)

The technology is said to have been used alongside the lighting effects and the sounds in order to create varying perceptions of the space in which the dancer was moving. The sound was used to relate to the dancers melodically, harmonically and also through its location and the expansion/contraction of its spatial parameters. The score was redesigned for the performance, but the music was written previously.

The work is a significant reference, although I did not have the chance to watch it personally, for it relates to many aspects I am researching (as well as adding lighting, which I did not use in *Stranded*). The main difference between *Stranded* and *Night:Light* is that the music for *Night:Light* was composed prior to the sonic movement score (it was an arrangement of Cendo's previous work). A core issue of my approach to the creation of sonic movement is to choreograph sound and movement together as they are being generated, influencing each other instead of applying movement to the sound afterwards. In *Night:Light* sound is used for its changing spatial attributes and, combined with the lighting and the dancers, a multimodal experience is achieved.

Another work, *TranSonic* (2011) by Stan Wijnans, is based on ambisonics, and consists of a dancer wearing five sensors to generate movement tracking data.

A performance space is created that makes it possible to synchronise the living architecture of the dancer(s) with the movement of the sonic architecture. In this way, the dancer's two geometric architectures (the architecture of the body and the architecture of the space around it) are blended with the sonic architecture of the sensitive space created by the distance reach of the ultrasonic tracking system and the spatial sound system.

(Wijnans, 2011)

Wijnans employs many of Laban's terms to describe the movement's dynamics recorded by the sensors to synchronise the sound design and sound spatial design with the physical gestures:

the location of traceforms (pathways) of the movement in general space and the localised movement within the dancer's kinesphere.

(ibid.)

The project shows research into Laban's analysis of movement and acknowledges of the importance of embodiment for the appreciation of motional cues, the proprioceptive aspects earlier discussed in Chapter 2.2.4. The dancer is in the best position for receiving the spatial cues, which are also activated proprioceptively by the connection between the sonic movement and a matching or corresponding physical gesture:

it should be taken into account that spatiality in the ChoreoSonic environment is experienced differently when we observe from the outside as a viewer than when felt from the inside by a dancer who is actually directing the visible and audible movements in space. The latter being able to choose to hear and experience sound from all speakers in the ChoreoSonic performance space more easily by participating to move in the direction of the spatial sound that [she or he] is guiding. In a live situation only a small minority of the audience may ever be in the most ideal spot to get the full spatial audio effect despite the influence of head movements and visual cues. A sound that is located in one speaker may simply never be heard by a part of the audience. However, this problem is partly solved during my research by giving the audience the freedom to move around in the sensitive ambisonic space to get the best spatial perception. The improvising dancer is trained to interact with the movements of the audience participants in the ChoreoSonic space.

(ibid.)

The pertinence of this project to my practice is that associations between dynamics of movement and sound spatial attributes are attempted: a dancer moves in combination with spatial sound. However, this experiment is focussed on linking movements of the body to generate spatial sound rather than creating a choreography between them for an audience to experience. Wijnans tried to resolve the technical issue of the sweet spot in ambisonics, which was affecting the experience of the audience and the dancer when off-centre. He organised a different behaviour of the dancer (improvising his/her position in the space accordingly to where the audience would have been) and of the audience (moving around the space). That shows an interest similar to my own of developing the role and activity of the listener and of the importance of the performance space in the appreciation, understanding and enjoyment of a performance based on sonic movement.

4.5 Performance space

Once the main artistic effects I wanted to achieve have been defined (for example, the type of spatial sounds and the dance style), I needed to determine and visualise the performance space. To build spatial and kinetic

relationships between aural (sonic movement) and visual (body movement) perceptions, I had to design the listening space and audience seating arrangement carefully. In regular concerts and performances with the system, no particular seating arrangement is required, usually many chairs are located aligned in one direction within the space or facing concentrically (Schipper, 2013). In few occasions, people have been asked to stroll around. My choice was to take advantage of WFS technology's ability to physically reproduce any sound source with no loss in resolution at any point at which the audience would be seating within the loudspeakers area. Any part of the space could be occupied by the audience, facing different areas, not only one space, as in a proscenium-type arrangement.

We developed an arrangement that we reproduced once for the ANNA building basement installation in Den Haag 2013, covering a rectangular area of approximately 8x10 m, and again in the Laban Studio performances in London 2014, where it was a square area of 10x10m. For these arrangements four groups of three and two groups of four chairs are spread across the space, as shown by the white markers in Figure 4.2 below.



Figure 4.2. The Game of Life System in Den Haag 2013, with taped areas for *Stranded's* seating arrangement.

From their seating positions listeners could clearly perceive sounds in front, at the back, close and far away, indefinitely surrounding or precisely passing close to them and other people. That generated a sense of being 'in the space', as opposed to a proscenium structure which would abstract each listening point, with not much difference between each location. If I had used a proscenium arrangement it would have been unclear to the audience to determine which direction to 'look' in order to understand each movement and it would have been difficult for the audience to grasp from which perspective I imagined and constructed the scene. That is because any perspective would have been possible since the seating area is abstracted from the performance space. Sometimes program notes address this problem, giving some directions or preparing the audience for certain particular features of sound, space and movement, but the perception doesn't become evident by itself from the performance. Instead, by making the seating perspective unique, I could engage individually with each listener, with the sounds and the dancers.

I wanted the audience to feel the performance space as a place where they belonged to for the time of the show, not just as a seating area. The fact that dancers could move through, and around them, and engage in several positions with the sounds, contributed to making each seating position a unique and relevant perspective on the show. Casper Schipper, the WFS system technician, noted:

in the current WFS system you cannot rotate sound sources, although it is a feature that will be added soon [- it is added now]. When the dancers started to make their rotations around audience and space, relatively to sounds, it felt it added something to, and suddenly it made you interpret the movements, the combinations of the movement of the dancers and the sound. It led me interpret the movement of the sound differently, because of these relations with the dancers.

(Schipper, 2013)

Through the seating arrangements, I managed to combine maximum mobility of the dancers over the stage area and to act in combination with the most effective sonic movements to create multiple perspectives on the movements of both dancers and sounds, for the best appreciation of the joint choreography.

4.6 Structure of the work

Stranded was divided into four scenes. In this choreography, each scene unfolds into the next in a kinetic flow rather than expressing a particular story or discourse. The kinesis is the complex result of both body choreography and sonic movement: for some parts the leading inspiration is sound, for other parts dance or the

interaction of both.

4.6.1 Scene 1 (0'- 14'18")

The piece starts with silence, with dancers already in the space strolling between the chairs and waiting for the audience to enter and take their seats. Once seated, their attention is drawn to the space. By placing a sound for quite long time in different positions in the space, my intent was that people would eventually adjust to sense it clearly each time in the different locations. The dancers are drawn to the sound's location, slowly, ready to change their attraction path if the sound appears in another location. The sound I have used is perceptually undefined, ambiguously resonating throughout the space, but felt stronger at the location where the virtual source is positioned. It is to this intensity the dancers are drawn to, magnetically.

The magnetic attraction between dancers and sound is rhythmically interrupted by a complete opposite sound, a very complex set of textures of ambient recordings, of people chatting in the streets, of streets noises, the wind and mechanical noise, although processed in such a way to remain unrecognisable. The strength, size and trajectory of this sound are completely contrasting to the suffused and still sounds: it swipes across the whole room very quickly from side to side and disappears. I adopted and then simply varied this logic by accumulation and transformation: the swipes grow in duration and saturation, increasing layer by layer, the still sounds' reappearances become slightly harmonic, with more voices adding up at each event, to create chords.

Likewise, in the choreography, the patterns of attraction grow in complexity through an increasing interaction between the dancers. The dancers are also reacting to the loud swipes as if the sound was completely dragging them away from the movement they were doing, causing them to restart each time and more articulately. Jalianne wanted each dancer to have their distinctive set of movements, upon which to develop individual variations for the following parts of the piece. Each dancer's characteristic set of gestures works as introspection into their personality, as if to distinguish them as individuals. The group movements instead are to underline the idea of being 'stranded' together in a foreign territory, where something extraordinary is about to happen, symbolised by the aggressive growth in intensity, generated by rhythmical condensation and the accumulation of sound and movement materials.

4.6.2 Scene 2 (14'18"-18'26")

The sustained climax of sounds turns suddenly into silence. Immediately, a new presence is felt. It is a soft,

subtle, fast passing of sound across the space, this time not intrusive and preponderant as a swipe, but like a small invisible creature frantically but sporadically flying up and down the space. I wanted to give the impression as if the dancers finally entered a different world, to find and interact with a live presence. Here the relation to the sound movement changed: instead of the previous pattern of attraction, we worked on instinctive reactions to the sounds, trying to relate to this new presence in the space and interact with its motion. Here, the sonic movement impression is no longer generated by the alternating contrasting perceptions of stillness, attraction and swipes, but by focussing the attention on precise trajectories in the space.

These new patterns favoured great vitality and playfulness, and we maintained the rhythm at a high pace by filling the space with variations of the same events, each time repeated with slight differences in timbre and trajectory. Alongside these, short sonic events appear in sequence. Small bursts of sound explode randomly like fireworks across the space at high and low pitch transmitting a sense of unpredictability. The reactive moves of the dancers in response adds to the lively session.

These 'fireworks' produce an interesting rhythmical crescendo and are set at different pitches. The low frequencies in particular can produce a more intense sensation of the spatial location of sounds through physical vibration. The scene concludes at its climax, with a grand crescendo of sound (at approx. 17'12") organised into a sequence of sonic movements moving in straight parallel lines across the space, impersonated by the dancers following these same parallel lines, and progressing towards the centre, where they stop.

4.6.3 Scene 3 (18'26" - 21.44")

In this scene both the kinetic experiences of scene 1 and 2 combine. Stillness comes back, not as a single point in space but as a sonic movement, a very low and slow sound continuously and repeatedly appearing on the same side of the space. With minimal variations in duration and trajectory each time, this low sound is appearing and disappearing, establishing a presence through its movement. The movement suggests stillness, while pitch and timbre contribute to defining the mood of the scene.

At this stage, choreography moves on into a different pattern: no longer is the relationship to the sound's movement and location attraction or reaction, but cohabitation. The sonic movement has now acquired the precise function in the choreography of being a presence in the space, together with the dancers. The articulation of the individual characterisations, performed by the dancers since the start of the work, now develops

introspectively, until fusing into a new group posture, where the three dancers produce a composite figure of a three headed multi-armed and multi-legged body, strolling around the space.

A melodic development begins to intersect with the gesture of the choreography. It is organised through a set of ethereal harmonies appearing somewhere diffusely around the listeners, leading to quite expressive moments. The melody discharges the tension created by the relationship between the main sound and the dancers, and the group structure is temporarily abandoned in order to briefly follow the expressiveness of the melodic incises. This section is introspective, slow, generated by presence, realised through motion, stillness, and obtained by repetition of gestures.

4.6.4 Scene 4 (21'44" to the end)

Scene 4 is arguably the most complex scene where all the kinetic elements that were previously explored are joined together and further elaborated upon. The way sound and body express and mirror each other in Scene 3 is taken further in Scene 4, but with loose ties. Body and sonic movement are more free in their interaction and spread around the space. Dancers start working independently on the floor where they elaborate on their personal characterisations. In the sound, I have made the harmonic and melodic aspects taking over the kinetic: sound proceeds just by slight progressive motion along straight lines, in correspondence to the dancing paths through the audience, or only remains still, at random fixed points in the space.

The impression is that the kinesis slowly morphs and freezes, leaving space for the melodic development to bring the work to an end. The menacing presence of the low-frequency sound of Scene 3 is still in the space, acting as a presence, but at the same time as a harmonic complement and melodic lead. The sound materials break up and become lighter before vanishing into silence. Complex connections at multiple levels replace the simpler patterns previously created between sonic and body choreography.

At this point in the score, references to previous melodic elements and particular moods reappear. For me, this session represents a moment of freedom and joy, of dance through sound in space. Until this point I have been working on investigating the power of movement by engaging mystery, energetic action, and dialogic presence. These sensations now blossomed into a positive, hopeful and inspired view of the past, albeit with a touch of melancholy.

4.7. Methodology - Working with the dancers

This new type of performance, a choreographic work based on the kinetic effect of both sound and body, challenged our (Jalianne's and my own) respective practices and methods of composition. To create a kinetic effect with sound I had to control and work on its spatial attributes at the moment of its creation, balancing choices of materials with their intelligibility and suitability to the type of kinetic idea. My drafted work had to then be discussed with the choreographer and tested with the initial ideas and body movements she designed.

As sound spatial attributes engage the body in a complex performance relationship, Jalianne too had to adjust her approach:

I felt quite overwhelmed about choreographing with sonic movement, relating movement and sound and space together, because I was going to work on a much bigger plane than usually with choreography. In my usual approach, I don't necessarily think of the correlation of where the dancers are on the stage with the sound. With this project, I had to. [...] I started thinking about sound differently, about choreographing sound and body at the same time. Here's a movement that I believe it would work, and then the sound is travelling too fast, it needs to be longer... and I had to change. Many things had to be considered, besides I had no previous experience with moving sound. In the approach learned through Laban's school, I would start with movement and then lay music on top. In this project it was about putting the two together at the same time, to question where sound and movement were and how they could interact. I tried not to mimic the sound, and I wanted a creative approach designed on movement in constant relation to the sound in that particular space.

(Li, 2013)

Together we developed a method of work based along the lines of the following routine:

- projecting a sonic movement idea in the space
- evaluating the perceived sonic movements in the space
- studying the dancers' reactions to the sound displacement
- studying the effect of certain positioning and movement of dancers in relation to the sound sources displacement and perceived displacement
- studying the effect of associating different body movements with sonic movements

By seeing the two kinetic expressions together, of dance and sonic movement, we began to form an idea of the

whole structure and spirit of the work, of how to develop a joint kinetic idea and study the new meaning it potentially carried. By analysing the clarity and effectiveness of each sonic movement idea with the dancers and choreographer, I have gathered valuable information in understanding the listeners' perspective and increasing intelligibility of the sonic movements.

Alicia Meehan, one of the first dancers working with us, said:

I remember the connection that I had with the sound: it was like an image, I could almost see it. I remember the way the sound would pass through the body when you were in the middle of the space. It was visual as well as a sound, and because I was so close to it, it influenced how I moved, how I wanted to move. Almost as if it was passing through my body, I felt it, and that was what made me want to move in a certain way, so close, that I could feel it reverberating in the body, like if it was passing the energy through. Sound almost transported me to the outdoors, like when you are within the sounds of a busy street, or with birds flying by.

(Meehan, 2015)

Elena Cocci, restates Alicia's impressions:

when you hear sound moving around, at least for me, it becomes quite natural to follow it across the space. So if you turn your face, sometimes is not a dance gesture but just a natural reaction like simply following the sound, e.g. I hear the sound over there, and I turn my face, following with attention. At some stages instead, you feel the sound that is passing through you and so your body too, naturally, devises some poses to reflect that. It is an intense experience.

(Cocci, 2013)

The difficulty of the task were the limits of technology and our perceptual mechanisms. Jalianne's first impression of the system was:

I felt excited but also disappointed: there were limitations as I could not hear sounds as close to my ear as I imagined. I could clearly perceive that speakers were emitting the sound, even when my eyes were closed. Loudness played a big part into that, and possibly the room reflectivity so that the impression was not actually as I thought it would be. If a sound was placed in the centre, for example, I instead

heard it with the same intensity from all the loudspeakers around me, which was disappointing: a sound positioned in the middle sounded all around.

(Li, 2013)

Our rehearsal routine, a method that came about by trial and error, allowed us to assess the respective kinetic ideas (with the body and with sound) and gave us insight on how to develop and consequently refine our work. By observing the dancers' reactions and learning from them about their impressions, I could go back to my materials with different ideas on how to adjust the perceptual issues and the kinesis. We approached movement in several ways, in the end looking for the overall impression of motion generated by different combinations of body and sound. Sometimes we imagined the sound being a physical object in the space, with the dancers being included in it, or being around it; other times we evaluated its 'body', that is, how neatly it could be perceived, or how diffused in relation to its position and movement. After all, the mere perceptibility of the sounds, in particular, to be clearly felt in relation to the dancers, was the most important element we were aiming at, that has been quite difficult to realise. There were, in fact, general issues highlighted by the dancers: sonic movement could be misheard or misinterpreted because its reproduction didn't reach a good level of clarity; the kinesis could be entirely ineffective or uninteresting, or unpractical to dance with. Sounds could be ambiguous for psychoacoustic reasons (for their frequency or timbre, or by odd combinations of the two), for being placed too close to speakers or creating auditory artefacts at the corners; they could also not be particularly effective for their trajectory, speed, or location being uninteresting from a kinetic point of view. For example, an excessive speed could make the body of the trajectory unintelligible, revealing only the start and ending sessions or by giving a general and very approximate perception of the movement shape, with insufficient detail of the movement (e.g. a sinusoidal sound could be more difficult to locate than a broadband noise, therefore both are suitable for different kinetic approaches respectively).

I mentioned earlier in Chapter 2.2 my idea about the multimodal characteristic of motion perception and how sound perception is not excluded from intra-sensory influences. Since I had the necessity of making clear the sonic design to the dancers in the first place -which, in a way with the composer are the first listeners of the piece-, I was working on many aspects of my sonic design, studying how it would have appeared from a listener's point of view. Dancers needed to feel where the sound was, to understand their placement, cues, and to use sound's spatial elements as an inspiration for their movement creation. Both the dancers and the listeners shared the need to perceive the spatial positioning and movement of sound with the same reliability.

On Jalianne's side, the routine helped her to overcome the difficult task of integrating sound spatial attributes, and use them as a constitutive element of the choreographic score. The dancers' thoughts and impressions, as

well as my ideas on sonic movement, helped her understanding the issues that came out in practice and how to relate to them for the choreographic development.

Our final ideas were the outcome of a dense collaborative practice centred on the constant evaluation of each feedback.

4.8 The movement ideas

I have been paying attention to movement by sound and body. In sound it is the expression of an elaborate relationship between sound and sonic movement; in dance is the development of the individual dancer's gestures and the group, and their relationship to the sound and sonic movement. Our focus was the independent evolution of each kinesis and the collective effect of two kinetic expressions when synchronised and simultaneous, articulated throughout the show. The fact that sonic movement is seen synchronously or simultaneously with body fires up many novel kinetic elements, in comparison to other dance and sound practices.

Each scene of *Stranded* is based on a characteristic kinetic idea. The work is the development of the connections we have found between these ideas, unravelled scene by scene. In Scene 1 the sounds are still, but kinesis is in the attraction pattern of the dancers to the sound sources locations. In Scene 2 the kinetic power of a fast swirl across the space replaces the previous mechanism of attraction promoting interaction between body gestures and sonic movement, using reaction and interaction instead to affect the motion of the dancers. Speed and direction (and their power, that is their velocity), as opposed to presence and positioning, are used as kinetic elements to trigger the movements of the dancers individually and as a group. In Scene 3, the sense of presence and positioning of sound sets a new relationship with the dancers in the space, this time by using motion, not just location. The slow moving, dark sounding, always in the same location sonic movement pattern exists in the space with the dancers, who dance alongside it and on its tune, intersecting its rhythmical suggestions. This sonic movement is felt as a living presence, the dancers live in the space with it. The kinetic elements so far presented have reached their full development, and sounds and choreography have evolved particular mood and themes, which have taken into Scene 4 a different interaction path. The melodic element has taken more space now, imposing over the kinetic its strong ability for connecting and linking materials and ideas. Movement is there, though: melodic fragments slowly change as their direction and place in space do, as if they were suspended. This type of combination of gestures seems to celebrate the space of the encounter of body and sound: they do not trigger actions anymore but underline and emphasise them. For example, the slow and low sound of Scene 3 reappears in the same space, but with a melodic function which grabs the attention more than the main motion. In Scene 4 the musical structure interplays with the kinesis, in balance.

4.8.1 Placeholders

Our collaborative process developed from primordial generative ideas, able to instantaneously trigger images in our minds about the appeal, the type, and characteristics of articulation of a movement, which we used for developing our thoughts and as a reference for understanding each other's artistic expressions. These were placeholders, names we used to communicate between us, which, although at times quite bizarre jargons, yet contained the full core of our artistic ideas.

The first time I have heard the sound, I liked the way it travelled fast. Because we were going to dance with the sound, I was really intrigued how we were going to do that, as sound travels much faster than how we could move. I liked the imagery that we attached to it straight away [...] like birds, fairies.

(Chambers, 2013)

This quote relates to the type of sound, the direction and speed of the movement that would create certain impressions reflected in the mental image. For as simplistic as it might seem, these imageries were useful descriptions of the raw kinesis of the particular sonic movement. For us, they have been crucial in structuring the work, especially in building the main kinetic impulse at the base of each choreographic idea. We used them for remembering the type of kinesis we were working on and how one should progress to the other from scene to scene. Using placeholders was a useful method for quick understanding with the choreographer about the complex processes in action. They all signify a particular (or absence of) kinetic property we were trying to develop, the specific sound's kinetic function and its interaction with the choreographic work. I outline hereafter those that have been used for indicating the core of *Stranded*'s sonic movement and dance interactions, and the descriptions of their meaning.

