Sound Labyrinth:
Exploring the Embodied Sublime Through an Immersive Audio/Visual Installation

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Abstract

SoundLabyrinth is an immersive audio/visual installation exploring the relationship between sound and the body. Set within a 6.5m diameter geodesic dome, *SoundLabyrinth* invites the participant to explore distant lands, lost memories and inner worlds through sound and motion.

Through the use of both representational and abstract audio, immersive sound spatialisaiton, multi-channel video, and the incorporation of gesture-based interaction abstraction, *SoundLabyrinth* applies theories of gesture within electro-acoustic compostion, and theories of movement analysis and embodied music cognition, to the examination of the boundaries between virtuality and embodiment, transcendance and immanence, as an exploration of the "sublime within the everyday".

Within the context of the *SoundLabyrinth* project, an aesthetics of the sublime for sound art is developed through a review of selected philosophies and practices of sound and music. As a work, *SoundLabyrinth* is analysed in terms of both this aesthetic framework and established frameworks for the analysis of electro-acoustic composition.

Declaration

This is to certify that:

i. the thesis comprises only my original work towards the degree,

ii. due acknowledgement has been made in the text to all other material used,

iii. the thesis is less than 22,000 words in length, exclusive of tables, maps, bibliographies and appendices.

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Mark Pedersen, November 2013

Acknowledgements

To my family, who've helped potential become reality.

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An aesthetics of sublime sound

1.1   Introduction

This work arises from my desire to use sound as an artistic medium for expressing experiences of the sacred, not in an overtly religious sense, but in the sense of the (transcendent) sublime: that which is beyond the senses. The question then arises as to how sound can be used to evoke an awareness of the sublime.

In this chapter, I establish an aesthetic framework for sound art as a medium for exploring the sublime, drawing upon the philosophical perspectives on music and sound art from antiquity until the present. In particular, I draw upon the broader concept of the aesthetics of the sublime developed by Burke, expanded by Kant, and reframed by Lyotard, and connect this with concepts of embodied sound cognition developed by Leman, and various theories of sound and affect as developed by Seth-Cohen, Cox, and Scrimshaw. Concepts of transcendence and immanence, virtuality and actuality, abstract and concrete are also important to the work, and in this regard I draw upon the work of Brian Massumi, Alfred North-Whitehead, and Ian Almond, whose comparison of Derrida and Ibn `Arabi forms an important point of reference for my discussion of the transcendent sublime.

Throughout this review of the literature, I include reflections on pertinent examples of music and sound art that have informed my understanding of the concept of sacred sound. In this way, I seek to establish the context for my work, in terms of the literature of the aesthetics of sound and historical practice. Although there are sculptural and visual aspects to *SoundLabyrinth* as an installation work, I see the work as primarily focused

on sound, drawing upon other mediums as 'supporting players' as it were, and in this regard, I do not include an extensive survey of installation practice, which is frequently more oriented toward the visual.

Having established the conceptual and historical context for the work, Chapter 2 documents *SoundLabyrinth* as the primary artwork through which this research has been conducted. In Chapter 3, I analyse and reflect upon the work as a whole. Chapter 4 provides a consolidated summary, recalling key concepts introduced throughout the text. In between these chapters the reader will find short vignettes - personal reflections on my experience of sound - that I offer as opportunities to pause and reflect along the way.

1.2   Sublime sound: representational vs. abstract audio

1.2.1   The sublime in (sound) art

My objective of seeking to engage the sacred through sound art, specifically in the context of digital sound making, is a response to Walter Benjamin's critique of all art making conducted under the condition of mechanical reproduction (Benjamin 2008). Benjamin speaks of the transition from art being purely valued for its ritual function, often tied to a specific (religious) location, to being valued for its economic function as a globalised, reproducible commodity. In a time when the reproducibility of music has reduced even its economic value, I find it more invigorating to approach sound making from the perspective of a site-specific ritual: the installation.

Benjamin speaks of mechanical reproduction stripping an artwork of its uniqueness, diluting its "aura". Benjamin notes that "the stripping bare of the object, the destruction of the aura, is the mark of a perception whose sense of the sameness of things has grown to the point where even the singular, the unique, is divested of its uniqueness - by means of its reproduction." (Benjamin 1972, p. 62). Speaking of the way in which photography disseminates details of an object, but strips it of context, Benjamin explains that the aura is "a peculiar web of space and time: the unique manifestation of a distance, however near it may be" (Benjamin 1972, p. 61). In other words, the aura of an object does not emerge from the object itself, but from it's unique presence in time and space, including

its provenance, its social trajectory through time.

The reverence accorded to religious artefacts dedicated to some transcendent Other, associated with specific people or places, is indicative of such an aura. To a similar extent, secular art works that are valued for their uniqueness acquire aura: not merely by virtue of being handcrafted, but by virtue of being truly original *instances* within the *generality* of their form, from a specific artist and era, collected by specific people or institutions. Yet every object has a history. It is not just the specific history of an art object which generates aura, even if that history is distinguished. If virtuality, or arguably, transcendence, is a generalisation of the specific (i.e. the generative ground from which the specific arises), Massumi (2002, p. 82) suggests that it is the inclusion of "transcendence become immanent" in an work which lends uniqueness and interest to it. In this regard, I suggest that it is not just a specific provenance which lends aura to an artwork, but the presence of some aspect of the transcendent, or some residue of its generative ground, within the specificity of the work which sets it apart in the first place, and around which the aura of uniqueness accumulates.

Lyotard suggests that there is resonance between Benjamin's concept of the aura, and the aesthetic sublime explored by Kant (Lyotard 1994, p. 67). Although having roots in antiquity, the concept of the sublime as an aesthetic polarity in contrast to beauty was expounded by Edmund Burke (1889), and then expanded by Kant in *A Critique of Judgement* (Kant 2000). Kant's notion is that beauty is connected with the form of the object, having boundaries, while the sublime is to be found in a formless object, typified by boundlessness. Indeed, it is the boundlessness of the sublime that Lyotard argues is the parallel to Benjamin's concept of aura.

Schopenhauer (2010) further developed Kant's concepts of beauty and the sublime, in which the sublime lies beyond the subject's ability to either physically cope with or mentally perceive or even imagine. In grappling with this inability, the subject comes to apprehend the concept of incomprehensibility, and in this way becomes consciously detached from their own will[1].

In considering the concept of sacred sound, in broad terms, the concept of the aura

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[1]In more popular, and more humorous terms, this concept of the sublime emerges in the writing of Douglas Adams as the Infinite Perspective Vortex (Adams 2010).

and the concept of the sublime are useful in moving beyond the immediate association of sacred with religion. While a narrow interpretation of sacred would designate certain objects or acts having a special property emerging from the object, word, song, action itself, like Benjamin's use of the term aura, the broader implication of the term sacred is that it designates objects, places or actions which stand in relation to something beyond direct expression - the sublime. If, after Shopenhauer, we consider the spectrum of aesthetic experience ranging from the sensate to the sublime, where the experience of sensate beauty relies upon perfecting representation, in contrast to the sublime, which is beyond representation, then sacred music or sacred sound is that which is not necessarily beautiful (not focused on the perfection of form), nor that which perfectly represents some externality, nor even that which perfectly represents itself, but that which engages the listener with the paradox of perceiving the un-perceivable, the unrepresentable, and in that way offers detachment from self. Sacred sound, rather than being the concrete signifier of particular beliefs, is the liminal, aural space of Cobussen (2008), within which there is the *potential* to experience the sublime.

Lyotard (1984) critiques Kant's approach to aesthetics in terms of the inability of forms to express the sublime, positing as it does, a kind of nostalgia for what is missing in the form. He argues that modernity's mistake lies in its attempt to "reclaim the real, the pure, the essential, the authentic; or to discover the secret, the answer, the truth, or God" (Kim-Cohen 2009, p. 220). For Lyotard, a more productive aesthetic is one which "searches for new presentations, not in order to enjoy them but in order to impart a stronger sense of the unpresentable"(Lyotard 1984, p. 81).

Kim-Cohen (2009) applies Lyotard's approach to sound art, and in this light reconsiders key moments in the development of sound art by (im)posing Lyotard's question *"Is it happening?"* within the mind of various artists, including Cage as he experienced the sounds of his own body within an anechoic chamber at Harvard University. For Kim-Cohen, the presence of the discursive, questioning voice brings about a shift from essentialist materiality to a more engaged conceptual approach to sound that avoids the neat reduction of the sublime to a category, but allows it to "cascade outward formlessly and infinitely", as befits a concept which exceeds boundaries.

Unlike visual perception, which we can close off at will, our aural relationship to the world, is continuously operating, continuously apprehending the world around us, is continually asking *"Is it happening?"*. This take on sound, and sound art, is what underpins Kim-Cohen's argument that sound art is an ideal vehicle for prompting engagement with the sublime, the never answered question. Kim-Cohen challenges sound art to go beyond a self-referential system obsessed with the materiality of sound-in-itself, and embrace the entanglements of time, society, and the "third space" of relations between potential and reality. In so doing, Kim-Cohen suggests that a more conceptual, non-cochlear sound-art will enable us to hear all that sound has to offer.

Can Lyotard's aesthetics of the sublime support a sound design practice for performative sacred art? The answer to this seems to lie in the tension between concepts of presence and absence. In seeking to supplant modernity's obsession with reclaiming the authentic *real* and treating the sublime in terms of ultimate presence, post-modernism has construed the sublime in terms of absence and the collapse of representation. It would appear that an aesthetics of absence, or perhaps, of unrealised potentiality, would lead only to an emptying of aural space, just as the revolt against representationalism in visual art gave rise to abstraction, and to the conceptualism of the blank canvas..

Indeed, Kim-Cohen explores at some length various accounts of the origins of Cage's "silent" piece, 4'33'. He considers whether, on the one hand, the piece was inspired by Rauschberg's white canvases, as a visual equivalent, drawing attention to whatever visual "noise" may incidentally happen to appear within the frame. On the other hand, 4"33' may be closer to Rauschberg's *Erased de Kooning Drawing*, in as much as it draws attention to the 'non-auditory' elements of performance, just as Rauschberg draws attention to the non-visual, conceptual elements which constitute the art work. In the case of Rauschberg, an erased drawing in and of itself had no particular value - hence erasing a drawing that had some perceived value was very much fundamental to the concept of the work. The knowledge of the significance of de Kooning, and thus the direct reference to him in the title, renders the *Erased de Kooning Drawing* conceptual, in contrast to the white canvases which may still be seen as focused on the perceptual. Kim-Cohen poses the question of whether 4"33' as a piece of sound art, is focused on the sonic material that

enters the frame of the performance, or whether the piece is focused on all of the non-cochlear material that surrounds the performance: the concert context, the score itself, the role of the performer, the role of the audience.

Kim-Cohen argues that much sound art since Cage has remained focused on the materiality of what is in the frame, no matter how large the frame now is, rather than transcending materiality and engaging with the conceptual, with the non-cochlear. In this regard, is it the non-cochlear which brings the sound art into the realm of the sublime? I would argue it is not.

The conceptual turn of visual arts is in many ways still bound up in language - in conceptual thought - and so merely turning the focus of sound art toward the conceptual does not address the sublime. The opposition of presence and absence in terms of representation, or the opposition of materialism and conceptualism, does not reflect Schopenhauer's insight that the sublime not only exceeds the ability of our senses to perceive it, but also exceeds our ability to conceive it. In seeking a framework for sublime sound, we need to look at the sonic spaces beyond language, as Marcel Cobussen suggests in Rethinking Spirituality Through Music:

> If the spiritual, whether or not connected to music, always already escapes any language, any category, any conceptualisation, why then this desperate and beforehand prospectless endeavour to speak and write on the relationship between music and spirituality? Spirituality and music meet each other in a space which is inaccessible for language. Both belong to a pre-thematic and an-archic space which is not already (or not yet) pre-dictated, pre-determined, pre-scribed, and thereby foreclosed by language and the various institutionalised relations that organise its meanings. (Cobussen 2008, p. 67)

Cobussen does not despair of the use of language, for it is "only through language, only through categorical frameworks will we ever be able to catch a glimpse of this realm outside or beyond language" (Cobussen 2008, p. 67). On that basis I continue with this exposition, holding in tension notions of presence, absence, transcendence, immanence, percept and concept.

Given the dialectic nature of this exploration, it is useful to take a moment to consider the emergence of the sublime in sound art on the basis of historical human experience, and reflect on the historical development of theories of sonic experience, before setting the parameters for my own implementation of these ideas.

1.2.2 Pre-history: reverberant spaces

Sound and music have long been associated with the sacred, from the reverberant spaces of pre-historic sacred caves which "spoke" to the early human communities who visited them (Blesser & Salter 2007, 71-73), to the massed choir in a cathedral, the *azan* echoing from minarets across the city, the immersive chanting of a Buddhist monastery, the songlines of indigenous Australians.

Sacred music in these examples all help to define a sacred geography, that is, they help to construct context for experiencing the sacred in a place, or for experiencing a place as sacred. Human beings' sense of sacred space is intimately connected to notions of sacred sound, in particular reverberant spaces.

The relationship between cave art and reverberant spaces is well documented, and summarised by Blesser & Salter (2007, pp. 71-73). Waller (1993, 2002) documents the correspondence between cave art in Lascaux and Fant-de-Gaume in France depicting large animals and highly reverberant spaces, and furthermore, speculates that the echoes found in such spaces may have brought to life the visual images as part of rituals intended to summon game. Lewis-Williams & Dowson (1990) studied South African rock art depicting the spirit world and theorises that the reflected sound within the cave may have been understood as sound or even voices of spirits from a world beyond the cave wall. Dauvois & Boutillon (1990) connects cave art with the presence of lithophones (natural stalactites and stalagmites that produce marimba-like sounds).

Devereux & Jahn (1996) draws more specific and deliberate connections between sound and sacred activity, based on the study of six Bronze Age structures in Great Britain dating from 3500 B. C. Man-made, these structures exhibited acoustic resonances in the range of 110 Hz, and were therefore thought to enhance male chanting in ritual ceremonies. Watson & Keating (1999) discovered even more complex structures in Scot-

land, in which different frequencies appeared to originate from different locations, and movement within the chamber resulted in unexpected shifts in perceived pitch and intensity. Speech perception was disturbed in some locations. The acoustic properties of the chamber and its linked passageways produces a Helmholtz resonator in the range of 4 Hz which, if sufficiently excited, could have produced discomfort, disorientation and sensory distortion.

Apart from the evidence of rock art and the acoustics of ritual spaces, Greek mythology, drawing upon that of earlier cultures, also suggests a strong association between reverberance and the spirit world, particularly with the character of Echo, the nymph from the myth of Narcissus. Blesser & Salter (2007, p. 77) suggests that the Greeks understood echoes not as a delayed sound reflection from a surface, but as a distinct voice with symbolic meaning.