4.8.2 Sound-Lights (0'-14'22")

A series of narrow band, almost sinusoidal sounds one at a time resonate in specific locations of the space for a certain amount of time, like lights softly turning on, before fading out and leaving space to the next one, appearing in another location. The sounds have a different pitch and sometimes they appear with others to form harmonies, and I have purposely offset the timing of their fading in and out for variety and balance. Any spatial kinesis is absent. They just appear, still, somewhere in the space.

From an auditory point of view, depending on where someone is sitting and also on the reverberating characteristic of the room the system is in, the localisation of the source is at first difficult. The phenomenon of learning and adaptation is quite a known effect in psychoacoustics (Blauert, 1997: 45-47), as sound lasts for a while, its location actually becomes clearer in most cases, although sometimes the opposite effect can also

occur.

The dancers are spread around the space, and when a *sound-light* appears a connection is made. Jalianne thought of using the perceived sound source as a pole of attraction for the dancers. They, in fact, start moving towards it, while carrying on their gestures. This movement of attraction towards the sound source gets temporarily interrupted when an abrupt, highly kinetic sonic movement suddenly appears and quickly fades (the *crowds-sound*), leading the original *sound-light* to start back in an entirely different area of the space, activating the attraction pattern with the dancers again.

This first choreographic element that the audience experience, is based then on soft static sounds, located unpredictably over the ten square meters of the space. The different interruptions dictate the rhythm, and with this strategy, almost the whole concept for the first scene of the work is created.

By simply using the location of sound, I could create a kinetic effect. Location worked as a pole of attraction for the other kinetic forces (the movement of the dancers, being slowly attracted), and on this model, we started constructing the next ideas. The audience got slowly acquainted with the sounds and progressively intrigued by the attractive power they had on the dancers. The sonic appearances, as static changes of location, are given clarity and kinetic strength by the dancers' presence, so that the audience can experience the repeating attraction pattern in many different areas with the same quality, and understanding it and constructing on top of their kinetic impressions their mental associations and references. A cooperation of dance and sound spatial attributes control produces thus a joint complex kinetic effect.

The *sound-light* term expresses the idea of appearance and disappearance of something in the space. Each virtual sound source appears in odd locations over the seating arrangement's area, and audience can perceive where sounds are and next to who they are, although initially, it might take some time to get acquainted. When faraway, the perception of the location of the sound source could be obstructed as behind a set of chairs or other people; when close, sounds can be all over the listeners, with great intensity, with a feeling of being all over rather than a clear perception of the sound in the space. The fact that the precise location of the sound is related to the movements of the dancers (individually and collectively) helps to give a better sense of orientation and consequently clarity about the location of the sound, regardless if the perception is more or less precise accordingly to each individual. As dancers move towards each highlighted (by sound) point in space in a more or less direct way, that creates a strong sense of where the sound is appearing from each listener's perspective. The experience unfolds as spatial appreciation, and recognition of the sound appearances, in kinetic relationship

with the dancers.

Compared to other spatial sound productions for The Game of Life system or to other technologies, our work marks an important difference: sounds are placed in a precise position that is clear or will get clear relative to every person's location in the space. Listeners are not indifferently placed in the front or second row, looking ahead. They are seating in a precise spot from which they have a unique view of the show. The seat is not anymore just a place like any other for listening to the sound playback. It is instead a precise location within the space where the sound will be passing close or faraway, at some angle, depending on the score and the movement's choreography, and each difference will matter in the overall picture. There is no proscenium, no distinction between stage and auditorium, but a shared, live experience in a shared space.

4.8.3 Crowds-sound

The next placeholder is *crowds-sound*. The term just relates to the materials I have used for creating it, which is processed audio of many recordings of people in public spaces, mainly outdoors, with city noise in the background. This sound is used as the contrasting element to the *sound-lights*. It is highly kinetic as it runs fast through a trajectory across the space. The feeling in the space when it is passing close or through the seating point is very physical, resembling of a wind passing, an impression aided perhaps by the air movement caused by the low-frequency components, quickly running through the loudspeakers.

The perceived motion of this sound, a force coming and passing through the whole space and the dancers, has been used by Jalianne to break the attraction patterns to the *sound-lights* by causing dancers to react and change their pose, thus creating the mechanism to restart another attraction pattern freshly anew towards some other location. In other parts of the score, I have utilised the same kinetic effect again, although with modifications in the trajectories' type and speed, in the textures and timbre, for a different feel and development (e.g. in the next sound, the *bird-sound*).

The *crowds-sound* is used as a disruptive force, passing through the dancers' bodies. It would be nice to say the dancers had actually found their choreographic cues, rather than exclusively in the sounds and timing, more on the precise perception of the sonic movement, acknowledging its presence by interacting at the precise point of encounter in the space. Expectably the reality was much more complex than that, and our strive towards interaction had to face many compromises. In the *crowds-sound* the choreographic cue has been found more at when the sound was heard, regardless of where exactly, but the sonic action that it performs did take part in the mnemonic of the dancers during the show. The interaction that the *crowds-sounds* carried out with the dancers, whether real or suggested, driven by imagination, calculation or by a physical sensation, was undoubtedly

present and played a part in the creation of the choreography, and worked well for the audience's engagement.

4.8.4 Bird-sound (14'22"-15'08")

A broadband noise sound processed and convoluted with other sources, passed through granulation processes, is diffused in smooth continuous bursts of less than a second to a maximum of three seconds. The main idea is of a sound thrown from one side to the other of the diffusion space and back. The dancers referred to it as to 'the bird'. The imagery worked great to start organising some new movement patterns and connections between sound and body's movement. Jalianne describes:

initially, I have thought one of the dancers to be the one throwing and catching the bird-sound. [...] We discussed the idea of birds, such as we called it since the beginning. I have researched it in London before going to The Hague. I rented a studio and had the dancers in the middle of the studio with some obstacles and stuff around. Then I would run like a bird around and through them, to imitate how the sonic movement would pass, and to study how they will react to it. If I was sprinting they reacted quickly, with an automatic reaction, since a quick sound surprises (also depending on which type of sound is chosen). When we tried it in the WFS space, it worked very well: you could hear the trajectory going from one side to the other, and right and left and curving at the end. I think it just came around naturally to move quickly with that particular sound. [...] Maybe we didn't think enough outside the box and we were restricted by calling it a bird, but, in a way, it did bring along the theme of 'distraction' that was starting to come up in the piece, of being led by something (which we developed in Scene 1 as attraction and disruption patterns). I thought it would have been nice to show the trajectory of the birds through the space, because each trajectory is different, so, if emphasised, it might have been interesting choreographically. The idea of catching, throwing, and quickly responding to sound was just one of many.

(Li, 2015b)

Jalianne tried different things in reaction to the *bird-sound*, and finally opted to trace things moving through the space. The dancers would stand in the centre of the space, joining arms so to create a group posture, and be "looking" at the trajectories going across, extending their bodies along each trajectory's path, as to trace them in the space.

The dancers imagined the sound as a living organism flying across the room, that they could catch and lose again, avoid and hide from, or follow. They were facilitated by the recognisability of the sound, quite easily traceable in space, and through its continuous back and forward repetitions. I started elaborating variations to the sonic texture, devising progressive evolutions of the timbre by adding sounds -convoluting or simply superimposing- and overlapping events. Throughout I have been maintaining a pattern of back and forth directions of the trajectories, to move sounds in the same direction and style, but slightly more sophisticated and articulate each time. The following figure (Figure 4.3) shows, for example, four different one-way motions happening at the same time, for comparison:

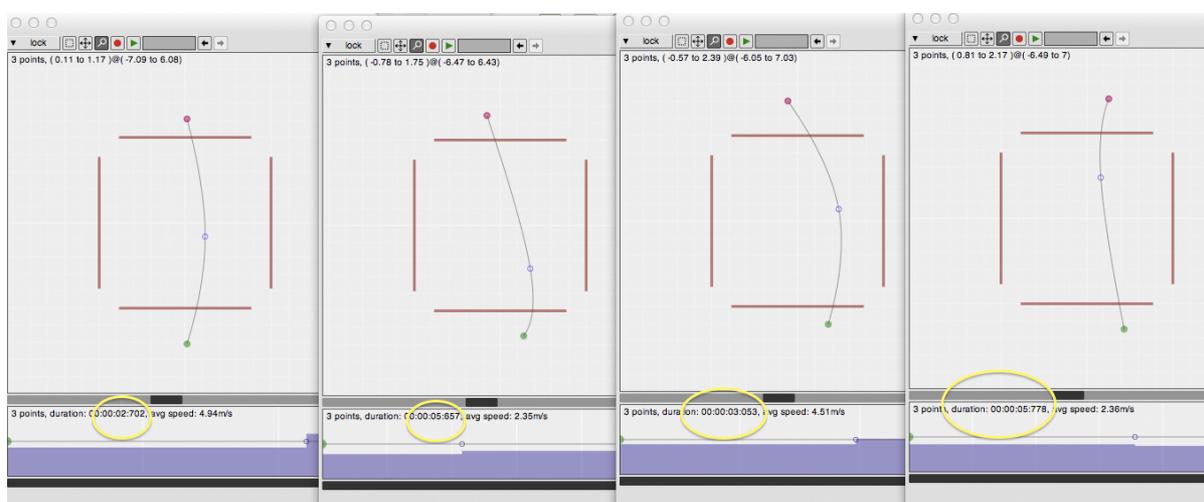


Fig. 4.3. Four screenshots of different three points *bird-sound* trajectories.

My variations consisted in making slight differences to the sound articulation, composing the same event with slightly different materials each time and adding multiple trajectories to follow the main direction but to perform individually different curve angles and at different speeds. I have made some sounds arrive earlier than others, or start as an identical trajectory to then spread out; I have changed the arrival point and created slightly varied trajectories to build up the feeling of a natural, unpredictable living being fast crossing the area.

By keeping a consistent behaviour in the trajectory design, helped the choreographer to see a pattern arise, and to devise elements for developing her structure. Layering and overlapping sounds over similar trajectories didn't interfere with clarity but made the scene more engaging and picturesque.

The characteristics of the sound contributed to the kinetic construction of the scene- for the broadband quality of its spectrum, that facilitated the intelligibility of the changes of spatial attributes-, but it was the speed and

trajectory from one side to the other of the space, and for the way the sound was cutting across the space and landing and restarting that generated interest and curiosity. Its kinetic power and the clear sensation of direction, velocity and of dimensions of the space it was able to give, inspired and fed our creative efforts.

Several compromises had to be made to produce an interesting and understandable effect, even for a simple scenario of one sound source travelling from one side to the other of the space. For a sound of 1.251 seconds of duration, diffused in the following trajectory (Figure 4.4),

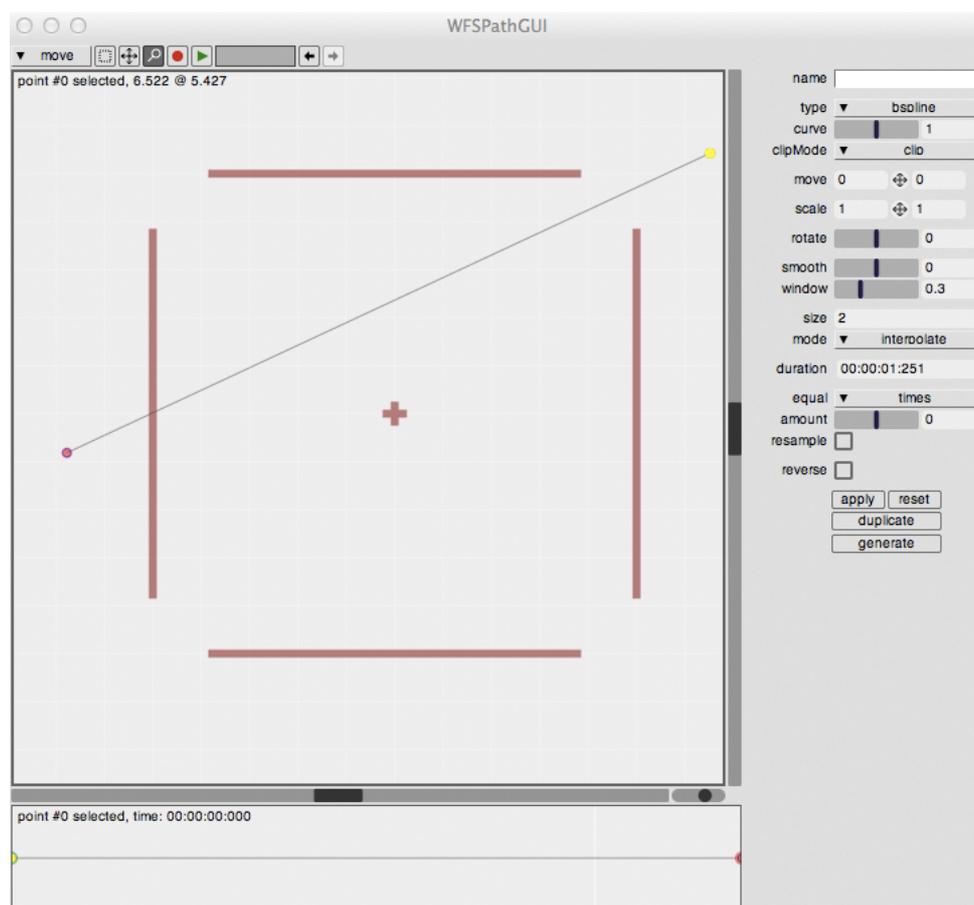


Figure 4.4. Screenshot of 1.251 seconds, two points trajectory.

the perception was quite straightforward, and effective, although quite too simple to be used repetitively. To elaborate the sonic gesture, a movement as illustrated below (Figure 4.5), unfortunately, produced very ineffective and confusing results, for the continuous approaches to the centre, the excessive numbers of turns, the small distance between one turn and the other, within such a limited time frame.

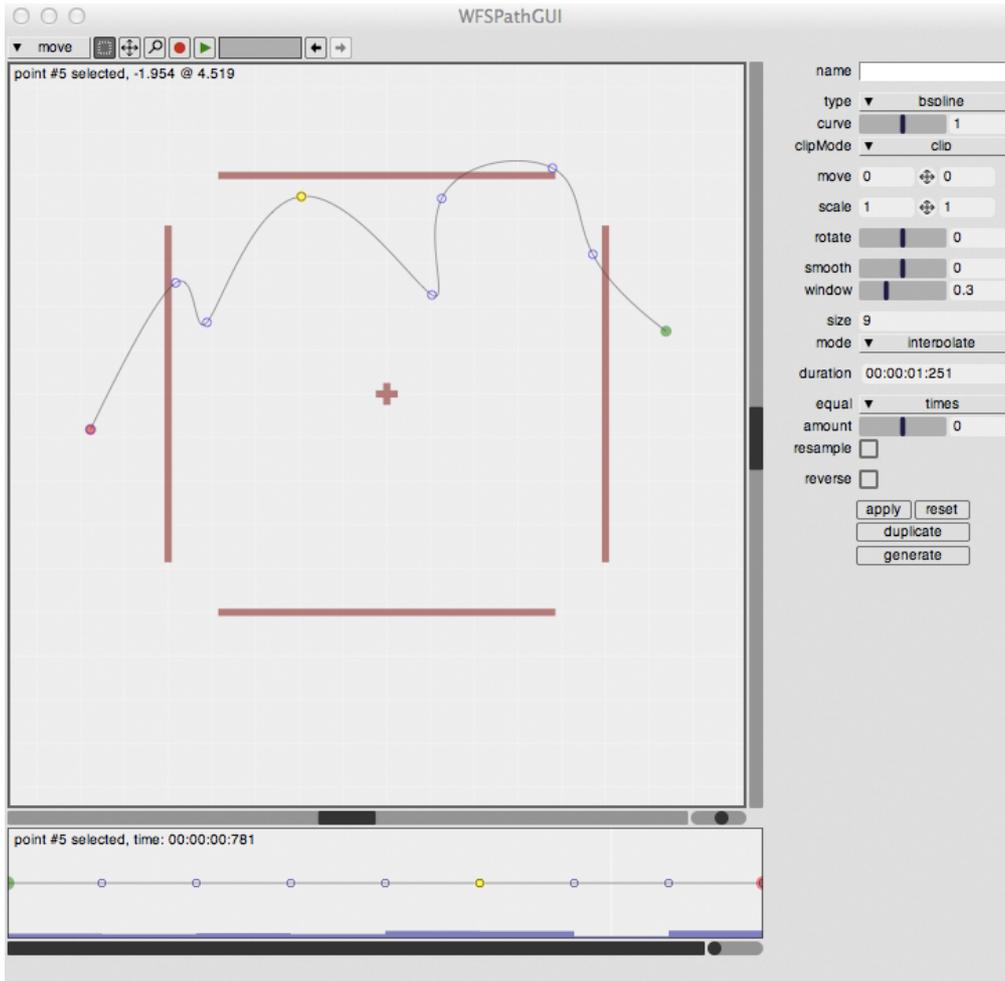


Figure 4.5. Screenshot of 1.251 seconds, eight points trajectory.

To obtain a compromise between variety and perceptual clarity, including effectiveness of the perceived movement, we arrived for example at the following trajectory in Figure 4.6.

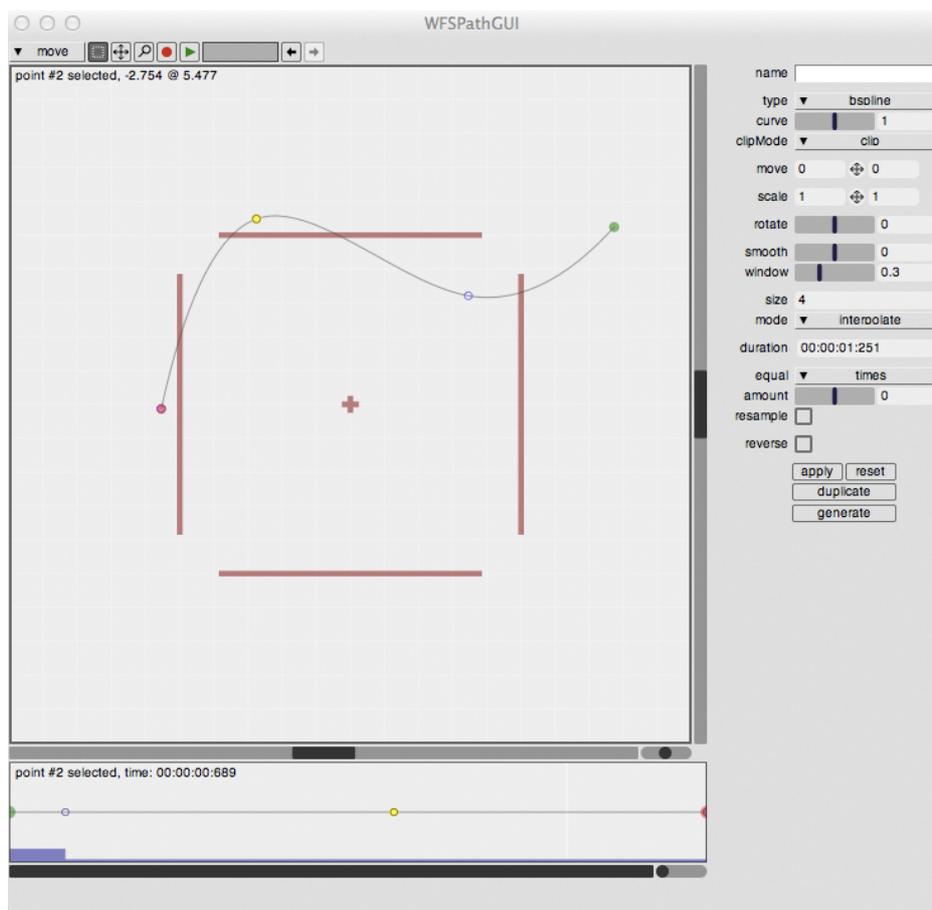


Figure 4.6. Screenshot of 1.251 seconds, four points trajectory.

Lesser points, fewer turns and at quite a distance from the centre (which could be critical for a directional understanding of sound, as the perception of a sound source at the centre is quite the most challenging effect for this technology to create) worked best for this occasion.

Another aspect of this particular sonic movement, and critical for the dancers, was the distribution of speed. As from the picture below (Figure 4.7), the software allows the adjustment of the time distribution of the points of the trajectory, which are the various locations the sonic movement reaches along a gesture. It is possible to specify exactly when the virtual sound source would reach each point in the trajectory. Therefore effects like fast accelerations or slowing down of a sound movement could be quickly realised.

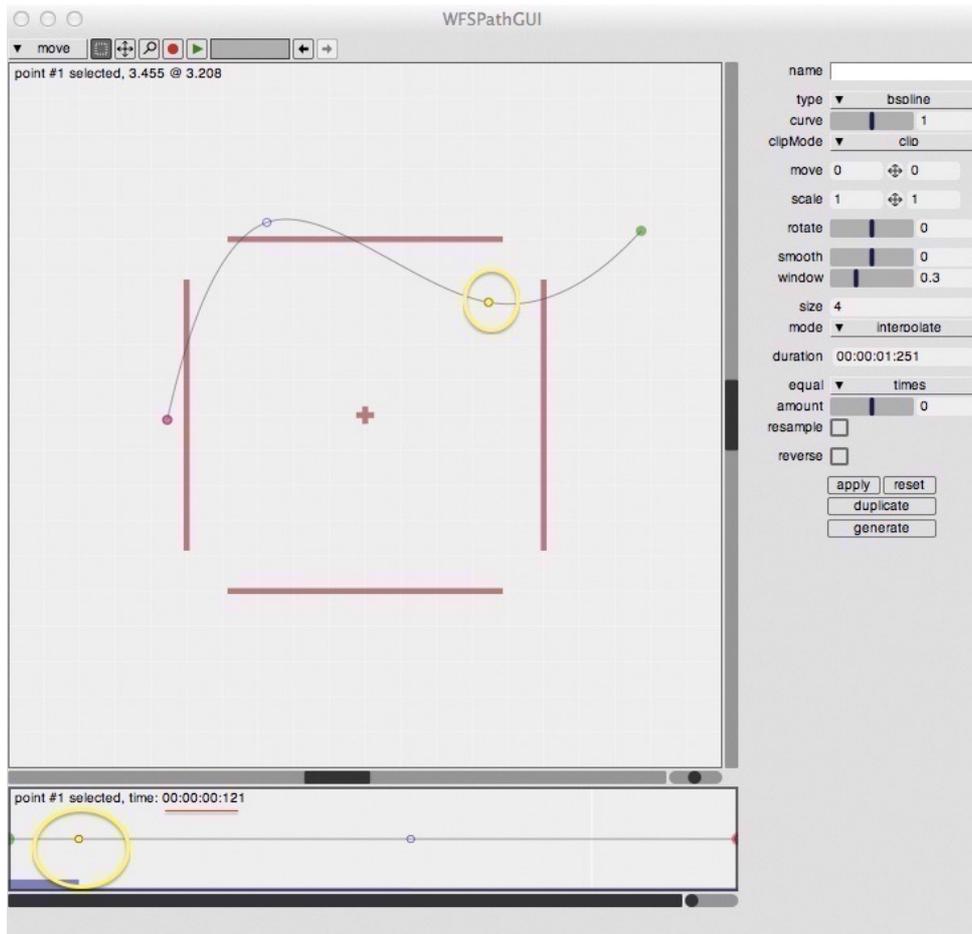


Figure 4.7. Screenshot of a trajectory to show acceleration adjustments.

In the low section of Figure 4.7 the lighter colour point (corresponding to the lighter colour circled point in the main display) is located at the position in time 00:00:00:121 milliseconds. The next picture (Figure 4.8) shows the next point in the trajectory (always the lighter circle), at time location 00:00:00:399.

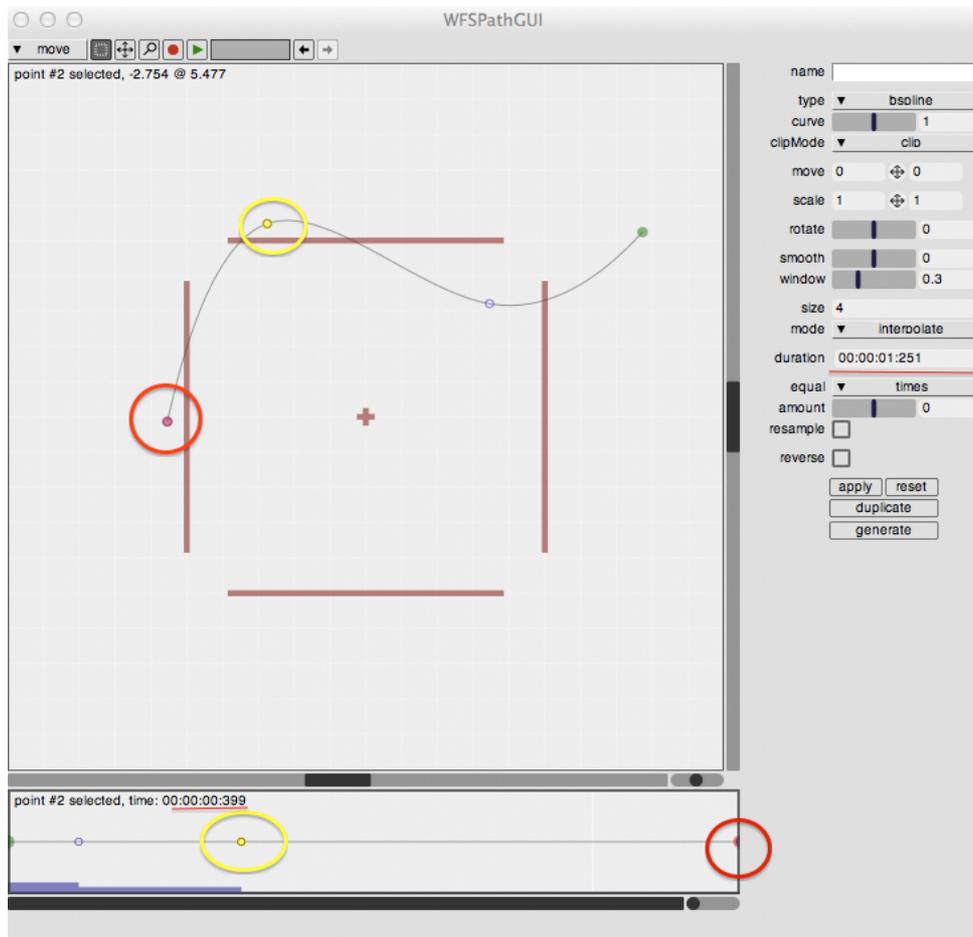


Figure 4.8. Screenshot of a trajectory to show further acceleration adjustments.

In 400 milliseconds, then, the sound has travelled already for about 80% of the space (approximately 8 meters) to complete the rest of the trajectory (852 ms) by moving through much less space. The resultant effect, of a sound triggered at a very high speed with an abrupt stop, is a powerful kinetic effect that the dancers could use dramatically or physically to generate other gestures.

I had to come to terms with the fact that the actual work on sonic movement is a practice to be generated, performed, and assessed in the performance space. It is impossible to achieve this accuracy if the sonic choreographic design is planned abstractly, for example in a composer's studio. For trying these actions and sonic movements, and attempting to articulate other gestures with them, I had to be in the performance space.

4.8.5 Fireworks - Scene 2 (from 15'.00" until end of scene)

A kinetic idea, belonging to Scene 2 and overlapping the *bird-sounds*, is that of *fireworks*. These are percussive sounds made with different materials and placed, as for the *sound-lights*, in several fixed locations around the

space. They are characterised by very short envelope's attack time and duration and are played each time in a completely different location, to resemble sort of explosions - as fireworks - in the space. To each sound burst the dancers react by changing direction or gesture in particular if very closed to the source as if they were pushed away by the propulsive energy of the sound.

This is a method of interacting with the position of the sound sources at their impact, in synchronisation with their timing, which enhanced the sensation of the presence of sound in the space, as made it explicit by the propulsive energy with which the dancers reacted to the sounds 'explosions'. *Fireworks* are static sonic events of a simple kind, as the *sound-lights* were, but instead of attracting, as a kinetic process, they reject, push the dancers away from their location, breaking their movement and forcing them to change direction. The listeners are exposed to immediate changes of direction and gesture of the dancers at the moment of a sound burst. The reaction of the dancers emphasises the location of sound in the space and exaggerates the kinetic power of the sounds. For some of them, being based on low frequencies, listeners can also experience a short physical, almost tactile sensation at the sound attack, increasing the feeling that sound is present in the space as a physical partner to the dancing bodies.

4.8.6 The monster and the snake (from 18'27")

As an auditory and visual experience, the distinct presence of both the dancers and the sound can merge and interleave on multiple levels. As shown until now, both have interacted and related to each other with immediate reactive response to kinetic dynamics. Naturally, a choreography takes into account not only the sonic movement but the actual sound qualities and mood, and that could play a major role in the kinetic creation.

The placeholder named the *monster and the snake*, expresses a relationship between body and sound that deeply interleaves with the one between dance and sonic movement. As an insight, at the time we drafted this, most of the other scenes were completed, which favoured a deeper investigation into our own practice 's processes.

I have prepared a low-frequency sound, made of processed instrumental recordings materials, appearing for few seconds each time. I have organised the sonic movement to pass only on one of the sides of the space, repeatedly appearing and disappearing in the same position for the same trajectory each time. Contrasting to this, which was *the monster* (Figure 4.9), I have made a sound with an opposite texture, noisy and of high pitch, to travel on the opposite side, as to oppose the presence of the low-frequency one, cyclically appearing where the other has faded out. This one we called *the snake* (Figure 4.10).

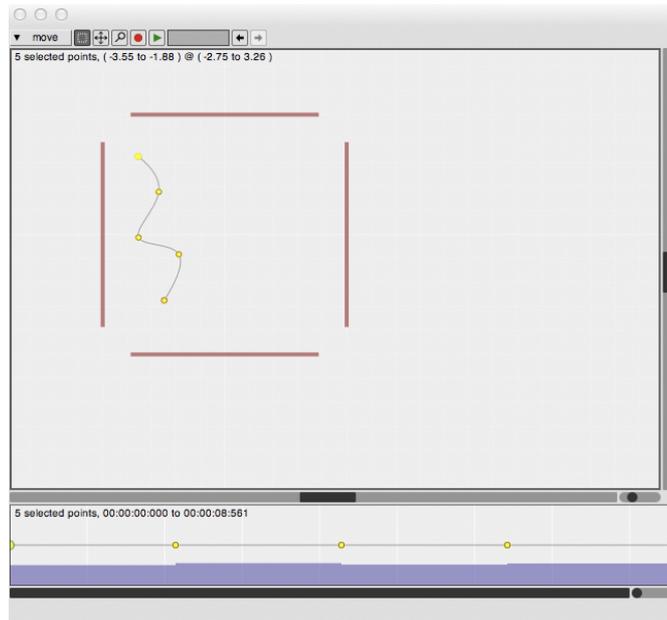


Figure 4.9. Screenshot of the *monster* trajectory pattern.

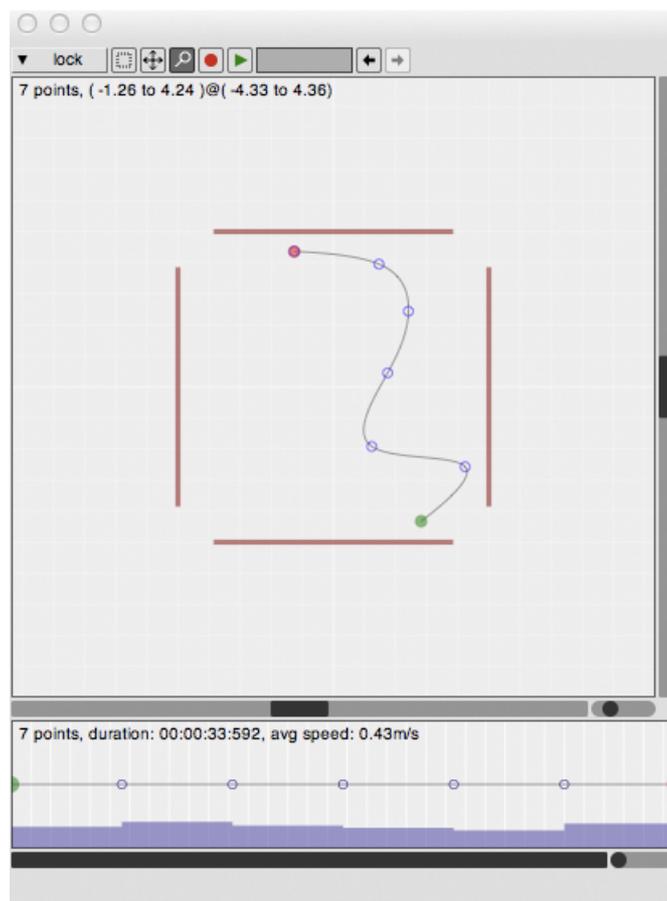


Figure 4.10. Screenshot of the *snake* trajectory pattern.

The low-frequency timbre I have used for the *monster*, with its smooth shape but rough texture, suggests something sinister; likewise, the sonic movement's slow motion through the space, via an ambiguous recursive trajectory over the same area, evokes mystery, threat. The high pitch of the *snake*, still slowly moving through the space, emphasised the threat through contrast and similitude. The *monster* and *snake*'s sounds contributed to a shared sinister image, by repeating their respective spatial trajectories at slow speed, in combination with the mood suggested by their other sonic attributes. The placeholder contains thus an imaginative reference to the effect produced by the quality of the sound kinesis and by its timbral and sonic characteristics.

Jalianne devised an elaborate group choreography, where the three dancers would hold on to each other crossing arms and walking as a multi-arms-legs creature.

The *monster* sound was a lot deeper than the sound we have been using so far, grounded, low, and quite wide. That inspired the idea of grouping the dancers and make them creating a complex form, joining their joints and balancing each other's weight on their backs. Dancers are connected together, their knees are bent, and they are more grounded to the floor. There was a play between the dancers and the snake sound, and I had the dancers going to the opposite space when the snake was going to their side. [...] The deep *monster* sound inspired the group figure's pose and motion, but where the dancers were in space was affected by where the *snake* sound was, as they were trying to go away from it.

(Li, 2005b)

The group figure takes different poses each time, passing from a standing position, walking and making various facial movements, to bending and arching backwards almost touching the floor. The fatigue of the motion is felt, since for the dancers is quite an effort creating this group pose, and it is reflected in the particular rough action of the group when walking (Figure 4.11, 4.12, 4.13). The backwards arching movement instead realises moments contrastingly delicate and expressive (Figure 4.14, 4.15).



Figure 4.11 The *monster* group in action, Laban Studios, London, 24th November 2014 (Perego, 2014).



Figure 4.12 The *monster* group in action, Laban Studios, London, 24th November 2014 (Perego, 2014).



Figure 4.13 The *monster* group in action, Laban Studios, London, 24th November 2014 (Perego, 2014).



Figure 4.14 The *monster* group when arching backwards, Laban Studios, London, 24th November 2014
(Perego, 2014).



Figure 4.15 The *monster* group when arching backwards, a close up of the pose, Laban Studios, London, 24th November 2014 (Perego, 2014).

The *monster and the snake* sounds show another level of productivity reachable with sonic movement; that is using the dynamics of a sonic gesture and its positioning for creating the physical sensation of a presence in the space and, through that and sound's timbral characteristics, to build a particular mood. Sound's slow but repetitive movement, the size of the perception (because the sound is very low in frequency it spreads all around in a diffused way, although its main intensity is felt in one place), the repetition of its passage always on the same side, and by the same route, has combined with the darkness of the *monster's* timbre, the slowness of its pitch changes, or with the insinuating quality of the *snake's* texture. These impressions have been intimately mirrored by Jalianne's body movement imagination. She designed the complex interaction of the bodies, expressing through the touching and brushing of their clothes, and through the motion and mechanical changes of poses, both a sense of effort and sensuality, and as well as of roughness and mystery, a simultaneous response/proposition to the sonic movements, sound materials, and sonic structure.

In the *bird-sound* (4.8.4), sonic movement's dynamic lightness inspired the whole scene and dictated the type of materials to be used, whereas here its characteristics acted on the choreography redesigning the dancers' gestures from within. As a core part of my collaboration with Jalianne was the ability to integrate the usual

collaborative elements of sound and dance with the higher order kinetic perspective, upon which we wanted to construct the piece.

From the intricate relationship between the sound characteristics (e.g. timbre, quality, pitch, dynamics) and its spatial attributes (its perceived displacement in the space), then comes a complex set of emotions emphasised by the interpretation or juxtaposition of the bodies' organisation by the choreographer. In my composition, everything revolved around the organisation of kinesis through a musical form. I mean how to work sound and its spatial attributes to create movement sensations. The choreographic ideas took part in this development through their juxtaposition to the sonic movements, their interpretation and elaboration, and as inspiration. The Laban's action-mood idea (Chapter 2.3.1) - the way the human body can model and express emotions by the different degrees of elasticity, contortion, speed, strength, and grace of a movement- has found in the joint choreography of *Stranded* its further realisation, derived from the interleaving of moods, ideas, dynamics, expressed by the movement of its two prime materials: body and sound.

4.8.7 Parallel lines, divergent, outbound, inbound (17'15"-18'27")

Other relevant kinetic effects have been used in the work, in particular, straight trajectories across the space. We have coupled parallel trajectories of sonic movement, from one side to the other of the stage, to the position of the dancers. The resulting impression was not as clear as the geometric abstraction: with difficulty, the different sounds could be discerned from one another, as they seemed to proceed more as a unique wall of sound rather than individual sources advancing in parallel. We called it the *big wave*. This resultant effect, which lacked perceptual clarity, worked for our purpose, yet this evidences once more how abstract and logical designs have often little to do with the perceptual result.

Another type of sonic movement I have used was in the last scene (from 25'30" to 29'31"), when, through outgoing diagonal trajectories, sounds would leave the space, metaphorically accompanying one of the dancers outside the space. That was exploiting a characteristic feature of the WFS technology, that is being able to reproduce sound sources outside the diffusion space, behind the physical line of loudspeakers.

4.9 Conclusion

The placeholders outlined here above should have given an idea of our collaborative artistic process, and of the type of kinetic inventions *Stranded* consisted of. They describe how a joint choreography emerged from our respective practices and their interaction. Our work has been based on movement since movement has been taken as the source of inspiration and direction for the creation of every part of the work. The aesthetic,

expressive, stylistic aspects of it belong to the personal artistic orientation and how we have personally adjusted to the situation, exchanging, creating, and refining ourselves and our experience, in an effort of collaboration and discovery.

Chapter 5

I Hear You See Me

5.1 Introduction

My second project *I Hear You See Me (IHUCM)* is an audiovisual installation with the additional element of participatory theatre and represents a complementary development of my sonic movement practice.

It is a cyclical piece of 13 minutes, in a perpetual loop, for two participants at a time (Participant 1 and Participant 2), who take on double roles (Role A and Role B), following vocal instructions. Each loop lasts approximately 13 minutes, and at the end of each loop Participant 1, who started in Role A, takes on Role B, while Participant 2 leaves the scene. A newcomer would take Role A so that the show could continuously loop.

Role A's experience is based on the progressive unravelling of situations and emotions completely unaware of what is going to happen next. When Role B is taken, the show is experienced for the second time, reviewing in another form the previous experiences. Wearing a pair of headphones (with different instructions) Role B watches the show from outside, observing the other person performing the gestures they did a few minutes before. The interactions between sonic movements, participants' actions, and visual projections are seen for the second time and from a different angle, to create an overall different kinetic impression.

The stage is a squashed cube of loudspeakers of 5x5 m and of (at least) 2.5 m height. From one of the sides and minimum 4 m height, a visual projection (by using a short throw projector of 0.6 ratios) creates a cone of light inside the loudspeakers' perimeter, with a diameter, at its impact with the floor, of about 4 m. The angle of the cone of light is such that a shadow casts down from the participants within the cube, so that, when positioned and instructed in appropriate ways, they can make their shadow appear, move, and interact with the sounds and animations.

The story, inspired by Japanese writer Haruki Murakami's novel *Hard-Boiled Wonderland and the End of The World* (1985), is told mainly through auditory cues, in the instructions, narrations or through the composed sounds, complemented by the visual projections.

5.2 Structure of the piece

I Hear You See Me consists of four main scenes.

5.2.1 Scene 1 (0 - 3'22")

Scene 1 starts with an empty space brightly illuminated by the cone of the projection light on which Participant 1 (P1), as Role A, is introduced and asked to stop in the middle of the space: immediately some instructions from the loudspeaker system are delivered to Participant 1, and the show starts. Slowly P1 will begin noticing the presence of the Gatekeeper, that is, Participant 2 (P2), who is impersonating Role B, and shortly they will start to dialogue. Through this time P1 has also started getting acquainted with the first graphic animations and sonic movements and got familiar with the instructions method, which would lead him/her through the rest of the experience.

The scene proceeds by making P1 (through instructions delivered by the audio system and live by P2) interacting and discovering his/her own shadow. P1 is asked to perform simple gestures, to which, calibrated and synchronised accordingly to average reaction times, sonic movements are applied. A magnetic audiovisual connection (Chion, 1994: 223) is created by the physical actions of the participant: motion graphic is not used yet, but only the natural shadow of the participant, cast on the floor by the projection light. Rather than witnessing a scene, the participant performs it, also activating and adding proprioception, to multimodality.

5.2.2 Scene 2 (3'22" to 5'57")

P1 is then asked to wear a white overall, and wearing that he/she enters a different world, which is Scene 2. Sounds and projections have worked slowly to prelude the new scenes to come, and from this point on they will be delivered more intensively. P1 is led into small interactions with the sonic movements synchronised with the motion graphics. The eyes are open, he/she is standing and observing, slightly rotating on his/her axis. Instructions lead P1 to notice a dot on the floor and to bend down to catch it with his/her palm. As soon as the dot is caught, it opens up and transforms into a bird, which suddenly flies away leaving into the palm only its shadow. P1 is asked to blow that shadow away towards P2. In the meantime and quickly, a whirlpool, which was quietly in the background until then, at this point grows to become an overwhelming presence of sounds and animations, cancelling out all the rest. The bird's shadow is caught and then thrown by P2 into the swirling water, and P1 is left with just watching the bird's shadow getting sucked into the whirlpool until the whole scene fades into silence.

and darkness.