Blesser concludes that while such superstitious interpretations seem alien to contemporary listeners, the principle of creating 'otherworldly' aural spaces is still at work in the design of modern electroacoustic sounds, and by presenting something outside the understanding and everyday experience of the modern listener, a sound designer can more directly tap into a 'felt' response rather than a consciously evaluated one. In other words, the goal is to engage with what is 'beyond' (the sublime), rather than reduce what is heard to an understandable form, a merely material 'sound effect'.

1.2.3   Sacred sound in Classical and Medieval thought

Perhaps one of the most persistent themes relating sound and the sacred or sublime has been the idea of sound not only being Other and beyond, but in fact, being the substance of all existence; a concept expounded in Western thought by the (possibly mythological) figure of Pythagoras. Pythagorean philosophy identifies mathematics as being an expression of the fundamental essence of the cosmos, with music being an equivalent mode of expression (James 1995, 31). In other words, that the universe is sound, and that sound existed before any created thing. This concept reoccurs in many cultures, even within contemporary thought, for example in Fritjof Capra's introduction to *Nada Brahma - The World is Sound: Music and the Landscape of Consciousness*, in which quantum physics is co-

opted to support the argument that matter is energy and energy is vibration, i.e. sound (Berendt & Capra 1987).

Going back to Pythagoras, he distinguished three kinds of music:

- *musica instrumetalis* - music made by instruments

- *musica humana* - the music of human organism, particularly resonance between the soul and the body, which is silent

- *musica mundana* - the music made by the cosmos itself, the music of the spheres

The concept of sympathetic resonance is applied to these three types as a means of explaining how, for instance, instrumental music arouses an emotional response from the human soul. Aristotle's theory of *memesis* suggests that there was a similarity between particular musical melodies and particular human emotions.

> Music directly imitates the passions or states of the soul...when one listens to music that imitates a certain passion, he becomes imbued with the same passion; and if over a long time he habitually listens to music that rouses ignoble passions, his whole character will be shaped to an ignoble form. (Grout, Palisca & Burkholder 1988, 7-8)

The association of various specific musical modes with various emotional states is a concept which persists through to the present day.

Plato, in seeking to explain why certain modes were more pleasant, argued that in aligning ourselves with the world soul, *musiqa mundana* brings us into harmony with the truth and gives rise to pleasure. Boethius (480-524 C.E.) distinguished music apart from the other mathematical disciplines (arithmetic, geometry and astronomy) as relating to morality as well as truth. His translation and summary of what is presumed to be Nichomachus' *Introduction to Music* became the standard text on music for the Latin Middle Ages. In his discussion on Music and Character, he summarises Plato's ideal of harmonic unity:

> Thus it follows that, since there are four mathematical disciplines, the others are concerned with the investigation of truth, whereas music is related

not only to speculation but to morality as well. For nothing is more consistent
with human nature than to be soothed by sweet modes and disturbed by their
opposites. And this affective quality of music is not peculiar to certain pro-
fessions or ages, but it is common to all professions; and infants, youths and
old people as well are so naturally attuned to the musical modes by a certain
spontaneous affection that there is no age at all that is not delighted by sweet
song. Thus we can begin to understand that apt doctrine of Plato which holds
that the soul of the universe is united by a musical concord. For when we
compare that which is coherently and harmoniously joined together within
our own being with that which is coherently and harmonious joined together
in sound - that is, that which gives us pleasure - so we come to recognise
that we ourselves are united according to this same principle of similarity.
For similarity is pleasing, whereas dissimilarity is unpleasant and contrary.
(Godwin 1986, 45)

The principle of the Platonic ideal carries strongly through this formula of harmony,
antithetical as it is to the dialectic of difference that appears to explain much better our
contemporary world of individual tastes and subcultures. The world seems to be a more
complex place now, and not so easily explained by Pythagoras' harmony of the spheres.

As an example of the engagement with the more complex realities of our sonic envi-
ronment, rather than the idealised harmony of the spheres, a significant development in
the culture of sacred music in the West was the emergence of polyphony. The tradition
of plainsong was a starting point for the music of Notre Dame, developing into a form of
polyphony which then spread throughout sacred and professional music practice within
Europe. The Notre Dame school of composition developed around 1220 in response to
the highly reverberant space of the Notre Dame cathedral itself (Dart 1967, 56-57).

It is worthwhile considering a specific example:

> ***Se valour / Bien me sui / Hic factus est***, *Haec Dies: Easter at Notre Dame (Les Six 1994)*
>
> This motet is an interesting example of the Notre Dame polyphonic tradition which exemplifies a number of significant elements: performance within a sacred space, engagement with sacred tradition, and engagement with contemporary culture, particularly through innovative performance practice. Although this recording is not from Notre Dame, the performance seeks to emulate the musical practice associated with one of the largest vaulted Gothic cathedral in Europe, and this brings an immediate evocation of the sacred.
>
> A particular practice of polyphony heard in this example is the addition of secular texts on top of a sacred text, which typically holds the baseline. The contrast of the two texts creates a creative tension, a space in which worshipers may have become conscious of the tensions between the mundane and the divine. In this case, the text of a popular troubadour poem reads:
>
> > It's clear to me that a great good has come from living in delight,
> > but I have stopped myself too much from going where my lady goes
> > this troubles me; for I should not have pleasure, unless by her.
> > God it's too long until I see her! So great is my desire. It troubles
> > me much when I do not see her, the one whom I love.
>
> Such juxtapositions might seem quite out of place some contemporary religious worship services. The ambiguous form used by this motet remains open, and is oriented toward the unrepresentable sublime, rather than forms which are oriented toward identification of the sublime with specific representations.

Stepping outside the canon of Western thought, two contributions from the Islamic world are of significance to our consideration of sacred sound. Majd al-Din Al-Ghazali (d. 1126), succeeded his more well known brother, Abu Hamid, as chair of the Baghdad law school, and thus held considerable influence on orthodox Islamic thinking of the day. In arguing for the permissibility of music and dance in a religious context, Majd al-Din

draws analogies between music, instruments and dance and the phenomenal, created world - thus arguing that music is, by extension, a natural part of the created order. He then turns specifically to the impact of audition, of sacred listening, upon the listener:

> So when a measured sound affects the inner being, it moves the spirit to seek ascent, and the body is moved by the movement of the spirit ...audition detaches one from external things and inclines one to accept the hidden lights and secrets ...audition is quiescence in the internal and movement in the external ...so as often as the movement is abundant in audition and quiescence become strong in the hearer, (the heart) is detached from everything but Allah (Exalted is He!), ecstasy appears in it, and it is drawn to the Unique Presence. (Godwin 1986, p. 80)

For Majd al-Din Al-Ghazali, music and dance are a means of attaining union with the divine - a pathway to the sublime - but apart from detailing the process, he does not differ from Boethius in expounding the virtues of only a pure form of "measured sound". Not surprisingly, Jalalu'ddin Rumi (1207-73), founder of the Mevlevi Order popularly known as the Whirling Dervishes, shares a similar view on sacred music and dance. However in Rumi's thought, we find something more akin to the aesthetic of the sublime we are seeking to adopt, for while Rumi postulates that music affects us because we recognise in it the echoes of the melodies of heaven, he also recognises the faultiness of human memory and the imperfect realities of human society, in which music, however profane, still plays a part. Godwin (1986, p. 90) supplies the following quote from Rumi:

> But his object in (listening to) the sound of the rebeck was, like (that of) ardent lovers (of God), (to bring into his mind) the phantasy of that (Divine) allocution; (For) the shrill noise of the clarion and the menace of the drum somewhat resemble that universal trumpet. Hence philosophers have said that we received these harmonies from the revolution of the (celestial) sphere, (and that) this (melody) which people sing with pandore and throat is the sound of the revolutions of the sphere; *(but) the true believers say that the influences of Paradise made every unpleasant sound to be beautiful.* We all have been parts of

Adam, we have heard those melodies in Paradise. Although the water and earth (of our bodies) have caused a doubt to fall upon us, something of those (melodies) comes (back) to our memory; But since it is mingled with the earth of sorrow, how should this treble and bass give (us) the same delight? When water is mixed with urine and stalings, its temperament is made bitter and acid by the commixture. There is a small quantity of water in his (a man's) body: suppose it is urine, (yet) it will extinguish a fire. If the water has been defiled, (still) this natural property of it remains, for by its nature it allays the fire of grief.