5.2.3 Scene 3 (5'57"-8'50")

In complete darkness, P1 is asked to pick up a paper note (prepared in a pocket of his/her overall) and to unfold it. A small light is timely triggered and projected right on the paper, so that P1 can read out loud "we are at the end of the world, there is no growing old, no death, no fear of death, just strip away your shadow, watch it die" (Mercuriali, 2013). A low pitch rumble is heard, announcing the creation of the wall. P1 is sitting in the middle of the space and has put away the paper note he/she has been reading just moments before. He/she is asked to close his/her eyes as sounds start crossing the space, accompanied by some light patterns (invisible to P1) that flash through the darkness. As sound grows in volume, a thick white line is projected on the floor, drawing a large circle progressively to surround P1. For this circular motion, I have composed a saturated complex of sounds of rumbling metals, wood, and chains into a sonic movement, to give the impression of the emergence of a wall around the listener. P2 has been standing all this time outside the space as a witness to the creation of the wall. He/she is experiencing with eyes open the scene, able then to see the visual effects in combination with the sounds.

In Murakami's story, the wall is very important. It represents the place where no one except birds could enter unless they strip off their shadow. I tried to realise the idea of the creation of the wall, as a kinetic process, and to give a strong physical sense of being surrounded or confined within something. A smoke machine has been employed to fill the room with smoke to increase the physical sensation of the creation of a wall. When a loud metallic, rusty sound announces the wall is up, P1 opens his/her eyes, to find himself/herself surrounded by a thick visible cone of smoke lit by the projection lights.

5.2.4 Scene 4 (8'50" until the end of the loop)

We are now in scene 4, the floor and lighting are turning red. In this scene, P1's shadow will be cut off. P1 is carefully positioned by P2 in the space and asked to lie down over his/her shadow on the floor. While listening to the following words sent through his/her headphones, P2 proceeds cutting off the shadow:

I surrendered my shadow. The gatekeeper had me stand in an open space beside the Gate. The three o'clock afternoon sun fixed my shadow fast to the ground; then he produced a knife and deftly worked it in between the shadow and the ground; the shadow withered in resistance, but to no avail, its dark form

peeled neatly away.

(Mercuriali, 2013)

A piercing sound is heard passing around the whole shape of the body of P1 on the floor. The visual projection draws a line to follow its path to symbolise the shadow cut, and, as soon as the gesture is completed, darkness is made, while on the floor remains only the shadow, slowly starting to float away. P1 is asked to sit, and from there he/she can watch the slow floating movements of the shadow fading out, with birds flying across the floor. P2 is asked to leave the room, leaving his/her headphones in a pool of light on the floor, while P1 puts away his/her overall, pick the headphones and put them on to take on Role B, ready on one side of the projected circle. Both the participants have reached a landmark of the show. For P2 the show is over and leaves the scene, P1 instead, the former Role A, is now the new gatekeeper in Role B, waiting in the space for the new person to arrive and take on Role A from scratch. The loop is completed and starts again.

5.3 Creative context

For this project, I have made some different choices compared to *Stranded*. I have involved two collaborators instead of one, such as theatre maker and director Silvia Mercuriali, and video artist Simon Wilkinson; there are visual projections synchronised and simultaneous to sonic movements rather than dancing bodies; the listener is not anymore sitting and watching but participating actively in the show, by moving, speaking, looking and listening.

I Hear You See Me is an audiovisual installation, featuring participatory and experimental theatre. It explores the innovative techniques of autoteatro, pioneered by Mercuriali and Ant Hampton as *Rotozaza* (Hampton and Mercuriali, 2007b and 2007), to allow participants to run the show by themselves, following auditory prepared instructions. This type of theatre removes the spectator for the participant and focuses on creating a performance by arranging guided first person experiences. I thought to venture a work on sonic movement with autoteatro because it was giving me access to the listener. I could act on the different levels of participants' attention, affecting audience actions, arranging times for contemplation and sensual experience, and introducing the curiosity and intrigue (and embarrassment!) of interacting with strangers, and of exploring unknown situations. An imaginary world, dreamful, made of complex perceptual experiences that could easily be accessed, through the narrative and the poetic of theatre (Lecoq, 2009: loc. 719-735).

I have tried to establish in which way I could use the narrative and the interaction between participants to support sonic movement's impressions. The process has been elaborate and at times difficult for the type of research and work needed to accomplish the task and for accommodating our respective artistic trajectories. Silvia, once exposed to my ideas on sound kinesis, elaborated a minimal story, based on Murakami's novel, that worked as a structure for a show, where imaginary worlds were to be created almost exclusively with auditory cues, with minimal use of the motion graphics in support. This idea, although designed to enhance the sound context fully, wasn't working perfectly for realising a sonic movement experience as I imagined: it required a different approach to the narrative and several adjustments to the flow of the events and instructions to the participants. I have realised that by giving text-based narration a priority, I would not have been able to manipulate sonic movements as flexibly as I wanted since it would have led to a simple juxtaposition of text, gestures of the audience and motion graphics with the spatial sound. I did not want the listener to exclusively see a movement of a projection and straightforwardly link it to the perceived changes in the position of the sound source, although that has been necessary and useful in many points. Also, by solely standing and watching things happening on the projection floor, I felt I would have created a too static orientation contrasting with my desire to produce a more dynamic and intimate level of movement perception.

After carefully examining the listening perspective, focussing on the sonic movement dynamics I have decided the different perceptual stages should have led the narration, that is the various combinations of sonic movement, postural indications, and graphical hints flowing one into the other. I set to develop ways to support rather than lead the perceived kinetic emotion with the text/instructions interventions and motion graphics, extending the structural moments in which just sound was heard, changing the position of the listeners including sitting, squatting, and lying down, and using alternating state of darkness and light through the use of projections, not only as a source of graphical content but also purely as light.

Therefore I have worked at connecting each scene with its previous and next, not simply descriptively, but also taking into account many connotational elements of the perception, of the location and direction of the listening, of the different types of sound and sonic movement dynamics, and of the emotions flow. Working intensively on studying and feeling the actual effect of the sonic movement, by trying in the space on my own the different subtleties, I have learned the necessary changes to make to Silvia's initial structure. I have left intact the core of the story as she designed, but re-proposed it, after cutting portions of it, and modifying the way as a listener I would flow into each experience. Silvia was then able to refine her text and further helping me by introducing

more dynamics in the actions of the participants, adapting to my sonic movement ideas and expanding on this territory as well.

IHUCM is thus about a stream of kinetic experience. For example, if the initial moments of the story (the silent walk of the Participant 2 around Participant 1, and the first discovery of P1's own shadow, in Scene 1) contain very minimal sonic movements, the next situations evolve by gradually becoming more intensive and sensational each time. When arriving at the episode of the whirlpool, sonic movement, motion graphics, and interaction with the bird's shadow provide a fully immersive experience. The next episode of the wall, which follows a moment of complete silence, produces again very intense sounds but is perceived sitting down and with eyes closed. In the following scene of the cut of the shadow more actions of the participants are added to the kinetic experience: as Role A, Participant 1 is lying down on the floor, whilst Participant 2, as Role B, is moving the finger along the shape of the P1's body. In that particular moment, P1's perspective is at its climax, something not experienced before on such scale. He/She is immersed in an intensive mix of sound spatial cues, lights flashing coming from the projector above, and with the presence and movements of P2 so close and dominant, as seen from the floor.

I believe this last scene of the shadow cut expresses the full symbiosis and perfect exchange between mine and Silvia practices of *autoteatro* and sonic movement.

5.4 *Hard-boiled Wonderland and the End of the World's* imagery

The story leads the participants 'at the end of the world', where they will be asked to 'strip away their shadow'. The imagery of Murakami's novel is taken loosely as inspiration and context, and we have employed several of its elements for their evocative function and very suitable applicability to the sonic movement's designs and theatrical experimentations.

5.4.1 The Bird

In Murakami's novel, the birds appeared to me a mysterious, obscure presence as if they were keeping some inaccessible secrets. They are directly associated with the idea of freedom, as only birds could travel freely back and forth, beyond and within the wall (Murakami, 2003: 332). As the visitor's shadow at the end of the story proclaims: "we are free as the birds" (*ibid.*: 397).

Birds' symbolism is open to many interpretations other than the usual concept of freedom. In poetry (O'Riordan,

2009), they have been used for indicating solitude, love, a metaphor of human condition and the world, sometimes a disquieting presence, and to different birds, different meanings are associated. In *IHUCM* there is no reference to a particular kind or shape of birds: we imagined the birds as symbols of the many shadows cut from the participants, flying over the scene accompanying them in their journey.

In *IHUCM* birds are a constant presence. Their description welcomes the participants' first approach to the sounds: "the birds gather and roost at the top of the wall, waiting" (Mercuriali, 2013). They are a light presence, in the background, that composes the suggested landscape which is introduced with the story. The image of the bird also recurs in the following interactive scene. It is a bird morphing from a dot and immediately flying away from the holding hand of Role A. This time, it is a visible presence, virtually touched and immediately lost. After then, the birds very briefly reappear in the wall scene, frantically crossing the stage, to remind the participants of their presence, almost surrounding, watching on them. Moreover, when the shadow is stripped away, they are impersonated just by sounds, loudly screaming over and passing very close to the participant, emphasising the core moment of the cut off of the shadow. At the end, when the participant's shadow is cut and floats away, it morphs into the shape of a bird.

Birds have been a strong image to use with sonic movement for their dynamics. They are easily associated with a trajectory in the space and therefore have been very suitable for different types of movement ideas.

5.4.2 The Whirlpool

Along the river, there's a pool where "the surface may seem calm, but below is a whirlpool. The pool never gives back what it takes" (Murakami, 2003: 121). The pool in Murakami symbolises the exit from 'the end of the world', as the visitor and his shadow observe "this is the exit [...] nothing can keep us in this Town any longer. [...] There's a whole world the other side of this Pool. [...] Ready to take the plunge?" (*ibid.*: 397). We played on this idea and used the whirlpool not much as an exit but as a passage through another session of the story. We have found the idea of having a whirlpool very powerful in terms of sonic movement design and for creating a topic moment in the story, which Role A can experience in all its strength. When Role B throws the bird's shadow in the whirlpool, that announces the passing to the next scene of the wall.

5.4.3 The Wall

"The wall, seven yards tall, circles the whole Town. Only birds can clear the Wall. No entrance or exit except this

Gate. [...] You see these bricks? Nothing can dent them, not even a cannon [...] nobody can climb it. Because this Wall is perfect [...] Nobody leaves here" (*ibid.*: 108). The wall has a strong dramatic feature. For the show, the construction of the wall is a crucial moment to signal the arrival of Role A at the End of the World, where soon he/she will be asked to cut off his/her shadow. I wanted to make clear the size of its structure and to create a strong impression of being surrounded by it, inescapably. To realise that as a kinetic sensation, I have decided to capture the wall in its magical construction, progressively building around the listener - who is sitting down with eyes closed - a circular motion of rough and loud sounding sonic movements.

5.4.4 The Shadow

The Shadow is central to the piece. It is the main inspiration that moved Silvia in choosing this subject, for its connection with the sonic movement idea, and for its playful interactive aspects. She tilted the cone of light of the visual projections for creating a perfect shadow with the participants' bodies. Since participants are instructed to move, the shadow moves consequently, creating interesting sensations of interaction when sonic movement accompanies them. The idea of the shadow continues further as a virtual representation of the motion graphics: the bird, that develops from the dot on the floor, fully appears on the palm of the participant to escape shortly after, leaving its shadow behind. The separation of body and shadow suggests what the participant will be experiencing in the first person later on with his/her own shadow. In Scene 4, Role A is exposed to a very personal and physical connection with his/her shadow: he/she is asked to lie down over it, and through a significant sound and sonic movement he/she perceives the shadow being cut from his/her body. From the spot on the floor, where Role A was lying, a shadow takes off transforming into a floating morphing image of a bird, finally departing from the scene, and taking Role A's journey to its end.

Dramatically the shadow is, therefore, central, as realisation by the body of the participants and interpretation by the projected visuals. It also interacts with sonic movement in different ways, as a suggested humorous connection with the real shadow in Scene 1, or as a virtual interaction between the two participants, throwing and catching the bird's shadow, or by the physical suggestion of being stripped off from the body, and finally through its floating trajectory's interplay with the melody that closes the show.

5.4.5 The gatekeeper

The gatekeeper's image is not represented by anything in the show but is impersonated by Participant 2 (Role B). The elements that characterise Role B's personality reflect those in the novel, because the gatekeeper knows

already what's going to happen, and because of his/her somehow authoritative position delivering a message through a mix of real spoken words (as instructed via headphones) and by the prerecorded fragments of text, doubling the real voice and resonating through the loudspeakers' system. This role is both functional and metaphorical in the structure of the story.

Several other elements of the novel resonate in *IHUCM*: the stillness and silence of lonely landscapes; the isolation of the characters, strangers to each other, but engaged in an encounter in a mysterious place; the idea of passage. There is also a special connection between beings and sounds in Murakami's:

As dusk falls over the Town, I climb the Watchtower on the Western Wall to see the Gatekeeper blow the horn for the herding of the beasts. One long note, then three short notes— such is the prescribed call. Whenever I hear the horn, I close my eyes and let the gentle tones spread through me. They are like none other. Navigating the darkling streets like a pale transparent fish, down cobbled arcades, past the enclosures of houses and stone walls lining the walkways along the river, the call goes out. Everything is immersed in the call. It cuts through invisible airborne sediments of time, quietly penetrating the furthest reaches of the Town.

(ibid.: 13-14)

This passage is indicative of the atmosphere of *IHUCM*, where sound dominates the sensations amongst the brief visuals and physical encounters. The recurrent references to dreams in the novel (e.g. *ibid.*: 38-42, 58-61), to closing and opening the eyes and explore different perceptions of reality, have inspired many of the situations in *IHUCM*, sometimes almost subconsciously evoked:

I imagine flumes of foam rising underground, filling the alleyways, climbing over house walls, drowning even the clocktower. But on opening my eyes, the flow immediately vanishes.

(ibid.: 14)

I have organised sonic movement around the mood of this work, of images, strange apparitions and fast disappearances, "an indelible intimacy of memories long departed from their eyes" (*ibid.*). I have tried to generate sensations through kinesis such as to build memories, connect them with each other, and to tell a story with them.

5.5 The technical setup

For creating *I Hear You See Me* I have used first order ambisonic technology by employing Bruce Wiggins' plugins (Wiggins, 2010), operated from Reaper software platform. These plugins allow a reliable and easily configurable setup, and good compatibility with Reaper software. I have chosen Reaper amongst several Digital Audio Workstations (DAW) because of its support for up to 64 audio channels on each track (at the time of this writing, 2015) which meant avoiding other expensive and less flexible software solutions.

My system worked by placing a panner into each of the individual tracks containing the sound material and directing them all via internal *sends* to a master decoder track, set to receive and decode the incoming four channels *b-format* (Leese, 2015) into the chosen output of a cubic rig of eight loudspeakers. The decoder plugin also features presets for a cubic setup, with easy customisation of the effective dimension of the space allowing great flexibility in case the show is performed in different venues and contexts. The panner is a simple graphical interface which allows setting the x and y coordinates for each source and their elevation. Sometimes I have used polar coordinates rather than Cartesian depending on the type of movement I was trying to build.

All my sonic movements are therefore generated and recorded with standard plugin automation, which, although sacrificing the accuracy and number of details of the WFS collider software used for *Stranded* (e.g. precise speed and acceleration control), was very effective for the purposes set on *IHUCM*.

IHUCM's system is a squashed cubic rig made of eight loudspeakers. The base is 5x5 m, and the minimum loudspeakers height is 2.5 m. For practical reasons I have reached only 2.5 m instead of 5 m, as for a proper cube, but, for this research, this did not affect the sonic movement definition, neither created notable artefacts (Wiggins, 2015). The projections instead needed to be placed at 4 m minimum height, to ensure a sufficiently large projection was created on the floor. The power of the loudspeakers and their volume had to be reasonably adjusted accordingly to the space the installation was built in. I have used effectively either Genelec's 8050A or 1030.

Vocal instructions and all the sounds of the score are performed from the loudspeakers. The vocal instructions though are always used in the same manner and from the same location, to distinguish from the other sounds. The voice, for example, has been recorded with the same intonation throughout, clean, with no effects, and it is

always playing from above the listener, in the centre of the cube. No movement is applied to it. Other vocal sounds, though, like poetic text fragments, with other function than giving instructions, are used freely as the other sounds.

The sounds that are directed to Role A are played back from the loudspeaker setup. Role B instead receives vocal instructions from a set of wireless headphones, and sometimes also parts of the soundtrack to reinforce the perception in certain specific moments of the show. Role B is wearing headphones all the time, which can cause auditory artefacts, and also stands in a position offset from the cube's centre: that is only slightly limiting the appreciation of the spatial effects, since they are viewed for a second time, and therefore more easily understood.

Initially, we had worked extensively with another solution. We have bought two parametric loudspeakers, and placed them overhead at the height of the projector. One was destined to give instructions to Role A and the other to Role B. Since they are directional loudspeakers, they project a beam of sound to a specific point in the space, for the ear only of the listener at that point. We have tried a 'sound shower' mode "to minimise reflections of the sound and its audibility at different locations around the room. The sound starts to travel from the ceiling, bounces off the floor and is reflected back to the same spot on the ceiling", and a 'spotlight' mode (Ultrasonic, 2015).

This solution appeared fascinating initially, as we could deliver the instructions in this fashion separately from the main loudspeakers, which could be dedicated to playing back exclusively the sounds and sonic movements, avoiding any obstructions (such as headphones) to the ears of the participants.

This method though did not work. In the first instance, the parametric sound obliged the listener to receive the instructions in one position only, which resulted in an impractical and most of all ineffective limitation. My resolution was to free the listener around the space for changing and trying several perspectives on sonic movement: with projecting ultrasound in a fixed position, that could not be done. Secondly, the low quality and high reflectivity of the parametric ultrasonic sound was causing distraction and imprecision in the reactions of the participant, as well as effective problems of audibility: some high-frequency hiss and other artefacts were heard, disturbing the clean perception of the sonic design, but most of all it was the difference in timbre, in comparison to the cubic rig's loudspeakers, the major factor that pushed us to abandon the idea.

After these attempts, we came to the conclusion that using headphones for one of the roles would have been the best solution, for ensuring mobility of both participants, their independence, and also creating an interesting and marked difference between the two. We left the instructions for Role A openly audible from the loudspeakers system, and since Role B was revisiting the same experience and also wearing headphones, that have not caused problems of clarity about whom the instructions were addressed to.

5.6 Preparatory work

IHUCM work roots in preparatory studies and projects I have undertaken with ambisonic technology. Most relevantly the already mentioned (in Chapter 3) *Untitled, Two on a White Surface* with Alice Bariselli (2011), and the works in collaboration with Silvia Mercuriali, *Wondermart* (2009-2010, in Appendix II) and *The Eye* (2012). I would also add to this *Axis Mundi* (2009) with Nora Razian, of which I will talk about in Appendix II. Ambisonic technology interested me, especially for its simple and flexible setup. With a minimal amount of loudspeakers, and, especially now, with easily obtainable software for programming it, I could build an efficient and powerful sound space in very short time. I was also intrigued by the possibility of rendering complex audio works into binaural versions, which I have used in many earlier experiments and in *Wondermart* and *The Eye*.

These mentioned works relate to *IHUCM* for several reasons, beyond having in common the same technology. For many parts of *Wondermart*, and for its entirety in *The Eye*, I have made 3D binaural acoustics soundscapes which are synchronised with the movements and actions of a listener, directed by the vocal instructions. The body actions, the suggested movements, and the script influenced one another in different ways, e.g. via symbolic references between sound and text, or by sonic movement and certain actions taken by the participants. *Untitled, Two on a White Surface*, as described more extensively earlier (Chapter 3.4.1), explores a similar cubic environment using ambisonics technology, employed in *IHUCM*. I have particularly enjoyed manipulating and experimenting extensively with the links between physical actions and sonic movements, at this stage not fully developed, but that became central in *IHUCM*.

5.6.1 *The Eye* (2012)

My previous collaborations with Silvia Mercuriali consist of two works, *Wondermart* and *The Eye*. *Wondermart* falls outside the time of this research, as I have completed it just few month before, nonetheless, it contains relevant work that marks my beginning with practicing with spatial audio and theatre practices, and I discuss it

more at length in Appendix II. For *The Eye*, we worked in collaboration with Dr Dominic Ffytche, and explored the topic of the exploration of the eye, still employing *autoteatro* techniques and binaural sound rendition. The work is part of a series of podcasts produced by Fuel Theatre (2015) and The Guardian (2015) that put together artists and scientists for a 15 minutes audio work, to make audiences explore their body from artistic and scientific perspectives.