With typical earthy humour, Rumi brings the abstract concepts of "pure" sound back to ground level with the hiss of piss upon the coals, and also brings to light the tension that has continued to play out over the centuries between differing conceptions of sound and music: heavenly and profane, transcendent and immanent, structuralist and post-structuralist.

While less common in the Christian tradition, the play between earthly and divine love is a common trope in the Islamic Qawwali tradition of devotional singing, best known in the West by the prolific Nusrat Fateh Ali Khan. Qawwali frequently features not only references to an earthly lover, but to drunkenness, which is strictly forbidden in Islam. A metaphor for divine intoxication, it is none-the-less controversial as the ambiguity of the text. The lives of the Sufi poets who penned these devotional poems frequently leave room for wondering whether the author spoke only from experiences of being drunk on the divine or from much more mundane intoxication.

Consider the following example:

> **Yeh jo halka halka saroor hai (Mild Intoxication)**, Nusrat Fateh Ali Khan (1992)
>
> In this piece, Khan sings lines by Mohammad Iqbal Naqibi, and disciple of Nusrat's father, Ustad Fateh Ali Khan.
>
> Being coquettish my sweetheart sometimes comes very near to me and at other times goes far away. But all the time she is close to my heart. Since the day my eyes met her lovely ones I am in a perpetual state of slight intoxication.
>
> …
>
> The whole universe is in a state of drunkenness; the day, the night, the dawn, the dusk, everything is perpetually intoxicated. Even the wine cup and wine bottle are drunk. And this is all a result of your bashful eyes.

In terms of an overall aesthetic framework for sacred sound design, maintaining the tension between sacred and profane is key point, be it subtle references to earthly love, or outrageous statements of (metaphorical) transgression.

Another perspective on the incorporation of the everyday within the ambit of sacred sound arises in from the tradition of Zen Buddhism with the honkyoku repertoire of the shakuhachi bamboo flute. Honkyoku's evocation of Zen koans as an implied text for the instrumental music strengthens the associaton of these shakuhachi pieces with the process of moving beyond rational thought, just as we see in the music associated with Rumi. Far from being a music only of perfected contemplation, the shakuhachi tradition embraces error and noise. During a shakuhachi workshop I was having with Stuart Ransom, a Japanese visitor joined the class, and was invited to play. He took the instrument, played a piece confidently, although for large portions of the piece, no tone sounded, only the noise of breath passing over the edge of the bamboo. The visitor handed the instrument back to Stuart, and showed no sign of regret at what sounded, to my novice ears at least, like an inexpert performance. Stuart explained later that intention

is more important to the performance than the sound itself.

The capacity for sacred sound to incorporate human error and environmental elements (noise), and yet still evoke the sublime, rather than just the chaos of the material world, is another key principle of the aesthetic framework I am seeking to adopt.

> *Mumonkan (Gateless Barrier)*, Riley Lee and Andrew McGregor (2002)
>
> Recorded in the Jenolan caves in the Blue Mountains of New South Wales, this traditional shakuhachi duet carries with it an even more ancient sense of reverberant space than Notre Dame, as well as the Zen tradition of Japan. The title of this piece refers to a classic of Zen literature, a collection of 48 koans from the 13th century. Each koan epitomises one or more of the polarities of consciousness that act like an obstacle to the insight. The koans or barriers cannot be entered into with ordinary thinking or logic because they have no gate. But for one whose "Eye is opened to [the] True Self", entering is easy because there is no gate at all."Mumonkan" could therefore also mean "a checkpoint that is not blocked in any way", or "open checkpoint". (Lee 1992, p. 170)

1.2.4   Music, meaning, emotion

The pendulum of debate around the meaning of music and sound and how it works has swung back and forth over the centuries. Having touched on classical and medieval thought, any discussion of contemporary approaches music and meaning, particularly music and emotion, must acknowledge Eduard Hanslick, the 19th century Viennese music critic, whose text *On the Musically Beautiful* – a polemic against emotivist accounts of music's value – sparked a now long running thread of investigation into music as a formal communicative system rather than the domain of metaphysics and humours.

Hanslick rejected the arousal or association of emotion with music as being the cause of it's true meaning. Rather he takes a formalist perspective, describing music as essence being in its "tonally moving forms", and arguing that the musical imagination (the human cognitive faculty that is situated "between" the *logical* intellect and the *pathological*

or emotional intellect) "enjoys conscious sensuousness in the sounding shapes, the self-constructing tones, and dwells in free and immediate contemplation of them" (Hanslick 1986, p. 30)

However Hanslick does not provide much detail of how the formal structures of music actually communicate meaning, and this thread of investigation is taken up by others in his wake, particularly Edmund Gurney and later Leonard B. Myer. Myer is of particular interest for his detailed investigation of musical forms and his theory of emotional arousal being in response to the degree of expectation created by music is unfulfilled, or perhaps more precisely, fulfilled unexpectedly.

In contrast to formalist position of Hanslick, Myer and others, Cooke (1990) returns to a form of emotivist musical meaning, describing the process of musical communication as being one of transforming the composer's emotion into physical forms (rhythm, melody, harmony), drawing (unconsciously) upon the forms of musical tradition, but transforming that material in some unique way. Musical and emotional memory are key to this creative process. Likewise, the receiver also relies upon both musical and emotional memory.

> Just as Beethoven's feeling of joy, reaching a high pitch of excitement, must have powerfully stimulated the memories of musical elements attached to it, until one day it was suddenly converted by the creative imagination into a form of musical energy produced by the interaction of tensions from all these elements – so, when that form of musical energy is let loose on us by a performance of the actual sounds, it must powerfully stimulate *our* memories of similar musical elements; and through them must violently arouse the feelings attached to them, and the emotional faculty whence these arise, which must in the very nature of things be the emotion of joy. (Cooke 1990, p. 208)

Cooke still recognises the individuality of the whole process, noting that the emotion felt by the listener can only ever be as similar to that of the composer as any two humans can feel "the same", but suggests that music is never-the-less capable of conveying the composer's intention. Hanslick would no doubt object to Cooke's evocation of (remembered) emotion rather than the "musical imagination", just as Cooke rejects the formalist

argument that music does not communicate anything other than its own self-referential form.

The pendulum swings again, with Kivy (1989) levelling some strong critique against the emotional *arousal* theory of musical meaning in that it is overly subjective and provides no account for the objective communicative value of music and sound - i.e. its objective expressivity. However, Kivy doesn't settle for the formalist position of music-in-itself, but argues that musical meaning arises from the contours of musical structure resembling the contours of experienced emotion, or other experiences, evoking the mimesis theory of musical meaning from Aristotle's *Poetics*. Kivy goes on to show how such contours eventually become symbols, musical conventions, and hence convey meaning even if the context and meaning of the original musical contour has been lost. He notes that because of our cultural filters, even the contours of natural sounds, such as bird song, will be interpreted according to the cultural atunement of our perception (e.g. of scales), and as such the argument for culturally universal meanings is flimsy.