Silvia thought of using sonic movement as she initially imagined a 'choreography for the eye', something to listen to on the headphones and to experience through audio cues while looking at ourselves through a mirror. She developed the idea of a listener holding a mirror, looking at his reflection and following instructions about what to do and imagine. The self-reflection is then thought as animating, leaving the mirror and becoming a *homunculus*.

The homunculus concept tells our ego is formed by several homunculi assigned to several parts of the brain. Silvia liked the idea especially when Dominic confirmed that it was a very well know paradox in the field of brain studies.

The show consists of several scenes, from the initial interaction of the participant with a mirror and their own reflection, until when he/she starts to imagine, with his/her eyes closed, the homunculus' journey towards and through the eye, entering the skull, and finding his way through the control room, the brain. From there the imagined homunculus controls and assists the participant's eye check visit. In the soundtrack, the suggested (by the narration) movements of the eyes resonate as a bowed string, which harmonises with a piano at each blink. The narrative interleaves with the sounds, with the participant's movements and thoughts and with the spatial auditory cues.

The most significant moment is when the participant is asked to open his eyes and to look at a source of light:

look up at the strongest source of light in the room you are in. Look at it. Without blinking stare at it for 10 seconds, 9, 8, 7 ... now close your eyes!

(Mercuriali, 2012)

As soon as the eyes are closed something happens:

can you see an imprint on your retina? A pattern is slowly emerging from the darkness around it. Squeeze your eyelid gently to increase the darkness. Place both hands on your eyes, palm resting on your cheeks. Concentrate on the little specks of colour and faint glowing before your eyes the shadow of the light you've been staring at, the static...

(ibid.)

The sound and sonic movements simulate the apparition of this imprint on the retina, which naturally flows around, as much as we try to focus on it. Its glow and slow growth are symbolised by the sounds slowly fading in, and their very unstable texture. The sonic movement is designed to be focussed on the centre of this internal optical effect, and slowly identifying with it, simulating the probable movements to the right, left, away from the centre and back. The show ends with the homunculus disappearing and leading the participant back in front of his mirror as if everything was set to start back again.

As part of the work, we took measurements of Silvia's EEG brainwaves during one of her eye check visits. I have sonified the collected data and set into sonic movement as to represent the noises of traffic of a busy city, made out of neurones and synapsis. The movements of the eye itself were also sonified. I wanted to give a sonic impression of them on an imaginary level, like as if by physically moving the eye one could hear its sounds: the sound of a double-bass poetically was posing as that of an improbable noise of the eyeball in its slot. Ambisonic spatialisation in binaural rendition has perfectly served the purpose of realising the main stage of the narration and the action inside the head of the protagonist.

The Eye connects sonic movement, sound design, text and physical actions. Whether these are real situations, like in the case of the retina imprint, or staged illusions as the eye check visit, they both sensibly contribute to the final effect. It is from this particular and intimate experience of *autoteatro* that I have understood, more in depth than with *Wondermart*, the subtle, strong communion of text and sound through symbol. Balancing spatial sound attributes with sound design, accordingly to the narrative and journey of the story are elements that from this work I have carried into *IHUCM*.

5.7 My collaborators, Silvia Mercuriali and Simon Wilkinson

I have asked Silvia Mercuriali to work with me for my project *I Hear You See Me*. I have chosen to work with Silvia and Simon, for the interest I have developed into their collaborative work, which I have personally

experienced. Performing together under the name of il Pixel Rosso (Mercuriali, 2015), Silvia and Simon are renown for their explorations of immersive theatre, in particular with their shows *And the Birds Fell from the Sky* (2010) and *The Great Spavaldos* (2012). In collaboration with Simon, Silvia has expanded the possibilities of *autoteatro* in combination with video, in particular acting on the participants' reception by immersing them into mixtures of real and imagined worlds.

Silvia Mercuriali has been working in theatre since 1998, creating events, site-specific installation, experimental theatre shows and immersive performances. Her work is often created in collaboration with other artists, driven by the desire to explore new practices and continually re-invent and expand her creative process. She is co-director with Ant Hampton of the experimental theatre company Rotozaza under which name she created performances, site-specific events and installations between 1999 and 2008.

Rotozaza is better known as the pioneer of *autoteatro* which began in 2007 with their show *Etiquette*. As mentioned earlier (Chapter 1.4.3), this strategy explores a new kind of performance whereby audience members perform the piece themselves, usually for each other. She has continued to develop this new performance style outside of Rotozaza in her shows *Wondermart* and *The Eye*, and her activity also spans to other types of theatre, spread between being a director, writer and performer.

In *IHUCM* Silvia brought all her experience in creating *autoteatro* shows, with the additional ability to integrate complex technology. She proposed the subject of Murakami's novel, which I have found suitable for my purposes, besides being quite a fascinating subject, and it provided many themes and images that interested me for their kinetic qualities. After proposing a draft of a script, and collaborating to the technical plan and structure, she has also been constantly assisting me at the various rehearsals, practising tirelessly the various roles hundreds of times, discussing throughout the evolution and structure of the piece, and assessing its weaknesses and strengths. In many conversations we had, not only we discussed the practical matter, the organisation of the participants' actions, and the timing with the music, but also the symbolism of the story and how sonic movement could be integrated. These conversations greatly helped me developing my vision and methods of work for this project.

Both of us set in the space and tried every role by ourselves, trying to assess the experience in detail. In her relationship to the idea of sonic movement, Silvia reacted leaving the script open, waiting for me to devise sonic

examples, for then arranging around them the possible actions of the participants through instructions. At that point, it was me again who had to try if the instructions were generating actions compatible with the sonic experience I wanted and the kinetic effect. Silvia tried to adapt to my perspective, as much as I had to model the invention of sonic movement around the story, the chosen imageries, and the methods of participants' action and interaction she devised.

Simon Wilkinson is a fine artist working in audio visual performance, transmedia, and installation. I have met him through the work of Silvia and an earlier collaboration with myself (2007) for a music video project. In the preparation of *IHUCM*, Simon's input, through his experience of encompassing multiple formats and media, often all at the same time, was important for determining the technical structure of the show, the narrative and the interesting inputs from the novel. The quality and directness of his video images and motion graphics have been responding well to Silvia's directions and worked effectively in combination to the sonic movement's designs. His in-depth experience with audio visual technology, and of working with Silvia for their other projects, was fundamental for setting the work on the right foot from the beginning. I also credit Simon of part of the film footage that composes the documentation of this project.

5.8 Other artists' work

Other artists' work can form a basis for a contextualisation of *IHUCM*. The closest are works of interactive and participatory theatre, like Rotozaza's *Etiquette* (2007) and il Pixel Rosso's *And the Birds fell from the sky* (2010), or Char Davies' *Osmose* (1995). I also account many experiences of sound and interactive installations I went through or studied, such as Allan Kaprow's, the New York Happenings 1950-60, Janet Cardiff's work, and Lucas Samaras to name just a few. These works are related to *IHUCM* for the type of experience they deliver to their listeners, spectators, or participants.

Etiquette, which has been my very first experience of the *autoteatro* form, is a show for two persons sitting at a table in a cafe, exchanging dialogues and designing from a simple conversation an imaginary world, through sound cues, instructed dialogues, and several props available on their table. I liked the intimacy of the experience, being close to another partner, sharing something unique, and I was also struck by the dramatic effect of certain gestures connected with the sounds. I am thinking at the opening piano chord playing unexpectedly when the other participant is touching the table with his finger, or at the tactile sensation of the water droplets I recall falling on my hand (as delivered by the other participant while I was with my eyes closed),

while listening to a heavy rainstorm' sound through my headphones, as part of a particular moment in the narrative.

This type of synchronicity and cross-modal suggestions, features of *autoteatro*, are present in *IHUCM*, where sonic movement is the main medium. *IHUCM* is rich of interactive moments in between sound and participant, sound and visuals, and sound and participant with the synchronisation of visuals. They also appear between the participant and his/her own shadow, with the interaction of the sounds, and between the real shadow and its motion graphic alias. *IHUCM* explores, multimodality, interaction, and participation, yet through the immateriality of perceptual kinetic impressions and their ambiguities, with the help and interplay of the visuals, and the movement of the other partners' and own body.

And the Birds fell from the sky, by il Pixel Rosso, is another example of autoteatro work. Its importance and relation to *IHUCM* are in the use of the listeners' positioning (sitting down or standing), the manipulation of their perception by changing orientation in space, and moving around along a predefined path. The show is about the participant being involved "at the heart of the story, [...] a joyride from inside [...] [his] head all the way to the edge of civilisation, accompanied by three Faruk Clowns" (Mercuriali, 2015b). The sense of personal space and place is displaced by using video goggles, which close the view entirely, locking it to the screen, and by using props and a wheelchair to move the participant around. Being physically moved during the show increases the effect of being immersed in the story, stimulating the sensation of the participants of being in another place.

In *IHUCM* the experience of the listeners is based on a similar control over participants' perspective. A certain scene is designed to be played and observed from a certain angle, not as an imposition, but as to provoke certain reactions, to prepare the user and avoid resistances in favour of a deeper engagement with the artistic conception. Moreover, this is naturally organised to create the sensation of a journey, of a place to experience, with a story to actively play part in.

I have analysed audience's feedback on the matter. Many of the people that experienced *IHUCM* report almost unanimously they felt deeply into the story and have been living it fully. Laura said:

I wasn't really differentiating a lot which is probably a good thing; I was in the experience. [...] Surprisingly, being myself a musician, I was not analysing the sounds when I was in there, but I had a sense of really

being in something.

(Laura in: Brighton's Dome, 2014)

Even when the roles were swapped they were surprised to see their involvement were still high:

I was surprised that it was still effective, because I thought it would have been like acting out or saw someone acting, however by watching them, it enable my imagination to still be very active [...] I had the desire to remain in the film and in the story" (*ibid.*). "I have picked up details in the Role B that I didn't at the first time. It wasn't just repetition, but a very different perspective. I was actually surprised how different it was.

(Rachel in: *ibid.*)

These comments are for me relevant to see how the *autoteatro* theatrical form used in *IHUCM*, similar in certain aspects to those created by il Pixel Rosso, can create a basis of engagement very high, to favour participation to the artistic effects and the story. In *IHUCM* the movements and changes of orientation in the space are part of the effort to put the participants in the best relation with the multimodal experience, and to make everything feel like a natural development of the story. The kinetic expression delivered through the sound and visuals is balanced with the way the participants move around.

Sharing with a stranger an activity together (*IHUCM*), living in a public space an intimate experience (*Wondermart*), results in excitement, embarrassment, or fear of being caught: these reactions and refrains in the audience affect their end experiences. In *IHUCM* two persons who most likely don't know each other are in the space, but still have to play together or enter into some sort of relationship. Some audience's members reported that, since they were unaware of what was going to happen, they related to the other (to Role B in particular) as a sort of a guiding figure, an authority in the situation, or for help or trust:

when you lie down, and the person is pointing from above you to cut your shadow, at that point there is a question mark about your personal space, as you don't know what the other person is doing or going to do.

(Ralph in: *ibid.*)

This sort of hierarchical relationship between Role B and A comes from the *autoteatro* form, and from our choice of using double roles (Chapter 5.9.5), firstly unaware of the show and then re-living the experience: although not sure how that would have unravelled with the audience, me and Silvia have been fully aware of it and happy to let it happen.

Char Davies' *Osmose*, as described by Jones (1995):

is a fully immersive and interactive virtual environment which uses stereoscopic 3-D computer graphics, a head-mounted display (HMD), real-time motion capture and live stereoscopic video projection. [...] *Osmose's* setting is a series of nearly a dozen virtual worlds in which the user explores and becomes a part of: a world of text and literature through a fog; a forest; a clearing; a pond; a leaf; one can journey inside the ground; into an abyss; into a world of lines of code.

(Jones, 1995)

Dyson reports that *Osmose* explores:

aurality, not just through her use of translucence and transparency to disrupt the object and disrupt the eye's acuity, but [...] by developing a navigational interface based on the breath and body balance.

(Dyson, 2009:14)

There are several interesting connections between *IHUCM* and *Osmose*, although they are two entirely different contexts. *IHUCM* is not virtual reality; it is an audio visual installation with the additional element of participatory theatre, based on specific instructions that lead the participants' actions, 'under the acceptance' that they are willing to be guided and respond promptly to them. It is probably similar to a guided tour, where people are free to experience, but following a fixed path. *Osmose* is instead about freedom of exploration, and the perceiver is monitored, for adapting the visuals and auditory inputs throughout the course of the experience.

From some other reactions from the audience, I have gathered *IHUCM* came across as an immersive experience, in which the listener wanted to become lost into, like in a film. As Dyson further explains, this power comes from sound:

the features that differentiate new media -the ability to 'enter the screen' to interact with three-dimensional images or 'virtual objects' to acquire a new subjectivity, a liquid identity, to enjoy authentic rather than mediated experience, and to transcend the material- all these features are present in the phenomenality of sound.

(Dyson, 2005: 3)

Char Davies explores this by choosing virtual reality as the medium. She arranges the experience as free as possible of other elements potentially disturbing or limiting the perception of oneself in a different world:

another way of re-embodiment is through the interface Davies has chosen. Gone are the cumbersome datagloves and joysticks: in *Osmose*, the immersant controls his/her movement with breath and balance. Davies explains: 'I wanted to get away from interface methods that were directly manipulative, and in this work — as opposed to many other VR pieces — I was looking for alternatives to getting into that space and controlling or dominating things, where the user is reduced to a disembodied eye'. We're trying to get away from a lot of the stereotypes that you see in VR, where there's a horizontal floor and you've got all these solid objects — buildings, or whatever they are — in empty space. That aesthetic to me is based on separation of self and world. That's why we're avoiding the probing hand and disembodied eye, instead working with balance and breath, which are visceral and instinctual, and re-affirm the body's central role as experiential ground.

(Jones, 1995)

In *IHUCM* sound and listening are in fact the only reality, with the exception of the visuals support. The actions of the participant are given a path to follow, already chosen for them. There is no adaptive control or improvisation, and it is all fixed. Therefore I didn't measure the participants, checking their emotional state and evolution throughout the piece. I have just built a flow of sensations alongside a narrative path. *IHUCM*'s successive emotional situations are based on the kinesis of sound, organised by sonic movements and their relation to the story, the characters and the visuals. There is no gear to wear, but the focus is, similarly to *Osmose*, on the listeners' perception, and on its relationship with the stimuli proposed.

Osmose is about our relationship with Nature in its most primary metaphorical sense, e.g., the inter-play between the exterior world-space of nature and the interior world-space of self', writes Davies. 'Osmosis:

a biological process involving passage from one side of a membrane to another. Osmosis as a metaphor: transcendence of difference through mutual absorption, dissolution of boundaries between inner and outer, inter-mingling of self and world, longing for the Other. *Osmose* as an artwork seeks to heal the rational Cartesian mind/body subject/object split which has shaped so many of our cultural values, especially towards nature'.

(ibid.)

IHUCM through sound delivers the experience of visiting a town- immersed in a lonely, cold landscape at the end of the world-, of interacting with mysterious figures, of almost touching visions, of being in places and getting involved into situations. The kinetic effect of sonic movement excites, for example, the idea of the physical presence of a wall, which remains for longer in the experienter's mind, as it is drawn on the floor by the projected motion graphics. The sensation as if something has touched the hand is given when visualising a bird shape growing from a dot in the palm, and suddenly hearing and seeing the bird flying off it; this happens, despite the sound is not the sound of a bird, but a sonic kinetic representation of the flight path drawn by the motion graphics.

"Relax, get used to the space and the interface" (*ibid.*), says Davies. "Take a deep breath, relax your shoulders, close your eyes for a moment" says the narrator's voice in *IHUCM* (Mercuriali, 2013). Both the instructions alert the participant they are about to enter a new experience, a new dimension in which relaxation would help to receive as much as possible of it.

In *Osmose*, the reconstructed body is made possible by the absence of physical metaphors. With no metaphorical hands in front of your face, you become intensely aware of your entire being despite the fact that you have no physical form.

(Jones, 1995)

In *IHUCM* there is no *immersant* but a participant. In the end, there's no navigation, no adaptation of a looped scenario. It is in being open and ready to follow the instructions that the many designs of the artistic work could take effect. Just by changing perspective, by taking on another role (the Gatekeeper's role for example), the audience is revisiting the same show again, but with new eyes and tasks that would give a sense of fresh development from the previous one.

Discussing these works have served for me to present the context of *IHUCM*, a cross-disciplinary artistic attempt. It should have also shown a different kinetic experience than the one realised with *Stranded*, in purpose and function. Movement is used for creating images, to give life to sensations, establish links between actions, gestures, words, and things seen. Rather than creating a choreographic flow of sensations to look at and build connections purely from the kinetic impression, here movement realises a story, at multiple levels of perception: the textual, the auditory, the physical, and the visual.

5.9 Methodology and explorations

In *IHUCM* I have explored the application of sonic movement in a theatrical context. In particular, Silvia's participatory form of theatre adapted well to my exploration of listening, never static or tied to a proscenium-like perspective, but, through actions, alive and mobile. Compared to *Stranded* I have expanded the multimodal context by introducing text, and by extending the number and type of visual cues: on one side I have added motion graphics visual projections, and on the other, the participant's gestures, interactions and exchanges.

As already explored in *Wondermart* and in *The Eye*, I have chosen to use text for its ability to affect spatial appreciation through meaning, conveyed in the different situations through metaphoric, poetic images, or practical instructions. I have been attracted by the power of words in creating imageries to support and enhance the kinetic sensations of sonic movements. I have added another participant, to create dialogues, interactions, partnership and, through the presence of another body, as well of augmenting visual references. I have arranged changes of position (standing, sitting, lying), and orientation in the space, activating in this fashion the proprioceptive aspect of perception that I have been looking to integrate.

The kinetic aspects of *IHUCM* run alongside the necessity of creating a dramatic flow, a narrative that the participant contributes to creating. That required a quite different approach than the floating, undefined form of a sound for dance work.

5.9.1 Synchronous and simultaneous

In Chapter 4.8 I have discussed how the dialogic relationship between synchronous and simultaneous use of visual and auditory cues was a key element of *Stranded*. Both interleaved and crossed each other seamlessly. The synchronic element is important because it creates a direct and immediate link with the auditory spatial cue: the trajectory's path is the same for the visual as for the sonic movement. The simultaneity means that both the

kinetic experiences of sonic movement and body movement are received at the same time but have different behaviours, characteristics, velocity, and energy: they can interact, react to the respective dynamics, or simply exist in the same space, producing two separate and distinct sensations.

Sometimes in *Stranded* I rather wanted the dancers to follow exactly the path of the sound, or reacting to it, in some other I wanted them to move at the same time in the space, in cohabitation, but for different paths. It was the combination of the two, the continuous flow of one into the other that constituted its very essence and interest. The auditory perceptual impression of movement was forming a dialogue with the dancers' choreography, for constructing the final desired kinetic flow of a dance of bodies and sound.

In *IHUCM* audiovisual cues have been organised with a different balance. Most of them have been based on synchronic rather than simultaneous behaviour. Light is more easily connected with sound, as its movements are promptly associated with the perceived changes in hearing, an identification that with body occurs more slowly. We have possibly evolved a familiarity through our long-term experience of cinema: projected images can have a magnetic effect (Chion, 1994: 223) on the simultaneous and synchronic sound. In many situations I have made sonic movements of a sound matching exactly the trajectory of the visual image, to stimulate connections with the motion graphics.

My priority has been clarity: synchronicity between image and sound, in my case between sonic movement and visual motion paths, can give an immediate, almost subconscious understanding of the kinesis. Using forms and figures in the visual image, I have represented something recalling the source or the kinetic behaviour of the sound: hearing the sound of water whirlpools immediately links the sound with the seen waters (even though the material and recording is very distant from the one shown in the picture), or the shape of a flying bird connects with a sound shaped into a sonic movement impression of a flight (even though the sound might be totally different from the flapping of a bird's wings flying around).

This approach has given me significant advantages in dramaturgy but have also reduced the freedom and chance to give more subtle details in the articulation and spatial differentiation of the visual and auditory kinetic experiences. A projected bird's image 'can not avoid' being connected to that particular 'flying sound'. Instead in *Stranded*, the dancing body, even if running in the same direction of the sound, could often be perceived as a separate experience. In fact, that was the aim of the work. In *IHUCM*, then, I was set to create a different kinetic

experience.

5.9.1.1 Synchronicity examples

I use the term synchronicity in a broad sense, as none of the following examples could be defined as completely synchronous or that they are representing the same thing. My movement design implementations have not been realistic, as I did not aim to represent reality accurately, and they always have been the product of a simplification. I have also preferred an approach based on giving suggestions to stimulate the imagination, rather than providing a realistic representation.

By synchronicity of sonic movement then I define the moment when a movement is connected, in whichever combination, with sound, image, and own body, to express the same idea. Like for example, the image of a bird, the motion graphic of the flight of this image, the sound of the bird flying, the sonic movement aligned with the path taken by the motion graphic. Therefore the possible connections in this approach are between sound, image, and body symbol, linked with sonic movement, image kinesis and body movements, in different combinations.

5.9.1.2 The Wall

The wall consists of numerous layered tracks of sound, hinting to metallic noises, rough scraping of wood and soil. I have been inspired by the idea of hearing the sounds of pushing a massive and old wooden door with metal frames along a terrain. The wall is imagined so huge that even low rumbles, like earthquakes sounds, are heard at the beginning of the scene, hinting to its motion. The sonic material also includes other sounds, in particular, the resonant blow of a horn, and its processed forms, which I have inserted to hint to the story when:

as dusk falls over the Town, I climb the Watchtower on the western Wall to see the Gatekeeper blow the horn for the herding of the beasts. One long note, then three short notes— such is the prescribed call. Whenever I hear the horn, I close my eyes and let the gentle tones spread through me. They are like none other. Navigating the darkling streets like a pale transparent fish, down cobbled arcades, past the enclosures of houses and stone walls lining the walkways along the river, the call goes out. Everything is immersed in the call. It cuts through invisible airborne sediments of time, quietly penetrating the furthest reaches of Town.

(Murakami, 2003: loc. 272)

If I consider the perspective of Role B, there is a straight synchronic link between the sonic movement and the visuals: flashing lights appear where sounds are placed and moved, so that the sonic movement is perfectly aligned with the location, duration and velocity of the light flashes. Similarly, when the white line of the wall is drawn on the floor, the sonic motion follows that path precisely until the drawing ends, and a slamming noise is heard, indicating the wall has been closed, symbolising its creation has terminated. The sound is an assembling of impressions with the purpose of suggesting the materiality of a gate closing and forbidding access to anyone. It is expressed in conjunction with a sonic motion, in synchronisation with a motion graphic to complement the image. This synchronic organisation is arranged for the listener in Role B, while when in Role A, it is designed for being an exclusively auditory experience, with eyes closed.

5.9.1.3 The shadow cut

When lying down, Role A gets his/her shadow cut by the participant in Role B. The motion graphics are a very simple but effective drawing of a line around the body lying on the floor. Participant 2 in Role B is given instructions to point at a dot and follow it moving along the shape of Participant 1's body on the floor. The dot moves, leaving a white and yellow line around P1's body, synchronised with the sonic movement of the sound, which follows exactly in the space the trajectory of the dot. The sounds are designed to symbolise the cut: I wanted almost piercing sounds, made of high-frequency noise, but also with a critical mid-range body, to give overall a physical impression, of something touching the body.

This is a case where multiple synchronicity occurs: the sonic movement, the dot's trajectory in the space, the drawn line to reinforce the idea of the passage of the dot and of a cut, the gesture of the finger pointing and following the dot, Role A's perspective from lying down (in a potentially disturbing closeness with the other participant), Role B's self-motion and direct interaction with the perceived sonic motion. The sounds are abstract, the scene in itself is all imagination (the cutting off of a shadow), but the kinesis of the scene consists of powerfully and deeply felt elements.

5.9.1.4 The Bird's flight

I refer here to the birds' flight in general, when depicted as red images of birds flying, they cross the space. Their sound is recorded noise of birds. In June 2012, I went on a field recording trip to Iceland with the idea of collecting materials for *IHUCM*. The materials I have mostly used and processed are water sounds and the

recordings of Arctic Terns. The sound heard though is again an example of loose synchronicity, since the actual sound has little to do with the projected images of the birds. In our imaginary world, it worked well to give the results we wanted, to generate a sonic movement impression to create the story. Synchronicity is to be found between the movement of the fabricated sound source and the motion graphic. The visuals produce two effects, one of suggesting the bird, by drawing a view of its shape; the other is by hinting to its movement across the space, making the shape move.

The bird in Scene 2, when, after 'growing' into the palm of Role A, flies away in circles around the space, is connected to a sound which is not the sound of a recording of a real bird. It is a processed sound which I made from scratch and found it was very effective for creating sonic movements (which I have also kept throughout the scene with another function). In the particular moment when the bird takes its flight, that sound runs through a circular sonic movement, matching entirely the trajectory drawn by Simon with the projection on the floor, until it disappears. The circular motion thus represented anticipated the whirlpool waters, which immediately after took over the scene circling louder and louder around Role A.

5.9.1.5 The Gatekeeper walk

A dot on the floor follows the circumference of the projection circle, the full-size stage of *IHUCM*. Role B is asked to walk around the circumference following the dot's movement. At the same time, a sound is projected, with very few harmonic components, almost sinusoidal, creating a sort of ambiguity. While hearing the sound, Role A is asked to look at Role B, and follow him around the space, rotating his/her body.

The example shows the synchronicity of the sonic, physical and visual movements. If sound and motion graphic are connected by their path, the perspectives of Role A and Role B differ for, respectively, one is to rotate with the sound, the other is to walk with it. This moment in the whole piece is the first real impact with sonic movement perception, in the full form that has been employed in *IHUCM*.

5.9.1.6 The shadow game

In Scene 1, Participant 1 in Role A is asked to look for his/her shadow. He/she is asked to rotate the body so to project a specific shadow on the floor, then to raise the arm and to place the index finger on his/her lips. Sounds subtly follow these movements, organised by averagely calculated reaction times, and also are organised for sonic movement to match the movements trajectories in the space.

5.9.1.7 Blowing off the shadow

This example refers to the shadow of the bird left in Role A's palm in Scene 2, when it gets blown off towards Role B's hand set to catch it. When Role A is asked to blow on its palm, the visual projection of the shadow starts moving in a straight line towards Role B. A sound is heard, a sort of breathy sound, made with the processed recording of a blow into a reed, with pitch, but also high noise components (coming from the recorded breath of the blow). The sonic movement goes along the straight line of the visual trajectory and is also accompanied by a glissando which gives a slight raise in pitch to the sound.

The sonic movement and the graphic shape proceed along the same line, synchronically; Role B catches the shadow as soon as it reaches his hand (which is a gesture asked for via instruction through his headphones), in synchronisation with the main blowing gesture but communicating a different kinesis. By blowing, Role A initiates a proprioceptive relation with the visual and auditory movements, which ends with the reaction of Role B.

These examples show that synchronicity is based on three elements: auditory, visual, and proprioceptive. For visuals I intend the motion graphics, lights, and also the seen or felt presence of the other participant; as a proprioceptive experience I refer to all the experiences of movement made whilst moving our own body in relation to that sensation (e.g. like walking, visually perceiving the line drawn on the floor and the finger tracing the dot's movement in the air, catching, holding, blowing).

5.9.2 Simultaneity

By simultaneity I instead refer to situations where the sonic movement is not linked to the meaning, symbolism and kinesis of some other stimuli in the scene, but instead is in a relationship with that other percept, a kinetic relationship (e.g. when their respective movements interact or interleave) or as of cohabitation, of merely distinct presence in the same space (for example as in Chapter 4.8.6).

5.9.2.1 The Whirlpool

Scene 2 concludes with a large whirlpool taking over visually and auditorily. The sound of waters is heard starting from very soft growing into a sort of a water-wall of sounds. By accumulating white noise and real recordings of water noise from creeks and then adding recordings of huge waterfalls sounds (all taken again from the Icelandic field recordings, taken at Gullfoss in 2012), I have created the impression of growing the mass of the waters. The

playback of these water sounds is designed to go over circular trajectories, not concentric but differently offset, and spiralling to their centre until they disappear. I wanted the sound of water to be heard loudly, but also to be felt close by Role A, unpredictable and fuzzy, like vortexes in water could be. To this already strong kinetic sensation I added other sounds: I have used an elaboration of electronic sounds to cover circular trajectories, following the same off centre location of the water's sonic movements. Their texture and timbre recalls the brightness of the creek waters, but is mainly an electronic sound, with some percussive elements, to create the effect of nice, delicate swirls. The scene ends with the water sounds disappearing, leaving only the electronic sound to fade out.

The recorded and electronically generated sounds are linked, as if the electronic swirls were generated from the kinetic power of the water's sonic movements, to then continue, even after the water's disappearance, their circular motion and speed. The electronic swirls do not follow the exact trajectory of the water, but they go along the same rotatory sense, continuing for their part the kinetic idea initiated by the water vortexes. The listener perceives two distinct materials, and two different kinesis for the same type of movement, not synchronised but happening simultaneously.

5.9.2.2 The shadow's flight

In the last scene, the shadow is cut. As soon as the piercing sounds of the cutting moment are off, loud cries of birds are heard. They are not real, but electronic surreally processed Arctic Terns' attacks' sounds. While being instructed to sit down, Role A sees his/her shadow taking off after the cut in a slow motion flight. The drawn blue shape represents the shadow which slowly transforms into a bird's shape. Its flight is soft and slow, going around the space and around the listener who is sitting down with the eyes open, although the scene is very dark. A sound is played, almost melodic: its sonic movement seems, at times, to match the movement of the projected shape, almost to fly with it. The movements run with similar but distinct trajectories, without a particular shape, sometimes the two cross each other or are in the same direction for a brief moment. They are perceived distinctly as separate elements of the scene, ambiguously interleaving. There is reference to the slow developing melodic element and the slow motion of the turns in the space of the visual projection, which, in tune with the slowness of the sonic movements, and of the morphing of the image (from shadow to bird), tell about the end of the show. In a way all together they contribute to a unique sensation and closure of the story, but through separate independent kinetic impressions.

5.9.3 Morphing of perspectives

The actions organised by Silvia's instructions make the experiencer adapting at what we thought was best for each situation. Behind each gesture, there is also a dramaturgic motivation. I have made two simple tables to see at a glance the different kinetic experiences as they unravel scene by scene and the way the participant in Role A is set to experience them physically and mentally:

Role A

Scene/Sound/Event	Image	Eyes Role A	Position Role A	Actions	Time (approx)
The city Landscape		Closed	Standing		0'25"
Walk	A dot	Open	Standing/ Rotating		1'22"
Shadow Game	Real shadow	Open	Standing/ Rotating	Moving arm	2'46"
Bird Shadow Catch	Bird	Open	Bending Down	Blowing, Stretching arm	4'30"
Whirlpool	Water Swirls	Open	Standing		5'09"
Wall	White Line	Closed	Sitting down facing forward		6'19"
Shadow Cut	Line and dot	Open	Lying down		10'00"
Shadow Flight	Bird	Open	Sitting down freely, no orientation		10'38"

Table 5.1. - Role A Positions and Actions

Table 5.1 exemplifies that there is a few complex actions as part of the experience as Role A, and most of it is about observing things from different positions with eyes closed or open. Role B instead is characterised by more actions, in addition to the several instructions and the fragments of poetic texts he/she has to pronounce loudly

(these are not shown in the table):

Role B

Sound	Image	Eyes Role B	Position Role B	Actions	Time (approx)
The city Landscape		Open	Standing		0'25"
Walk	A dot	Open	Walking	Following dot	1'22"
Bird Shadow Catch	Bird	Open	Bending down, Standing	Catching	4'30"
Whirlpool	Water Swirls	Open	Standing	Throwing shadow in the whirlpool	5'09"
Wall Rumbles	Light Flashes	Open	Standing		6'19"
Wall	White Line	Open	Standing		8'11"
Shadow Cut	Line and dot	Open	Standing	Pointing to and following dot	10'00"
Shadow Flight	Bird	Open	Standing		10'38"

Table 5.2. Role B Positions and Actions

I have considered how the kinetic effects and the several scenes' imageries unravel in relation to the different tasks of the participants, for each of their roles. Role A is mainly passive, but changes perspective more variedly and more times than Role B. Role B is active, but also has a supporting activity towards Role A, guiding him/her, as The Gatekeeper does with the protagonist of the novel, to the separation from his/her shadow. In Scene 2 both roles share an action, both actively change perspectives by bending down and synchronise over the throw and catch of the bird's shadow. Impressions, sensations, perceptions are thus organised around actions, poses, orientation, accordingly to which I have created the sounds and the sonic movements.

5.9.4 Sonic movement and words

Developing from the experience of *The Eye*, I wanted to explore the relationship between symbolic references to movement and sonic movement. By symbolic references I mean the use of text to indicate motion, or direction, or location, or to indicate an action or an object that implies movement (e.g. sea wave, car, aeroplane) or implies direction or location (right, left). In *IHUCM* there are no situations like in *The Eye*, where specifically I have asked the listener to complete actions that matched the perceived movement of the sound (e.g. in the eyes check visit scene, Appendix I, a.2.3, at min 6'55"-9'55"). This type of literal connection can work, but have very little creative life, as chances for development are limited. I have used this particular effect once, at the time of the instruction 'to blow' on the palm, directed to Role A' s participant: I have accompanied the blowing action with a sound that contained breathing noise and changed pitch progressively in a glissando style. The 'blowing', suggested by the script, was matched by some timbral characteristics of the sound and by the direction and velocity of the sonic movement.

In *IHUCM* I have used the moods generated by the sounds and their texture for the purpose of creating strong imageries, as to realise the wall, the whirlpool, the bird and the cut. Underneath, the sonic kinetic realisation of these imageries, are supported by the text imageries, opportunely matched. For example, by bringing the participant to believe that her shadow will be cut (through the narration and instructions), even an unfamiliar sound as the one I have prepared for the cut of the shadow, makes the action feel real. It is somehow difficult to determine who has priority between these stimuli, but their contemporaneity is key to the successful result.

5.9.5 Double roles and sonic movement

The show provides two contemporary experiences of sonic movement. The first is entirely sensual, with the listener completely unaware of what to expect, and drawn into the experience, accordingly to his/her sensitivity. The second is instead a review of the same experience, in which the participant explores a new role revisiting previous situations from another angle. He/she feels again the previously experienced sonic movements and encounters the same difficulties, by looking at the other person's behaviour and performance. What at first didn't come across, now gets a full meaning finally. The different spirit and approach, and the various tasks to be undertaken make this second experience feel new.

The double roles are complimentary. The choice of creating a challenging experience, in which much of the

process is in the transforming evolution of sonic movements and sound, could be overwhelming for the user. With a second perspective, I attenuated the impact of the first role and favoured an entertaining and more in-depth experience through a review mechanism.

The challenge of experiencing slightly uncomfortable situations is common in Silvia's shows, a strategy that makes *autoteatro* so interesting. It gets to the point where you experience theatre from within, a spectator of your failures or successes. Situations are always different, and unexpected developments often occur:

when you make eye contact with another person with whom you don't have a close relationship, you might feel uncomfortable doing so. I had in front of me my colleague. We usually talk, but there is always a sense of professionalism in our relationship. In that situation is much more intimate, and you have to trust them, which makes things go more on a personal level. Especially when they ask you to close your eyes.

(Ralph in: Brighton's Dome, 2014)

I thought it was a really interesting idea to have the show seen twice [...] it's not just the artist the one with all the knowledge, the audience too goes on that side. I haven't seen that explored before, outside of things like videogames, where you are kind of active and stirring into different worlds;

(Adam in: *ibid.*)

you look to their face to read something...if they are smiling... there are moments at the beginning when you are not completely in that role. If you relax you get into the role. The second part helps to get first person into that role.

(Ralph in: *ibid.*)

I consider the presence of double roles very important for sonic movement appreciation. The sensual experience I have tried to put together by working on the sounds, the movements and on the narrative is received by Role A not without resistance. The participants could feel overwhelmed, rather than letting themselves to fully experience: a lot of information is delivered to them at the same moment, the settings are unusual and could be felt as uncomfortable and lead to refrains or indecisions, the interaction with the other person can create embarrassment and, as some have found it, at times, can feel awkward. Once the participants pass from role A

to B they are in a different position. They are in a safer spot, as they have been there before and recognise themselves impersonated by another person.

The appreciation of sonic movement benefits from revisiting the experience. As quoted earlier, participants reported that they have been able to pick up more elements when in the second role, and to notice certain features first lost or missed. For example in the whirlpool scene, Participant 2 in Role B is not in the centre of the diffusion space, but can see and hear precisely as a spectator what is happening in the space. The potential auditory artefacts for not being in the centre of the loudspeakers projection are attenuated by the previous experience of it.

The wall scene is built for two perspectives. It is created for Role A to be with eyes closed and sitting down, a total sensual experience, almost physical, due to the low frequencies vibrations. For Role B instead, the complete darkness is broken by fast flashes of lights, associated with the low rumbles and piercing sounds. Role B can appreciate the sonic movements accompanied in total synchronisation with the lights. Arguably, he/she is also remembering the experience just lived a few minutes earlier as Role A with the eyes closed, which could add up to the final sensation.

The role of memory is important for me. As discussed earlier (Chapter 2.2.3), the role of familiarity with the sounds has been well demonstrated and reviewed in psychoacoustics for its value in auditory spatial perception. Clearly, familiarity can also be associated with a short-term memory, of an experience just lived a few minutes earlier. Although not easily quantifiable, this idea seems to be very effective, and in the making of the work, I have often considered it.

By the mechanism of the two roles then I have managed to expand the experience of sonic movement over two sessions, one complementing the other, for the benefit of the experienter.

5.10 Conclusion

As it has been for *Stranded*, the relationship between synchronicity and simultaneity is useful for reading the project of *IHUCM*. The way the two are interleaved determines the kind of kinetic experience. In *IHUCM*, in response to my desire of expanding the exploration of sonic movement with the introduction of proprioception and more enthrusting multimodality, the auditory and visual are joined by the exploration of the physical. The

personal involvement of the listener, strategically made possible through the *autoteatro* technique, allows participation in the form of actions to be performed and to be seen, and words to be spoken and listened to. These new types of inputs, in addition to the sounds and visuals, create a different involvement which engages, even more, the sensations felt through the visual and auditory kinetic inputs. When a participant sees the other performing a task like blowing on its palm, he sees the realisation of the story, through kinetic elements of gestures and images: the bird's shadow flying from one palm to the other, the blowing action to make it fly, the catching of the shadow by the other participant's hand. All these elements create a context for the sonic movement perception to take place as if the sonic movement completed the picture, or the picture itself created the context for the sonic movement to be appreciated and understood.

This type of recursive intersection between the elements at play makes *IHUCM* a very different exploration compared to *Stranded*, yet still entirely realised over the kinetic effects, with sonic movement leading the way. These kinetic effects are now delivering not only dynamic contrasts to generate emotions but can give physical sensations to support visual illusions and push the listener further into the territories of imagination. The work though is not directed to the augmentation of senses, to become a sort virtual reality, but is a live and real multimodal experience of a theatrical work.

Chapter 6

Conclusion

Since the first time I have listened to a composition featuring sonic movement, in Copenhagen for the International Computer Music Conference's edition of 2007 (ICMC), I have been involved in a thorough investigation of sound and movement practices. I have been working with choreographers, theatre practitioners, and multimedia artists in several productions; I have studied the technologies involved in the creation and dynamic modification of spatial attributes for sound and employed them in many different projects. The present research is the outcome of this artistic and theoretical enquiry.

Throughout I have tried to understand in which sense sonic movement was offering me a new perspective as a composer and sound artist, and found that I could explore in movement new properties and aspects of sound previously unknown to me. I have researched the nature of perception of motion and sound, and finally defined new methods adequate to realise best my artistic ideas, the kinetic focus and the performance design being the two main aspects for which my work differentiates from contemporary practices of spatial sound.

My starting point has been, as described in Chapter 1.1 and 2.1, the use of perceived changes of spatial attributes of sound, to invent and design kinetic effects. I have aimed to use the static and dynamic spatial attributes of sound as protagonists of the artistic creation, not just as extensions of sound, like its parameters, but as the core media of the artistic experience. Sound material (e.g. texture, timbre) and sonic invention (e.g. rhythm, pitch, structure) have become the essential complementary elements to the kinetic construction.

Current disciplines and practices of spatial audio touch or partially explore sonic movement, but hardly put movement as the core of the artistic focus. My artistic enquiry was devoted instead to realise work based on the kinetic experience, open to arranging it on completely new grounds, to avoid clichés and standard approaches. Soon I had to come to terms with the different type of work required by such an artistic idea. I have discussed in Chapter 4.5 that studio composition is useful but not adequate to solve the majority of the tasks required by the practice since the experience of sonic movement is intimately connected with the place in which it is created and the modalities of listening for its appreciation. I have found an incompatibility between the desire of stimulating

movement perception through sound as a form of expression and the current techniques of spatial audio playback and performance arrangements.

There is an inevitable relationship between the technology and the listener, whose arrangement could be determinant for the creation and performance of sonic movement: in Chapter 4.3 I have linked the perception of motion through sound to the idea of the sound stage (Moylan, 2007: 49-50). My work is centred around the listeners' experience, and therefore I have adapted the performance space, my approach to technology, and ultimately my production of sonic movements accordingly to its perspective. This effort, as well, distinguishes my practice.

6.1 The collaborative and cross-disciplinary approach

In Chapter 1, I have described how the cross-disciplinary approach has been influential in determining the performance type and space, and essential for solving the perceptual issues related to the perception of movement of sound. Collaborating across disciplines has been an occasion to get in contact with other experiences and artistic visions directly, ultimately enriching and expanding my practice into new contexts and experimentations. This opportunity has deeply informed my theoretical and artistic enquiry.