Messiaen became well known for drawing upon birdsong in his compositions, and his use of musical structures to convey complex emotions is an enduring aspect of his work.

> *Quartet for the end of time*, Messiaen (Ensemble Walter Boeykens 1998)
>
> Famous for being composed and first performed in a POW camp during WWII, Messiaen notes that his inspiration for the piece comes from the vision of an angel of the apocalypse announcing the end of time:
>
>> And I saw another mighty angel come down from heaven, clothed with a cloud: and a rainbow was upon his head, and his face was as it were the sun, and his feet as pillars of fire ... and he set his right foot upon the sea, and his left foot on the earth .... And the angel which I saw stand upon the sea and upon the earth lifted up his hand to heaven, and swore by him that liveth for ever and ever ... that there should be time no longer: But in the days of the voice of the seventh angel, when he shall begin to sound, the mystery of God should be finished ....

The key features of this piece for me are the contrast of slow string solo *Louanges* as meditations upon aspects of Christ, as a sublime figure, and the discordant announcements of the end of time in the 2nd and 3rd movements, filled with strident descending chord progressions evoking the sensation of trumpet blasts. Messaien's use of rhythmically repetitive but slowly evolving chord structures underneath melodic lines which do not resolve also evokes the gradual suspension of time.

The context of composition and performance in POW camp heightens the sense of dramatic contrast between the different musical sections - the pronouncement of the angel seems both terrible and salvatory, raising the question of whether the apocalypse could be any worse than what was already happening? In this respect there are both internal structural features which are used to evoke the sublime as well as contextual elements which add significant weight to the meaning of the composition, reaching out beyond the sonic inclusiveness of shakuhachi performance practice to include the human (political) context.

The mimesis account of music meaning has strong intuitive appeal, emerging and re-emerging across millennia. In a scientific age, we can reasonably ask whether there really is a basis for a relationship between the "shape" of human emotions and the forms of musical structures.

1.2.5   Phenomenology, psychology, and embodied cognition

The roots of empirical investigation of music and meaning, and particularly embodied cognition, lie in the nineteenth century, particularly with Helmholtz' work on psychoacoustics, the development of psychology as a science, as well as the phenomenological perspective of philosophy. A thorough review is beyond our present scope, but it is sufficient to highlight those aspects which focus on the extrinsic and intrinsic perspectives of sound. I consider two aspects: psychological investigations into music and emotion; and neurological accounts of sound and music perception.

Both of these areas of study are significantly influenced by phenomenology as a perspective on philosophy that turned away from the abstractness of logical positivism and sought to embrace human experience as it is. Perhaps the most influential contribution

to phenomenology comes from Merleau-Ponty's *Phenomenology of Perception* (Merleau-Ponty 1962). Elevating perception to a process of knowledge making in itself, rather than situating knowledge in a reflective process that acts upon sense data collected by (and perhaps filtered by) perception, Merleau-Ponty radically rejects the concept of an objective reality, arguing that knowledge is always situated from a specific perspective, and that the reflective process by which we might attempt to construct a more objective grasp of truth is an imperfect reconstruction of the original lived experience.

Looking at the phenomenology of the human experience of music, Kate Hevner's pioneering work in establishing empirical connections between emotion and music helped to establish an experimental framework for investigating the psychological basis for human responses to music (Hevner 1935*a*, 1935*b*, 1936). Hevner used checklists of adjectives and requested experimental subjects to select items which best matched their response to selections of music. Further work established empirical evidence for connections between musical features like tempo and pitch and emotional response (Hevner 1937). It is also recognised that her experimental process left room for improvement, as the selection of emotional responses was predefined and may not have matched subjects actual response, and subjects had to recall their emotional response after having heard the stimulus.

Schubert (2001) avoids some of the problems associated with collecting judgements of musical response through the use of checklists and other reflective processes by using a simple two-dimensional emotion space along axes of arousal (low energy to high energy) and valence (positive to negative), and allowing subjects to simply mark a position within the space that reflects their emotional response without having to reflect on their state in order to select a specific label. Hevner's emotion adjectives can be arrayed within this space (e.g. contentment is positioned in the positive low arousal quadrant, while anger would be placed in the negative high arousal quadrant).

In collecting statistically significant set of response data, Schubert (1999) shows that there are common emotional responses to musical features, and that the felt response is more significant than the emotion that subjects perceived was expressed by the music. Further work has looked at the gap between the expressed emotion of the music and the

felt emotion of the subject, establishing evidence that congruence of expressed and felt emotion is a good indicator of preference (Schubert 2007).

While this kind of investigation into music, emotion and preference focuses on the extrinsic aspects of musical semiotics and establishes some empirical evidence for associations between musical features and emotional responses, it doesn't explicitly address the question of why human beings respond to musical features the way they do. Fortunately, advances in neuroscience have helped to open up the internal workings of the mind for empirical observation, rather than just speculation.

Of particular interest is not just the neurobiology of the passive perceiver, but that of the *embodied* active perceiver. Knowledge emerges out of need to *act* in the environment, not just collect information for its own sake, and hence the focus of the embodied cognition approach is on action. Key to the embodied perspective is evidence for a close coupling between the cognitive processes for movement and perception. Leman (2008, p. 77-102) provides extensive discussion of the evidence, including the behavioural observation of infants' innate ability to perceive gestures and replicate them, and the neurobiological observation that some of the same neurons which are fired to create a gesture (e.g. grasping-with-the-hand) also fire when the subject observes another performing the same action. These are the so called mirror neurons.

The tight coupling of movement and perception at a cognitive level gives rise to the idea that just as our movements arise from intentions (simulation of the movement), so perceptions of the external world map back to intentions because of the trace left by the shared cognitive processes. This action-oriented ontology suggests that even at the social level, the actions of others are understood in terms our own intentions, i.e. our own simulated actions. The "moving sonic forms" of music are likewise attributed with intentionality because of the coupling of perception and movement. Thus, because individuals develop their own action-oriented ontology in a similar way by virtue of a common physiology, if not common culture, semantic communication is possible through music (Leman 2008, p. 92).

Similar concepts were developed by Manfred Clynes in his theory of Sentics . Taking the hypothesis of a strong connection between the body and emotions, Clynes developed

mechanisms for distinguishing between different emotional states on the basis of observable patterns in finger pressure, a measure found to be reliable across many subjects even though other physical expressions of that emotion varied widely, due different cultural and social backgrounds or even just individual physiology (Clynes 1972, Clynes & Menuhin 1977). Clynes later developed the concept of sentic forms - fundamental units of communication which communicate emotion through patterns to which the human nervous system is highly attuned - and applied this to the generation and modulation of music (Clynes 1992).

This perspective on embodied cognition is significant in the context of the discussion so far, for it provides both empirical evidence for and an explanatory theory which allows for a basic level of "objective" meaning to inhere in sound due to our common cognitive strategies, while still allowing for individual and cultural differences. In this sense, an embodied cognition approach to music meaning provides some resolution of the debate between formalists/structuralists and phenomenologists/post-structuralists.

In terms of sacred sound, we should not be surprised that there *are* some common human responses to stimuli such as highly reverberant spaces, particular rhythmic structures or pitch contours, and that these get associated with common meanings or intentionalities, even despite cultural differences, (Juslin & Laukka 2003, Tajadura-Jiménez, Larsson, Väljamäe, Västfjäll & Kleiner 2010). However cultural layers will still predominate in terms of how such intentionalities and experiences are interpreted (Blesser & Salter 2007, p. 67-93).

1.2.6 Sound, signifiers and society

In the context of the tension between musical formalism, communication and meaning, Nattiez synthesises a post-structuralist account of musical *semiology* which proposes a more nuanced theory of music communication which embraces each aspect. Although he introduces some novel terminology, Nattiez' tripartite theory of musical communication is, architecturally, similar to any that we have seen so far, including Cooke's: the composer undertakes a creative *poietic* process, bringing into being the *immanent* musical material, which bears the trace of the *poietic* process, and which can be interpreted by the

listener within their own context, the *esthesic* process.

The differences lie in Nattiez's argument that the relationships between these three levels is not tightly bound as it might be in a Sassuerean structuralist approach. Nattiez follows C.S. Peirce in including a potentially infinite set of interpretant's within the relationship between signifier and signified. The traces of the poietic process borne by the immanent musical material are merely suggestive of meaning, and may be construed differently by the perceiver, according to their particular set of cultural frameworks and experiences.

Nattiez is extremely open about what constitutes music, holding that only sound is a common element. Even that 'given' is contentious, as many non-cochlear elements (e.g. rhetorical gesture) are routinely included in various cultural definitions of music. "Music is whatever people choose to recognise as such, [and] noise is whatever is recognised as disturbing, unpleasant, or both." (Nattiez 1990, pp. 47-48). To force the label 'music' on to some collected set of cultural practices may in fact conflate practices which are ordinarily kept separate or separate those which are closely linked.

Cage's conception of music clearly aligns with this broad definition, and since the rise of rock music in the West, generations of youth have argued with their parents over whether what they're listening to is noise or music. Beyond the Western cultural framework Al Faruqi (1980) provides a more profound example of the difficulty in defining 'music', pointing out the distinction within Islamic cultures of what is, typically sacred, *sound* (sawt), including Quranic recitation, calls to prayer and religious chanting, but also non-religious practices such as working songs, and wedding celebration songs, compared to *musiqa*, a term borrowed into Arabic from Greek and used to designate usually instrumental music, often that associated with less religious or even profane activities. To the Western ear, all of these activities would be categorised as music, missing a point of cultural subtlety which has often made discussion of music within the anthropological literature about Islamic societies problematic.

Given the possibility of infinite interpretations of music, including what constitutes music, it seems difficult to consider developing any kind of framework for the meaningful design of sacred sound. Despite Nattiez' post-structuralist and relativistic approach,

he does not deny the possibility of musical universals. Rather, he suggests that universals should not be sought at the level of immanent structures, but rather in "more profound realities", the clues for which may be found in "the behaviours associated with sound phenomena" (Nattiez 1990, p. 65). In this sense, Nattiez does not seek to construct or apprehend some transcendent truth regarding music, but argues that a total truth of music is "out there", even though we may never be able to grasp it, for all its multiplicity.

This is the point at which Nattiez contributes to bridging the divide between formalist accounts and phenomenological accounts of music and meaning. Both modes of thinking about music must be accommodated, for both perspectives are, after all, valid readings of musical meaning. Formalist approaches deal with the intrinsic, internal qualities of music, while phenomenological approaches deal more with perceptual and contextual aspects - the external. Both domains intersect and interact, and in establishing a framework for musical meaning, the task is "to show how poietic and esthesic interpretants are linked with the work's material presence" (Nattiez 1990, p. 136). Nattiez' perspective is particularly useful in considering the shift from structure to texture as a carrier of musical meaning:

Stimmung, Stockhausen (Paul Hillier and Theatre of Voices 2006)

Stimmung (translated as "tuning") exists in a region in between choral work and acousmatic sound art, consisting as it does of streams of morphing sounds shapes, not always immediately recognisable as human, and yet profoundly arising only from the human voice. Stockhausen plays with both time and material, stretching the content of words and fragments of words - using repetition to elongate meaning and sensation - bifurcating and spilling over each other - a cycling, bubbling exploration of the human voice. References to different religious traditions emerge from the text through the use of religious term (Gott, Salaam wa laikum), as well as playful nonsense words. Godwin (1986, p. 290-291) reports Stockhausen's candid radio interview regarding his own concept of music and sound art, shedding further light upon his aspirations with *Stimmung*:

> What I want to say is this: one sees the end of the traditional religions, and music used to be imbedded, everyone in the world, in religion ... There are people

who have a sense for what is good or bad for them. But all should learn to
ask themselves: "What happens to me when I hear the composition *Stimmung?*"
Then one would feel: "Aha, this music awakens my consciousness for something
I would otherwise repress; for I am mostly busy with eating, drinking, moving,
buying, mending, talking, television, sleep ..." When does the question put
itself to one: "Who am I, why am I alive at all, where do I want to go from here,
what happens when I die?"

Music should above all be a means to keep awake the connection of the soul
with the other side ... Very few realise that every one of us basically needs music
for self-healing ... Then there naturally comes the next step, which religion also
originally strove for, namely to bring ourselves through music into relationship
with that which we cannot grasp with the understanding, but which we can feel;
with the supranatural, with that which gives life to the whole universe.

While opening up a vast space within which to develop his semiology of sound,
within the esthesic process Nattiez himself focused largely on the perceptual aspects,
and didn't extend further into social contexts. For this, it is valuable to turn to Theodore
Adorno.

Adorno is widely recognised as one of most influential thinkers in the field of sociol-
ogy of music. While it is Adorno's work actively resists summarisation, one of his most
principal concerns, that being importance of music for impacting individual cognition
and broader social "sensitivity", is highly relevant to any discussion of sacred sound.
In Adorno's thought, music is either a force for "stupefaction" by focusing on creating
pleasurable sensations to dull the consciousness from the discomforts of modern soci-
ety, or a force for raising critical consciousness by encouraging perception of difference.
Moreover, Adorno's positioning of music as structurally reflecting/influencing social or-
ganisation bears implications for sacred sound not just as an individual transformative
agent, but as an important art form for the broader society (DeNora 2003, pp. 12, 17).

1.2.7 Sound, the sonic unconscious, and the sublime

If we are to approach sacred sound from the perspective of only the immanent world, as complex as it is, then what has become of the transcendent sublime which is often overtly the subject of sacred sound making? In a post-Nietzchean milieu, does it make sense to speak of the sacred? The rejection of the Author and the concept of meta-narrative within critical theory begins to fray when the openness of meaning, which Derrida and others argued for, is turned upon critical theory itself.

This is eloquently observed by Almond, who takes the liberty of the post-modern reader to re-interpret Derrida's *differance* in light of comparison to Ibn Arabi's medieval Sufi writings, as being at least an echo, if not fully identical to "the non-present, eternally generative God of negative theology", despite Derrida's protestations to the contrary (Almond 2004, p. 133).