The idea of creating a dance performance as *Stranded*, using sound as a physical and spatial partner to the bodies of the dancers, brought me and Jalianne to re-invent either our collaborative methods, as well as the personal approaches respectively to sound and choreography design. The reason I have chosen an interactive participatory form of theatre for *I Hear You See Me* was for its original take on the listener, the ability to generate an entirely personal experience: it brought new developments in the approach to sonic movement, by using proprioception and participation designing from scratch the experience and the performance space.

I have discussed in Chapter 2.2 the role of multimodal inputs for the enhancement of sonic motion perception, and described in Chapter 4.8 and 5.9 how simultaneous and synchronised visual and auditory events produce complex interaction, that leads to the appreciation of movement.

Through the collaborative and interdisciplinary form of my practice, I have adopted an intra-sensory strategy (as explained in Chapter 1.5). Utilising different disciplines helped me to create a complex world of stimuli to make certain sonic movement could be realised effectively. The bodies led by dance choreography, the projected

images, figures and shapes of motion graphics, the self-motion led by *autoteatro* instructions-, all created a space for artistic invention, making interesting ideas emerge and new experimental interactions between the disciplines involved.

The idea of using dance as a visual counterpart to sonic movement, came after preliminary tests, when I could individuate a remarkable difference in listening to a sonic movement alone or instead listening to it with the visual accompaniment of a moving object, light, or body. The excessive strain of focussing on sonic movements solely through acoustic cues, caused by the perceptual issues and the overloading of the auditory scene, was effectively relieved by the visual input addition and synchronisation. With the visuals, the immediate resonance of one perceived movement into the other's similarity of direction, speed and shape, helped their respective definitions. The different kinetic perceptions (in particular auditory, visual, and proprioceptive) when experienced together delivered different simultaneous emotions to a viewer-listener, independently and as well as a product of their interaction.

With this interdisciplinary approach, I have realised two very different experiences of sonic movement, employing different methods, technological and collaborative. In *Stranded* (Chapter 4), by engaging body and sound in relationships of reaction, attraction, of spatial location and velocity synchronisation, I have explored how the perceived presence of both visual and aural kinesis in the space could give a sense of physical interaction: in the *bird-sound's* scene (Scene 2, described in Chapter 4.6.2, and discussed in Chapter 4.8.4), the dancers were following sounds fast crossing the room and reacting to them; with *sound-lights* (Scene 1, Chapter 4.6.1, and 4.8.2), the dancers were attracted to certain locations by the presence of sound; the *crowd-sounds* (Scene 1, Chapter 4.6.1, 4.8.3) were 'swiping away' the dancers, resetting and restarting their gestures in another location. By placing independently on the scene both the experiences, I have also managed to create a semantic transmission between them, of resonance of some of their elements, in their respective gestures: in the *monster and the snake* (Scene 3, Chapter 4.6.3, and 4.8.6) session, the movement pattern of the sound and its texture had inspired the form of the bodies' figure the dancers were creating and its movement. The trajectory in space of the sound was not triggering the movements of the bodies' group, yet the sonic movement was inspiring the characteristic of the figure and vice versa.

In *IHUCM* (Chapter 5), I have made further development to the kinetic experimentation, with the addition of vocal instructions, a story line, and of proprioception, through self-movement and interaction. The synchronicity of

visual and sounds helped to form the main kinetic idea to envision the different scenes of the story. The sonic movement, the sound, and the projected moving image mostly have been designed to work in synchronicity to represent a common image. The whirlpool's water sounded as water, and both the waters' image and the sonic movement were moving in a circle (Scene 2, Chapter 5.2.2); the bird was visually flying around as its sonic movement. Differently than with body, several similarities between sound and light facilitated the immersion of the participant into the kinetic ideas, and offered a new relationship of visuals and auditory cues to develop. The text also contributed adding adjectives, images and metaphorical representations functional to the movement appreciation, to the final perception. In the wall scene for example (Scene 3, Chapter 5.2.3), the listener is thinking about the wall even before hearing the sounds and seeing its images: Role A experiences the wall first as an idea suggested by the story, then through sound, and only after becoming Role B, as a visual and sonic movement experience.

At a closer look, though, *IHUCM* offers experiences that, although pointing to the same concept, image, or sensation, they express it differently. Separate instances of sound, sonic movement, motion graphic, or text present similitudes that develop then independently. In Scene 2 (Chapter 5.2.2) for example, the sonic movement accompanying the bird's image, moves in circle as the bird's image projected on the floor, yet, after the image is gone from the scene, the same sound reappears in again circular trajectories, multiplying and getting more frantic, not to represent a bird's flight anymore, but to sustain the circling of the waters' whirlpools.

Multimodality is further explored with proprioception, stimulated by the interaction of the theatrical strategy of *autoteatro* and sonic movement. I have made the participants experience with their gestures and from multiple physical positions and perspectives the visual and auditory kinetic interactions of the story, adding further levels of interaction to the show.

6.2 Sonic movement and spatial sound practice

My background is music composition, in particular researching the relationship between acoustic instruments, performance, and technology. I have moved then into the context of spatial audio, focussing on loudspeakers systems as my main instruments. In Chapter 2 I have overviewed how the new methods, effects and materials were enriching my work, including the many sources I have gathered inspiration from. It was established quite soon that my new practice was not just about applying spatial geometries or physics to sound, but represented a specific path within sonic arts that, starting from sound composition, would have taken a more independent form

and structure, still embedded into sonic culture and sound making practice, but with profound aesthetic changes.

To elaborate a kinetic discourse through sound, I have considered the mechanism and processes of the sensation of sound. The impression that sound forms in our psyche, the ever-changing reaction of the human apparatus to the variations of surrounding acoustic pressure, could never be formed by but all of its attributes. Sound (generally) does not manifest without a spatial attribute. My sound design consisted of putting emphasis on the spatial attributes through the manipulation of the sonic materials, working on their relationship, establishing links, similarities, and contrasts. For applying this emphasis, my approach has been very practical, empirical, in the performance space. I have focussed on the listening experience, designed new performance spaces, and ultimately looked into other kinetic arts examples to find a comparison and relation with my strategies, methods and outcomes.

6.3 Stravinsky's artisan idea

This research introduces a different and novel focus in the practice of spatial sound. Sonic movement has to be experienced in the space, to evaluate from close the real conditions, orientation, and modalities of the listening experience. The studio work is considered not anymore sufficient to allow the composer to be fully aware of all the aspects of a sonic movement composition (Chapter 3.6). The collaborative practices I have initiated highly contributed to this issue to come out, because of the direct development carried out in the performance space, and because of the rethinking of methods of work and sound production they caused.

I had to physically be in and perform in the dance space, to be able to understand how my kinetic effects were perceived and then possibly utilised for inspiring or combining with dancers' body gestures. I had to be situated in the ambisonic cubic rig immersed into darkness and light projections to verify the level of impressions that each particular visual and sonic effect was producing, in relation to the script, the story's emotional flow, and the participatory evolutions, and to invent new ones afterwards. In return, the experience of dance and theatre taught me further perspectives and approaches, which I have integrated into sonic movement composition, like the use of the listener's body presence in *IHUCM* as an intra-sensory stimulation tool, and of carefully evaluating the kinetic gesture in the space as learned from working with dance in *Stranded*.

As elaborated in Chapter 2.3.1 and 2.3.2, there is a physical idea of kinesis, which, as exemplified by dance, indicates the type of artistry required for movement to become alive, the care it needs to be constructed with,

slowly moulded in all its aspects before acquiring sufficient consistency to be communicated effectively. Both Stravinsky (Stravinsky, 2003: 50-51) and Duchamp mentioned this idea of art, of *techne*, in the original greek meaning of craftsmanship:

the word 'art' interests me very much. If it comes from Sanskrit, as I've heard, it signifies 'making'.

(Marcel Duchamp in: Cabanne, 1979: loc. 107)

Through the repetition or combination of their basic motions, gestures of different sources can produce kinetic sensation out of their encounter. These are higher level mechanisms, slow to build, on a trial and error basis. As Merce Cunningham once said:

with technology you could be one moment here, and the next moment up there very easily. With body you have to find a way to get up there!.

(Merce Cunningham, in: Sontag, 1986)

I have used this quote to refer to how mechanisms of kinesis are complex to realise, especially when the perception of a human being is involved, as, in a dance, a refined sensation is laboriously organised through the gestures of a dancer.

Oskar Fischinger's and Len Lye's work (Chapter 2.1 and 2.3.3), and that of many others kinetic artists, confirmed this mechanism of creation: kinesis is about creating processes, that not exclusively involve velocity (e.g. trajectory shape, speed, direction), and could be realised with different materials, even across disciplines.

Through *autoteatro* involvement, I have developed the semantic link between sound and spatial gesture and explored how other sources of meaning could influence the perception of movement, by creating specific imaginary situations with which the participant is induced to interact and participate with the kinesis produced by the sounds. Proprioception is also stimulated, by associating kinesis of sound and actions (Chapter 2.2.4 and Chapter 5).

This empirical emphasis, on the construction of a world of sonic impressions, will not just confirm that music is, after all, about:

balance and calculation through which the breath of the speculative spirit blows.

(Stravinsky, 2003: 50)

It also highlights that sonic movement cannot be based on the trend of abstraction which is common to certain contexts of sonic arts, in particular, electroacoustic music, and acousmatic music even more: the abstraction of the act of listening from the specifics of the space it is happening within, and from its physical mechanisms. With sonic movement practice, the listening experience in all of its aspects is central to the artistic imagination.

6.4 Listening exclusivity

Another important element of my research is the consideration of hearing as part of a wider complex of sensations that leads to the kinetic emotion. Throughout Chapter 2, I have emphasised multimodality, to reinforce the concept that listening is a human activity in between many others. A 'reduced listening' (Schaeffer, 1966: 93-94) will encounter issues in sonic movement practices, because, if its purpose is to focus on the actual sonic event without being distracted by the idea of its source, it is neglecting a huge part of the human understanding of the sensation of sound. In this sense, I am closer to Schafer's position (Schafer, 1977: loc. 2636), which confines the reduced listening in its laboratory place, as a useful method for in-depth sound analysis, rather than an inclusive, descriptive way of indicating the whole sonic experience.

Working with sonic movement, the perception of sound and movement has many implications with visual, semantic, and physical (proprioceptive) concurrent stimuli, that cannot be confined to the sole hearing process. Therefore the creation of a composition based on sonic movement, and the design of a performance for it to take place need to open up to more dynamic listening practices. I have made few examples in different contexts with *Stranded* and *IHUCM*, or *Axis Mundi* (Appendix II, aa.1), *The Eye* (5.6.1) and *Untitled, Two on a white surface* (3.4.1), but also experimented many other situations, as the project with Noora Baker (Chapter 3.4.2) or *Deuce* (Appendix II, aa.3). More works could have been created, a limit posed only by the imagination.

The reflection in Chapter 3 about the sound stage completes this point. In creating a work based on sonic movement, making and participating are on the same level of importance (for example, Chapter 3.5, and 3.6), as in Small's concept of musicking (Small, 1998), and for Blacking's reflections (Blacking, 1987). The concept of

sound stage linked these cultural perspectives with the psychoacoustic reality of perception and the acoustic realisation through loudspeakers sound systems. I have developed from there an idea of performance, that considered the experience of the individual as a whole, not designed for one sense exclusively, but through realising and controlling dynamically a multimodal sensitivity.

6.5 The kinetic effect

Finally, the last aspect of my practice is how it relates to the general context of kinetic art, and that could be understood by reviewing the type of kinetic effects I have employed. I have firstly worked on producing efficient and reliable dynamic effects: they are at the core of *Stranded* and *IHUCM*, although expressed in different forms: from the static *sounds-lights* in *Stranded*, to the circular motion of waters in *IHUCM*. Successively, I have used them as the foundation for the construction of many kinetic patterns to display in relation to dance, video and participants movements, aiming to build a higher level of kinetic structure: a sort of sonic choreography in *Stranded*, a kinetic storytelling of images and events flowing and morphing one into the other in *IHUCM*.

How can sonic movement express grace or fear? How can a kinetic sensation transmit a sense of strength, power, and as well perhaps the lightest and closest distance perception, almost touching the experimenter?

These emotions are down to the dynamics that constitute the movement experience. *Stranded* and *IHUCM* present two different types. *Stranded* is about looking over multiple simultaneous perspectives, of dancing bodies and sonic movement, *IHUCM* is about multiplying the personal perspective. In *Stranded* the audience sits and looks over a space where gestures by dancers and sonic movements are felt independently and in a relation of interaction or simultaneity. In *IHUCM* the participant navigates into a world consisting of perceptual apparitions in the shape of kinetic impressions, made of visual, acoustic or proprioceptive cues.

The reason why each project produces different dynamics is because the technologies used offered a more subjective perspective on the sounds and sonic movements with ambisonic in *IHUCM*, and one more objective through the wave field synthesis in *Stranded* respectively. It is also down to the different disciplines involved as partners, dance and participatory theatre. They naturally imply two very different audience's perspectives, since participatory theatre of *IHUCM* introduces direct first person participation of the audience as compared to the fixed listening points, although oriented differently in the space, as used in *Stranded*.

Some of the categories defined by Frank Popper in his compendium on kinetic art (Popper, 1968) comprehend several aspects of my practice. Popper states that the term 'kinetic art', as used in his study:

covers all two or three dimensional worlds in actual movement, including machines, mobile projections, whether controlled or uncontrolled: it also covers works in virtual movement, that is to say, in which the spectator's eye responds quite clearly to the physical stimuli. [...] Finally [...] those works which require active participation by the spectator, either through his own movements or by virtue of the part which he plays in composing or recomposing the elements of the work. [...] The fact that the term 'kinetic art' can be applied to this wide range of works, must not be taken to imply that the aesthetic experience of movement is identical in all cases. In fact, this experience seems to vary in direct relationship to the existence of three basic groups: those which are stable but stimulate physiological reactions in the spectator, those which challenge the spectator to physical action, and finally those which are themselves in movement.

(Popper, 1968: 96)

Following Popper, sonic movement could be considered into the kinetic art context, for it is a physiological reaction to a stimulus. It also challenges the spectator into a physical action, as in *IHUCM*, when catching the bird's shadow in Role B, and in *Stranded* in the reactions of the dancers to the passing by or bursting of the sounds. It is finally also movement in itself, when it circles around Role A in *IHUCM*, drawn around the lying participant, or when passing through the audience in *Stranded*.

If I take the case of the idea of virtual movement in kinetic art, an interesting aspect comes to attention, that sonic movement could be thought of having similarities with. In his description of virtual movement, Popper specifies a:

work whose motion or tempo only becomes appreciable after an effort of concentration [...] [and] only realises its aesthetic value when the spectator has responded in accordance with [the artist's] [...] intention.

(Popper, 1968: 93, 251)

Popper uses the virtual term movement to describe those works such as Victor Vasarely's *IX* (1966) or *Tau-Ceti* (1964), or Cruz-Diez's *Psychromie no. 260* (1966), which only through the eye and in the mind of the spectator

appear as kinetic, "half-way ground between the mobile and the static" (*ibid.*: 93).

Optical effects, relief, and volumes were used by artists to create kinesis from otherwise static works. Works like *Double métamorphose* (1964) by Yaacov Agam "only reveal their structures when the spectator moves in front of them" (*ibid.*: 95). As Agam himself states:

nothing is fixed in nature nor in the cosmos, and the painting that attempts to attain the truth through congealed/fixed representations falls far short of touching this truth of nature. Everything in nature/reality/creation can be transformed with endless variety, while preserving a particular definite character.

(Popper, 1968: 110)

The experience of movement through sound is complex. It encompasses many of the elements that just by themselves could become material for kinetic development. For example, rhythm contains elements that could suggest motion or, in general, the temporality of sound is already an indication of movement. If I focus on the perceived movement in the space of a source, it is produced as a psychoacoustic effect by our binaural auditory system (Blauert, 1997), with also psychological implications (Deutsch, 1999, Bregman, 1994). At the same time, though, it is also an effective and stable perception, appearing in an area of the space (e.g. like the phantom source appearing in a two channel stereo configuration, when and if the listener positions correctly in between the two loudspeakers).

On the other hand, sonic movement perception, for some of its characteristics depends inevitably on the presence of the listeners, since their orientation towards the movement and quality of perception affect the resultant appreciation of the kinesis. This makes it similar to virtual movement since a certain perspective of the listener would change the perceived emotion. I have tried this effect specifically in *IHUCM* by changing the listening position of the participant (Chapter 5.9.3), or by using double roles (Chapter 5.9.5).

Real movement, instead, is found, as Popper states, in works whose:

movement takes place in space, as opposed to those which utilise the effects of moving light on a plane surface. The very fact that these works involve real modifications in space sets them apart from those which merely indicate the presence of space in a symbolic or illusionistic way.

(Popper, 1968: 128)

Sonic movement, as I have presented it, fits ambiguously into this categorisation too. The objectification at the base of sound perception again dictates its ambivalence, exemplified by the conceptual difference between 'the bell sounds' or 'the sound bells' (Blauert, 1997: 2). It generates indeed the sensation of being located in a particular physical space, to which the dancers are attracted, or the gestural impression of physically affecting the movement of the dancers, as from Elena's and Alicia's comments mentioned in Chapter 4.7; it creates the physical impression of being surrounded by a wall, or immersed in a water whirlpool in *IHUCM*. It is subjective though, a perceptual, personal experience: its presence is dependent on the perception of the receiver and by a combination of contemporaneous stimuli, technological arrangement and listening orientation.

Whether my practice sits in between the real or virtual category of movement or in just one of the two, it is thus difficult to determine, yet I could say my purpose has been to build distinct dynamic nuances and sensations which could convey emotions, with whichever method they could be realised. Lye, through his work, showed whichever methods he used or media (e.g. film or sculpture, real or virtual), his focus has always been to create art of "motion per se" (Horrocks, 2013: loc. 1513). I shared this desire and interest, and at the core of my research, in whichever form it takes, is motion per se, realised through sound.

6.6 Sonic Choreosophia

I have been trying to observe the experience of movement through sound, studying two specific cases of spatial audio technologies and engaging with different other artistic disciplines, such as dance, theatre and multimedia. I have referenced in my title Laban's idea of 'choreosophia' since:

movement is one of man's languages and as such it must be consciously mastered. We must try to find its real structure and the chronological order within it through which movement becomes penetrable, meaningful and understandable.

(Laban, 1996: viii)

The differences between sound and body in the transmission of movement, implies the term remain just a suggestion.

'Choreosophia'- an ancient Greek word, from *choros*, meaning circle, and *sophia*, meaning knowledge or wisdom- [...] concern[s] the wisdom to be found through the study of all the phenomena of circles existing in nature and in life. [...] Choreosophy seems to have been a complex discipline in the time of the highest Hellenic culture. Branches of the knowledge of the circles came into being and were named 'choreography', 'choreology', and 'choreutics'. The first, choreography, means literally the designing or writing of circles. [...] The two other subjects of the knowledge of circles, choreology and choreutics, are not as well known as the first. Choreology is the logic or science of circles, which could be understood as a purely geometrical study, [...] a kind of grammar and syntax of the language of movement, dealing not only with the outer form of movement but also with its mental and emotional content. [...] The third subject, choreutics, may be explained as the practical study of the various forms of (more or less) harmonised movement.

(Laban, 1966: vii-viii)

The idea of a *Sonic Choreosophia* expresses my desire to expand spatial audio composition and sonic movement design to include all the aspects involving sound perception. It can't be satisfying considering a geometrical design or a phenomenological point of view solely, without taking into account the physical experience that a spatial sound perception entails. This experience can neither be examined without being related to the technological and performance issues, identified with the type of loudspeakers, and seating and listening arrangements, as these relate to the most delicate aspects of listeners' attention, participation, and activity.

6.7 Future Work

Following on from the observations I have made from the above study, I would continue exploring sonic movement in other projects. I would firstly like to create another work on body movement and sonic movement, expanding the idea of a joint choreography with the use of height, in a larger and more configurable audience space, with technology suitable for realising it. This would allow me to consider dynamic relations, directions, velocities of body and sound in a true three-dimensional sound field, and also to practice with different audience arrangements, on a larger scale.

I would also be interested in continuing to explore the audience's subjective experience. I am interested in the transposition of the subjective sound stage in binaural rendition with what is seen outside of it, as in Noora

Baker's project (Chapter 3.4.2), or *Wondermart* (Appendix II, aa.2) and *The Eye* (Chapter 5.6.1). I would look into developing other novel listening arrangements and audience's perspectives on sonic movement in connection with a simultaneous visual, kinetic experience.

Relatively to the *autoteatro* experience, I am interested in developing its potential in creating multiple simultaneous perspectives and using it to realise simultaneous sound stages (possibly delivered binaurally), all concurrently related to the same performance but from different angles, which would allow me to work on investigating the relativity of perspective of sound perception and of spatial attributes.

In general, I will be focussing on promoting the exclusivity and uniqueness of sonic movement performances (for loudspeaker sound playback systems) and by doing so reject processes of cultural and artistic standardisation. I will investigate original and creative methods for including multimodality into the sonic experience, two examples of which this current research has hopefully evidenced.