Almond compares the concept of textual interpretation as it arises in both Derrida and Ibn 'Arabi, suggesting that for both thinkers, the infinite interpretations of text is a metaphor for the ceaseless coming into being of existence, and noting that "whereas for Ibn 'Arabi it is infinite presence which causes the text to multiply and proliferate - the infinite presence of God in all interpretations - for Derrida it is an infinite absence which gives the text its freedom" (Almond 2004, p. 76). For Derrida, the choice lies between the structuralist quest for the original meaning intended by the Author, and the playful adventure of meaning untethered by any centre or origin, and that the two positions are irreconcilable. However, Almond suggests that Ibn' Arabi offers an intermediary position, noting that:

> [Ibn 'Arabi's] hermeneutics offer, within a medieval Islamic context, a de-constructive rejection of 'authentic' meaning and a thoroughly contemporary freeing of the text, but at the same time still retain the concept of the author as a Sender who is trying to tell us 'something'. The only difference being that this 'something' varies infinitely from person to person, from moment to moment, from place to place. Both thinkers feel texts can mean an endless variety of different things to different people, but only Ibn 'Arabi sees 'meaning' as essentially transitive - in this case as information 'sent down' to the reader

by 'Something' outside the book." (Almond 2004, p. 79)

It is in this sense of Ibn 'Arabi's infinitely interpretable and yet transitive communi-
cation that I wish to include the concept of the sacred, or, a transcendent sublime, within
an aesthetic for sound design. Sound as a point of contact between the listener and a
sublime Other, an incursion of the infinite into finite, material existence.

How then is sound a medium through which to explore the sublime Other? To what
extent can sound be used to explore the generative ground, the virtual space, of the sub-
lime, that Massumi alludes to?

Catherine Pickstock's reading of Augustine's *De Musica*, provides one perspective on
sound as point of contact with the generative ground of the sublime, suggesting that:

> "the alternation of sound and silence in music is seen by Augustine as a man-
> ifestation of the alternation of the coming into being and the passing into non-
> being which must characterise a universe created out of nothing . . . The fact
> that things are continuously *coming to be*, and continuously emerging from
> points which are nothing, implies for Augustine that it is most rational to see
> finite reality as having emerged in its entirety from nothing. One should note
> that the nothingness of the 'point' indicates for Augustine at once the abyss
> of finitude and a participation in the plentitude of the infinite. Thus, he evac-
> uates reality in a way that seems to include a nihilistic moment, only to af-
> firm all the more an absolutely infinite order which, nonetheless, finitude can
> never fully grasp . . . It is this suspension of the created order between noth-
> ingness and the infinite which demands that its order be primarily a temporal
> and audible sequence, rather than a spatial and visible one . . . the passage of
> time continuously acknowledges the nothingness of realised being, and can
> become the vehicle of a desire for a genuinely infinite 'permanence'. More-
> over, since this genuine permanence, as infinite, is not circumscribed, the non-
> closure of time is in fact the best finite image of this." (Pickstock 1999, pp.
> 247-248)

Where Augustine speaks of silence as a generative 'point' outside of time, the experi-

ence of the immanent world is more one of cacophony. That sound art is an ideal medium for exploring the theme of meaning which emerges from apparent chaos, or continual flux, is taken up by Cox (2009). Cox examines Liebniz' concept of noise as symptom of the limit of our perceptual capacity. Liebniz argues, for example, the *noise* of the ocean is a consequence of our inability to consciously process all of the perceptual input we receive from each individual wave. If our perceptual capacity were greater, then the apparent chaos would be seen as order. Cox takes Liebniz' concept further, suggesting noise is "the ground, the condition of possibility for every significant sound, as that from which all speech, music and signal emerges and to which it returns", thus identifying noise with the generative virtual, the sublime in the sense of the *sub-limine*, "beneath the threshold".

Noise, in the more common sense of unwanted signal, also poses an opportunity for engagement with the Other, in as much as the unwanted signal calls for an openness, a reorientation of desire, a relinquishment of control, a reception, an entering into relationship with its source (LaBelle 2010, p. 83). The next door neighbour's party, and the prophet's revelatory condemnation of societal injustice: both impinge upon a subjective contentment with the silence surrounding the status quo and offer an opportunity to engage - join the party, repent.

Sound art, as a field of expression that actively engages with the virtual (the abstracted, potentialised gesture), emerges from and disrupts silence without necessarily offering a concrete representation of the Other, is a medium like no other in which to explore the transcendent sublime.

It is from this understanding of the aesthetics of the sublime that I approach the issue of sacred sound design: a practice of sound design that acknowledges a transcendent sublime but rather than attempting to either directly represent it, or express it through absence, engages in a continual questioning of the present moment, prompting awareness of the formlessness beyond perception, which is the ground of being.

Embracing noise as an element within the practice of directing sound art toward the sublime is well captured by Pauline Oliveros:

A little noise in the system, Pauline Oliveros (2003)

Oliveros' surround sound remix of her 1969 piece *A little noise in the system* at the 2007 Liquid Architecture festival created an immersive sound environment for contemplation. Performing with spoken word artist IONE, Oliveros demonstrated mastery of her craft, keeping the focus on the sound, rather than the technique. The transformation of IONE's voice into fluttering folded shapes and shades of light and dark that took on a life of their own produced an almost hypnotic effect: I heard one patron later wondering if they'd been hallucinating.

Oliveros pioneered the Deep Listening movement, a practice which "distinguishes the difference between the involuntary nature of hearing and the voluntary selective nature of listening. The result of the practice cultivates appreciation of sounds on a heightened level, expanding the potential for connection and interaction with one's environment, technology and performance with others in music and related arts." (Oliveros 2010)

A little noise in the system could best best categorised as noise music, consisting of various forms of white noise and pitched drones which evoke the sounds of faulty electronics, and I include it here as an example of sacred sound for precisely the reason that it is the context of the listening, and the process of listening, which transforms the raw audio signal into something transformative and evocative of the sublime. Oliveros' celebration of noise is not in the transgressive and even violent style of much noise art, but much more of an invitation to meditate upon the textures of noise, become immersed within the detail and experience sound beyond the rational forms of music.

1.2.8   Sacred and profane: sound, the sublime, and the body

If Oliveros celebrates the noise in the machine, Electronic Dance Music (EDM), with its myriad sub-genres, celebrates the machinic signal: the cybernetic merger of human soul and electronic circuitry. EDM is deeply embedded within technology, sometimes fetishising the qualities of particular electronic instruments, such as the Roland TB-303. It is likewise embedded within the commercialised entertainment industry, emerging from

disco club culture, and although largely an underground cultural movement in its early phases, it is now overtly commercial and mainstream.

With this material and commercial focus, there is a question of how electronic dance music fits into the sacred music space. Reynolds (1999) traces the evolution of EDM, and particularly examines the sociology of the music, including associated drug use, and draws comparisons with sacred dance phenomena in other cultures. A particular feature of EDM which distinguishes it from other forms of Western pop and art music is the emphasis on the group rather than the individual.

Underground techno and rave culture eschewed the rock star format of other pop musics, with DJ's working under (multiple) aliases, music being released on white labeled vinyl, and the focus of dancefloor architectures being oriented toward the group experience, rather than focused on the concert stage. This focus on the collective extends to sublimating the individual experience within the broader group experience. This is achieved most particularly through the use of continuously mixed music with a steady or gradually shifting tempo, resulting in entrainment of the individual participants, creating the sensation of being linked to others (Phillips-Silver, Aktipis & A. Bryant 2010). To this extent, particularly during its formative years in the UK, underground EDM as a musical form and a social structure was about collective experience and the elimination of ego.