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Appendix I

Documentation materials on storage drive and interviews information

Description of contents

All these works falls within the PhD Period, except where indicated (a.2.4.2, a.2.4.3)

a.1 *Stranded*

a.1.1 *Stranded*: Dress rehearsal, Den Haag (31 August 2013).

Fixed audience perspective video with binaural audio recording. To listen to please use in-ear headphones.

Dancers: Elena Cocci, Eva Chambers, Cornelia Voglmayr. Filmed by Tommaso Perego.

a.1.2 *Stranded*: Performance, Den Haag (31 August 2013).

Fixed audience perspective video with binaural audio recording. To listen to please use in-ear headphones. This video shows a different perspective to the performance shown in a.1.1

Dancers: Elena Cocci, Eva Chambers, Cornelia Voglmayr. Filmed by Mona Kriegler.

a.1.3 *Stranded*: Dress rehearsal, London (25 November 2015)

Fixed audience perspective video with binaural audio recording. To listen to please use in ear headphones.

Dancers: Elena Cocci, Martina Tavella, Ina Colizza.

a.1.4 *Stranded*: extract from Den Haag's performance (2013)

Fish eye camera placed at a corner of the loudspeakers system, audio taken from the camera's perspective).

Dancers: Elena Cocci, Eva Chambers, Cornelia Voglmayr. Film by Arthur Sauer.

a.1.5 *Stranded*: extract from London's performance (2014): camera placed outside the perimeter.

Dancers: Elena Cocci, Martina Tavella, Ina Colizza. Film by Tommaso Perego.

a.1.6 Preparatory works

a.1.6.1 Nadine's video footage and sonic movement in binaural. Please wear headphones to listen to. Film and montage by Tommaso Perego.

a.1.6.2 *Untitled, Two on a White Surface*, with Alice Bariselli

Fixed camera behind the audience, audio from the camera. Dancers: Alice Bariselli and Marttaleena Luukkonen. Light by Andy Hammond. Video editing by Lasse Nikkari

a.1.6.3 Noora Baker's experiment: subjective camera and binaural audio

Footage taken by Tommaso Perego.

a.1.6.4 *In the beginning*, with Jalianne Li

Dancers: Amara McPhail, Anni Kulvik, Ayaka Furukawa, Bolam Lee, Eva Chambers, Justyna Sochaj, Panayiotis Tofi, Vanessa Trotter. Light Mikkel Svak.

a.2. *I Hear You See Me*

a.2.1 Two channels split screen video evaluation Role A.

This material shows an assembly of footage taken from different performances (left) accompanied on the split screen (right) by the footage of the projected motion graphics. In this material only the audio of Role A is played, in binaural rendition. Please wear your headphones.

a.2.2 Two channels split screen video evaluation Role A.

This material shows an assembly of footage taken from different performances (left) accompanied on the split screen (right) by the footage of the projected motion graphics. In this material the audio of Role B is played, in binaural rendition, simulating what Role B might hear. I have also added, more quietly, the audio for Role A, as it comes from loudspeakers in binaural rendition. This is done to simulate as close as possible the acoustic impression of the live performance as Role B. Please wear your headphones.

a.2.3 Preparatory work

a.2.3.1 *The Eye*: to run the show, please sit in front of a mirror and wear headphones, then start

the track

a.3 Relevant work falling outside the PhD period

a.3.1 *Axis Mundi* (**please note: this work falls outside the PhD period**)

Please unzip the compressed folder and open with VLC video playback software. 5.1 or binaural output (preferred) is provided.

a.3.2 *Wondermart* (**please note: this work falls outside the PhD period**)

To run the show, just play the track from a portable player and enter a supermarket. Please read more detailed instructions attached.

a.4 Technical schemata of the works

a.5 Additional documentation material

Note about interviews:

The interviews with Bascou, Snoei, Wright have been via Skype and approximately 1.30 hrs long each. With Northcott it has been an interview via email exchange and informal chat in person when I visited New Zealand in 2011.

Other sources of important technical feedback are for example many informal chats with Casper Schipper, the technician of The Game of Life Wave Field System, occurred several times during our several collaborations and meetings.

Appendix II

Description of works that fall outside the PhD Period

aa.1 *Axis mundi* (2009)

Axis Mundi is a 5'20" minutes soundtrack to a film composed for a commission by Sound and Music (formerly s.p.n.m.) of London, in collaboration with anthropologist Nora Razian. It has been performed at King's Place as part of a series of events dedicated to new music. Sounds were played back from a cubic rig of loudspeakers at the corners of the hall surrounding the audience, who would watch the movie displayed on a large screen fit on one of the walls. This work explores the connection between sonic movement and visuals with an abstract narrative. It is focussed on King's Cross function as a centre of arrival, meeting, and departure of people.

"While heavy with historical meaning and thick with personal and collective memories, the area of Kings Cross has now morphed into a passage space, elevated beyond locality, yet always rooted in site-specific significance and symbolism. This space, emanating from the stations of Kings Cross and St. Pancras, is produced as a site of transition and transmission, where the local/global and centre/periphery collapse onto one another" (Razian, 2009).

Our common idea was to consider King's Cross as a portal, and we jointly decided to recreate this sensation by using ambisonic technology and sonic movement in parallel with a specific film editing technique of layering images one into the other.

"Based on the area's historic and symbolic significance as a crossroads and a place imbued with royal connotations, and inspired by its contemporary rebirth as a liminal space, we are treating Kings Cross as a portal, in the symbolic and spiritually accented sense of the word.

Ours is an exploration of the exchanges and transformations that occur at the intersection point, with an aim to invoke the experience of a 'portal'; that is the cross-culturally mystical experience of moving from one reality to another via a tunnel, door, aperture, or hole. As people pass through the portal of Kings Cross, they interact, exchange, and change themselves and their environment.

[...] The visual simulation of this experience will be paralleled and enhanced by the use of ambisonic technology to create a 3D soundscape, stimulating in the viewer the illusion of direction, speed, location in space, and physical volume. The use of 3D soundscapes will transform the space around the projection into a dynamic experience, guiding the viewer through[...] and serving to induce the [idea] of a portal" (ibid.).

Sonic movements were just juxtaposed to the images, as a symbolic reference, and were addressing the experience of a portal opening and closing, by stimulating extra sensations through apposite perceived trajectories, following the imageries of the film. The main movements I have used were parallel trajectories from the centre of the projection outwards and inwards, made of sounds of different pitch and texture. The repetition of these movements helped me create a sort of hypnotic rhythm synchronised with the various scenes' crossfades. Relevantly to *IHUCM*, the experience was that of a large space installation, far greater than Bonnie Bird Theatre's stage, as used in the work for Alice Bariselli (Chapter 3.4.2). The images and the sonic movements were just happening simultaneously and in the same space, and hinted to a magnetic (Chion, 1994) but ambiguous connection with the visuals. Similarly to what would be used in *IHUCM*, multiple potential perceptions were generated at the same time, shared between the film and the perceived motion of the sounds, although subjective and not enforced, an attempt to purposely create ambiguity, for opening up to other several connections and meanings.

aa.2 Wondermart (2009-2010)

Differently than *Axis Mundi*, *Wondermart*, created in collaboration with director Silvia Mercuriali and artist Matt Rudkin, is a direct approach to the individual listener. It connects the audio to the actual physical experience, location and movements of the participants. As an interactive audio tour, it takes the listener on a journey of rediscovery through the surroundings of a supermarket. Wearing headphones, the listener is guided anonymously around the aisles, immersed in a private soundscape. The work is synchronised between two participants or can be experienced alone, and requires to be performed in a large supermarket, of at least ten aisles. It is a show based on *autoteatro* (previously mentioned in chapter 1.4.3 and 5.3) and the audio is a mix of precise instructions alternated with sound design, music, and fragments of soundscapes (e.g. the noises of fridges in the supermarket which morph into the sounds of steps in the snow, blown away by the wind of the Arctic pole). The soundtrack is synchronised, accordingly to the instructions, with the locations reached each time in the supermarket, and with the actions and interactions of the participants.

I have used auditory spatial cues to enhance and transform the perception of the listener when strolling around the different supermarket's areas. I wanted to interfere with the exchange of visual information and listener's expectation by transforming the sounds, 'augmenting' them, masking the real ones, already filtered by the headphones, with artificial sounds. Placing the listener in front of a dairy milk fridge and projecting all round through headphones the sound of a countryside, with a farmer voice emerging to explain the process of milking a cow, was the perceptual-illusory method used for generating confusion and engaging the imaginary. At the same time, the users were experiencing the normal act of picking up the milk, through the imaginative transposition provoked by the sounds they were transported in an entirely different place. The spatial cues were used as a refinement of this process of confusion and disorientation realised through sound. Part of the show is also the desire of creating a reflection on the act of picking products and buying, providing an opportunity to reflect on the function of the space (or non-space, Augé, 1995), and on human behaviours and activities.

Compared to *Axis Mundi* the visuals in *Wondermart* are substituted with real life observations, although under the auditory illusion of being somewhere else. The sounds were not completely abstract but derived from the real experience of a supermarket and many simple life situations (e.g. the farm sounds or walking on the snow), and very rarely kinetic effects were used. I have used them just as extra effects, to underline certain actions or situations with the aim of confusing or influencing the listener's impressions, rather than leading the sound's organisation. Instead, the focus was on simulating the illusion of changing the real environment by augmentation, by inserting elements extraneous to a normally expected perception of reality.

The experience of *Wondermart* led me to study a different type of participation of the listener. I have attempted to create an interchange and synchronisation between the emotions emerging from the exploratory physical activity and those suggested by the sonic content, which in *IHUCM*, I have developed further, into sonic movement.

aa.3 Research and development with Bradburn and Maclean (2009-2011)

The first approach to dance with sonic movement was the initial plan for a show named *Deuce* devised with Lexi Bradburn in 2009. It only consisted of some rehearsals in Okan Gonultas' *Apartment 42* (a club venue well known in East London between 2005 and 2011, Gonultas, 2011). We worked on the idea of using sonic movement to generate the impression of bouncing of sounds from one side of the stage to the other, as if in a ping-pong game, and working with dancers to interact with it. We tried to create associations between dancers in a line swinging

from one side to the other of the room, with the sounds set on identical sonic movements, and also we experimented with associating specific sonic movements to each dancer. For several reasons the rehearsals didn't progress into something more articulate and nothing else followed through. *Deuce* survives in the form of a submission proposal for the FIRSTS scheme at ROH2 in 2009, a supporting activity founded by the Royal Opera House for emerging artists, to rehearse and create a show to be performed at their Linbury Studio. Although the proposal was unsuccessful, rehearsing to prepare it gave me a very early but significant access to the complexity of the work with dancers and sonic movement, included finding a suitable space and technology for the practice.

With Nadine Maclean, early in 2010, I have made attempts and approaches at understanding the relationship between body movements and perceived sound. We did work using spatial sound and sonic movement but, in particular, we focussed intensively for several months on the relationship between dance gestures and sound in the design of a performance, practising with methods of creative generation of ideas, studying the reciprocal influences between body and sound. The only work that we brought to completion was for a presentation at a workshop in Hackney with the help of dancer Bianca Hopkins, before the start of my PhD in October 2010.

For the Graduate Festival at Goldsmiths University of London in 2011, I have prepared some videos using footage from those research sessions, with Nadine performing few gestures, which I have synchronised with a post-produced 3d sound. The videos showed the direction of the body on the screen aligned and counterposed with the virtual sources positioning perceived binaurally. A melody performed on a digital piano was rendered close or far away to the listener point of view and moved right to left and from depth and height of the screen accordingly to the position of the dancer. The listener could experience the effect by watching the screen and through binaural audio rendition. Despite being a simple demonstration and attempt, it carried substantial elements of my later research: the connection between visual and auditory cues, the particular use of technology in relation to listener's perspective (the two-dimensional screen experience and the headphone simulated three-dimensional space), the type of sound and type of movements, and type of kinetic experience.

Appendix III

Technical Schemata

aaa.1. *I Hear You See Me* installation plan at International Computer Music Conference 2016, Utrecht, NL

Workshop area floor 8

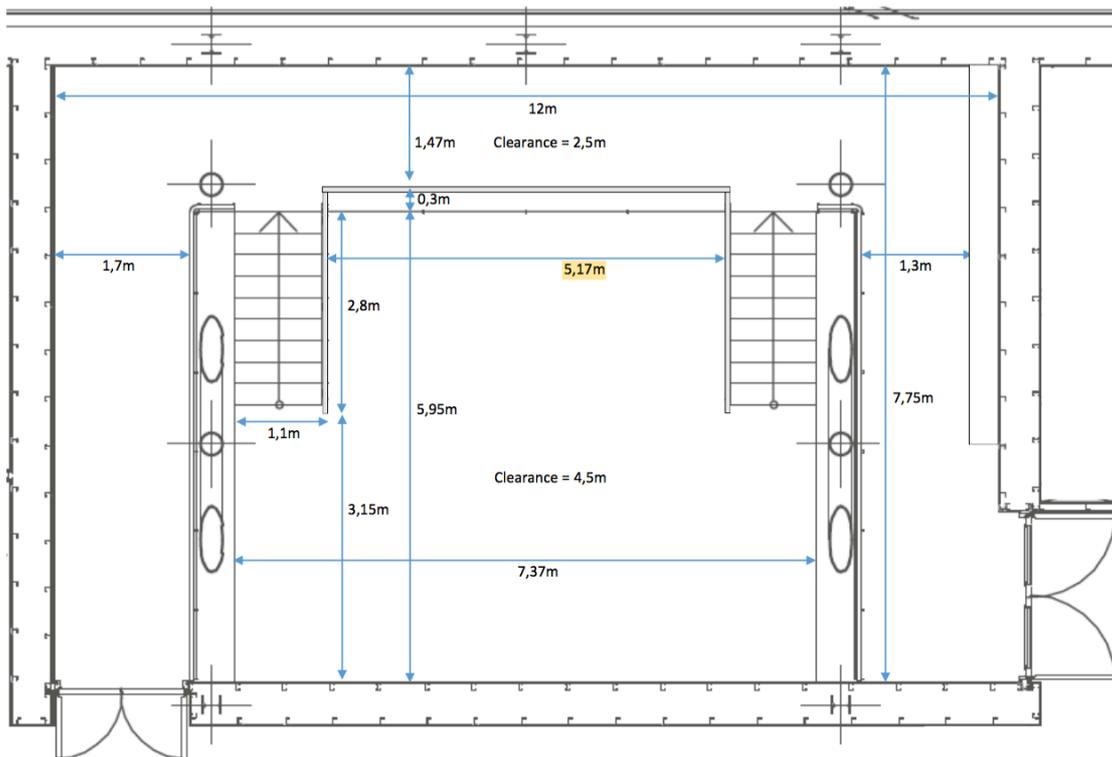


Figure aaa.1-1 The empty space planimetry of The Pit at Tivoli, Utrecht, for IHUCM installation

Workshop area floor 8

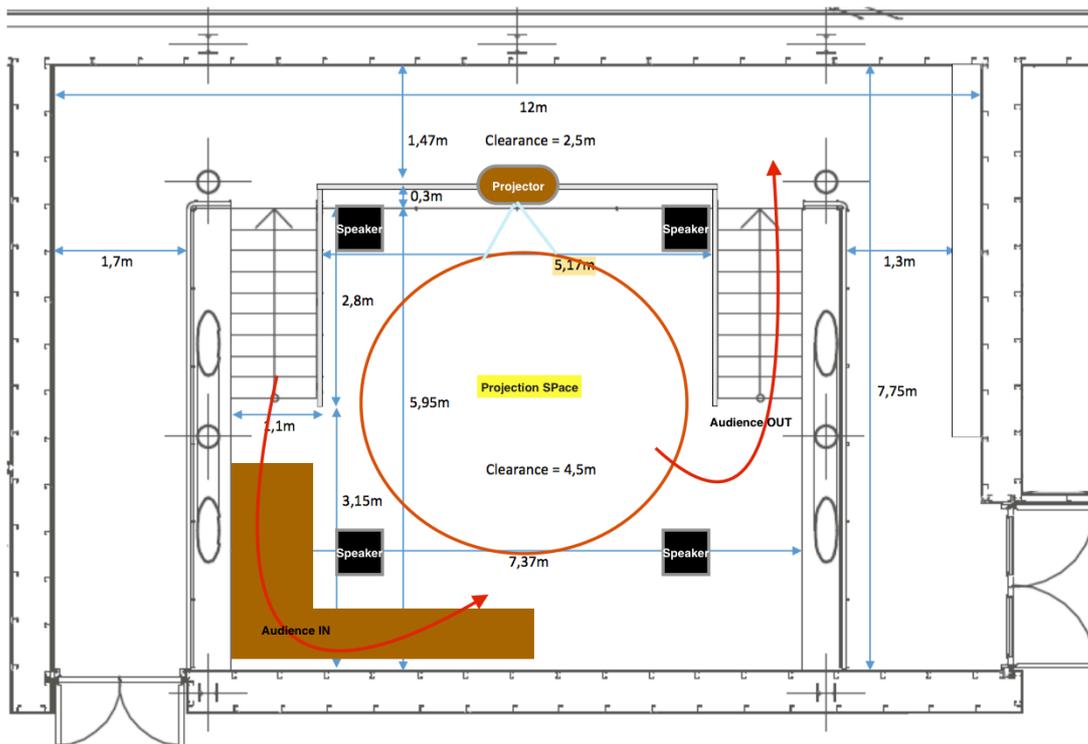


Figure aaa.1-2 The Pit with IHUCM schemata. The loudspeakers area is arranged in a cube fashion, in the diagram only the bottom four loudspeakers are indicated.



Figure aaa.1-3 Installing *IHUCM* in The Pit space, at Tivoli, Utrecht, ICMC 2016



Figure aaa.1-4 *IHUCM* performance in The Pit space, at Tivoli, Utrecht, ICMC 2016



Figure aaa.1-5 *IHUCM* cube seen from outside, at the Dome, Brighton, December 2014

aaa.2. *Stranded* loudspeaker plan at International Symposium on Sound and Movement practices, Laban Studio, November 2014, London

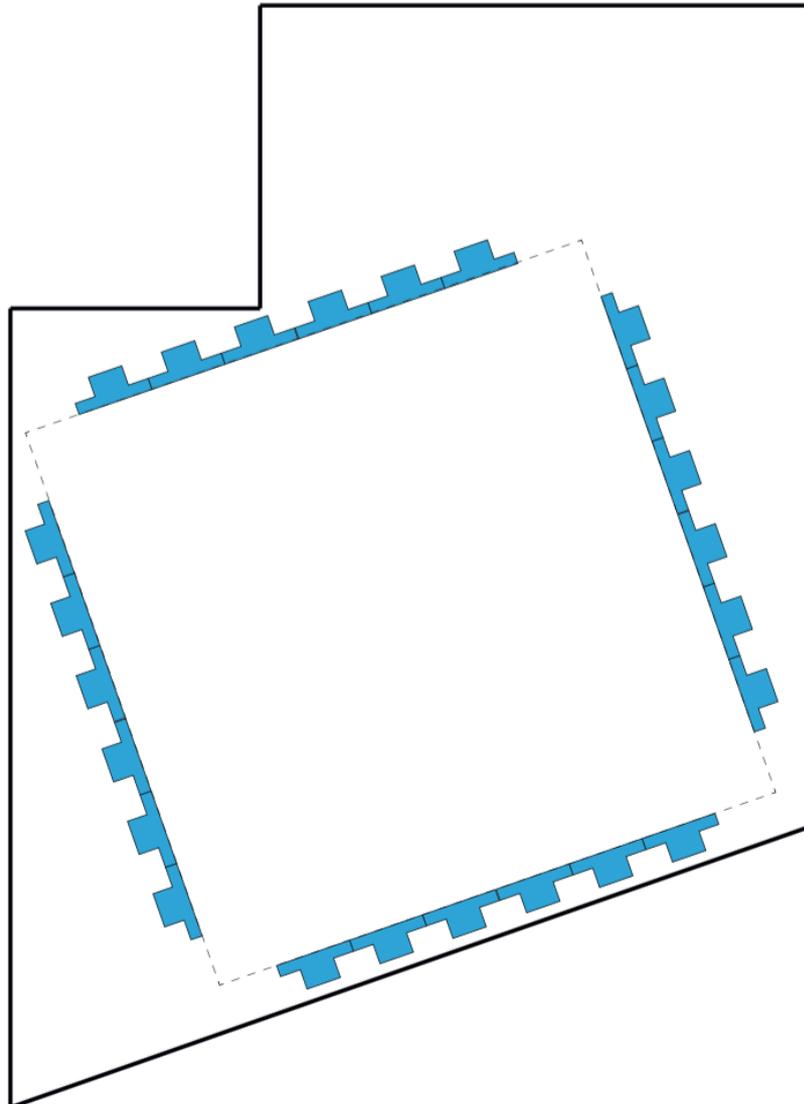


Figure aaa.2-1 The plan for fitting *The Game of Life System* in Laban Studio 1, by Wouter Snoei. Within the blue area, the seating plan has been arranged and the performance has taken place.



Figure aaa.2-2 View from the top of *Stranded* performance space with seating plans allocation marked with the white tape. This space has been used for the first performance at ANNA building in Den Haag, 31st August 2013.