The format of all-night dance party experiences mimics initiatory rituals, particularly when events are situated outdoors, with dance floor decor frequently incorporating overt religious symbols, icons and ritual altars and participants 'journeying' through darkness to reach the dawn. Sylvan (2005) extensively documents and analyses these aspects of global rave culture, particularly looking at groups which sought to take transformative spiritual experiences beyond the dance floor and into broader everyday life. Similarly, Williamson (2001) documents the social critique inherent in much of early Australian outdoor dance party culture, particularly the reclaiming of public space and the re-contextualisation of dance culture as socially transformative, rather than a spectacle for the distraction of the masses. The emergence of a more marketable structure of superstar DJ events in heavily commodified spaces marks the shift from sonic ritual to commercial

spectacle.

> ***Look Deeper***, Soundhive and Friends (2000) The track opens with a sampled quote from
> an episode of Star Trek Voyager, *"What your eyes show you is only the surface of reality. Look*
> *deeper,"* embedded within layers of analog bass and a driving 140 bpm kick drum and electro-
> tom rhythm. A syncopated hi-hat pattern skitters over the top of the mix, while angular
> fragments of filtered white noise play across the mid-range, moving within the stereo field.
>
> The accent of the primary analog bass line shifts continually, with the primary line occa-
> sionally dropping out to reveal the lower pitched and more heavily filtered bass line which
> provides the overall locomotive drive to the track. A stuttered version of the "look deeper"
> sample emerges in time with the kick drum and re-introduces the primary analog bass line.
> At about 5:30 mins in, a high pitched pulsing drone intensifies the sonic landscape for 30
> seconds before the mix is stripped back to bare base line, kick and panning hi-hats, with a
> light phasing effect across the mid-range frequencies.
>
> At 6:40, an atonal pad swells in volume in advance of an even louder drop of the sampled
> refrain "look deeper", heralding the return of the full mix, including the filtered white noise
> figures and a more urgently filtered bass line, establishing the final peak of the track, which
> gradually subsides into cavernous reverb.

Look Deeper creates a sonic fiction that operates at both an affective, bodily level,
and an associative, cognitive level. The 140bpm and insistent bass line pushes the lis-
tener/dancer into the realm of the heightened heart rate associated with excitement and
anxiety, and couples a text that alludes to enhanced mental abilities or insights with
sounds that evoke sensations of such mental exertion, particularly the high pitched drone
at 5:30 and the atonal pad swell at 6:40. Experienced in the context of an outdoor dance
party event, the track exhorts the crowd to transcend their everyday perception of reality
and "look deeper".

The socio-political connotations of outdoor dance events, particularly the scene in
South East Queensland during the 1990's in which the producers of the track were inti-
mately involved, adds an environmental and alternative social perspective to the science
fiction connotations of the original sampled text, in which the injunction to look deeper
was aimed at both seeing the natural beauty of the surroundings in which the event was
being held, and the ways in which current patterns of land use and resource consumption

threatened the very same environment. To the extent that, as Goodman (2009) suggests, electronic dance music, particularly bass-heavy music, creates a sub-politics of frequency as it attracts and mobilises groups of people, tracks like *Look Deeper* served to embody the collective values of the subcultural community within the participants. However vague and open such values were to individual interpretation, the shared experience of collective entrainment created a kind of 'cellular memory' that persisted beyond the event, and contributed to a widespread orientation toward proactive environmentally friendly lifestyles and politics. This was personally observable in stories exchanged and the values exhibited by the same community as it gathered for a 10 year re-union event over the New Year's period of 2012/13.

Moving away from the high energy entrainment elements of the main dance floor, another frequent feature of underground dance parties is the chill space, a separate physical and aural zone typically featuring less beat driven music focused on ambience and texture. Production techniques from dub reggae permeate the kind of music used in the chill space, featuring in the music of chill space pioneers The Orb, ethno-dub specialist Bill Laswell, and too many others to mention (Toop 2001, pp. 113-115).

Reynolds notes that while ambient techno was trading on the more authentically spiritual language of dub reggae, "the use of echo and and reverberance is a thread connecting most twentieth-century musics that aspire to timelessness" (Reynolds 1999, p. 193). Recognising the connection back to the ritual use of reverberant caves, Reynolds argues that the connection is more biological than historical: "with its numinous reverberance and fetus-heartbeat tempo of 70 bpm, dub reggae reinvokes the primordial intimacy of womb time, the lost paradise before individuation and anxiety" (Reynolds 1999, p. 194).

Although the dub virus that spread through ambient electronica became increasingly oriented toward the 'head trip', the twin elements of bass-heavy slow tempos and reverberance that Reynolds connects back to pre-cognitive experience profoundly orient dub toward the body, or perhaps more correctly, embodied ways of knowing. This aspect of dub, and the reggae sound system culture that created it, is recognised by Julian Henriques in Sonic Bodies, a detailed analysis of the systems of knowledge that underpins Jamaican sound system practice. Henriques proposes a model of knowledge which

places the sensing, kinetic body at the centre of a *sonic logos* founded on ratio rather than representation.

> Outside representation as code, text, or sequential logic on the one hand, or graphic or image on the other, one place to locate the reason of the *sonic logos* is in ratio and proportion. This is simply a relationship between two or more things and those within the whole. The ratios of the *sonic logos* are recognised through pattern and rhythm, rather than schema and discourse …understanding the ratio invariably takes place within the receptive and expressive flows of a multi sensory matrix. the auditory sensory modality, with its particular sensitivity to such ratios, as for example with the musical octave, plays a leading part in this, rather than one of subservience in a hierarchy privileging the visual image. (Henriques 2011, pp. 254-256)

Dub production embodies this movement beyond the representationaly rational through the erasure of the text. Dub "versions" of popular reggae songs typically erased most of the lyrics, leaving only fragments by which the original song could be recognised – a trace of the original meaning – and turning the focus to sonic treatment of the voice and instrumental material. The result is a kind of sonic palimpsest which turns away from text to texture.

Radiation Ruling the Nation, Massive Attack v Mad Professor (1995)

Mad Professor's remix of British trip-hop pioneers Massive Attack's *Protection* album delivers a bass heavy version of the original song, recalled as if through a dream, the now distorted bass rumbling beneath a tight snare drum snap, and echoing fragments of Tracey Thorn's vocals littered across a filtered TB-303 synth lead. The original tempo of 84 bpm is maintained, but the removal of the elaborate bushed drum patterns and occasional fills leaves the remixed track a far more langourous affair. A triangle percussion pattern that sits in the background in the original is brought forward to dominate the mix.

Part way through the original chorus text *"I stand in front of you. I'll take the force of the blow. Protection."* stutters in a drenched loop of *"taketaketaketake"* before finally

vanishing beneath a heavily filtered snatch of the original Fender Rhodes riff and piano lines, which likewise give way to the stripped back bones of acid bass, increasingly effected snare hits, and the ever present triangle pattern. The track closes with the bass line descending into a filtered sonic meltdown. *Radiation Ruling the Nation* was the opening track of the album, which was released in 1995, the same year that the Sizewell B nuclear power plant came online in the UK.

1.2.9 Music Concrete, Spectromorphology and Embodiment

The immersive, synaesthesic possibilities of purely electronic music, embraced by EDM, and positioning of the Dub producer as performer, are prefigured by the development of electronic music studios in Europe. Of particular significance are the *music concrete* pioneers Pierre Schaeffer, Pierre Henri, and others at the GRM studios in Paris in the 1950s. Schaeffer's Typo-morphology of Sonic Objects (Palombini 1993) outlines fundamental categorisations of sound perception and the structuring of sound as raw material for (artistic) communication.

Schaeffer's work was extended by Dennis Smalley, particularly in his publications on spectromorphology (Smalley 1986, 1997). A continuation of Schaeffer's project is found in Thoresen & Hedman (2007) work on spectromorphological analysis.

Smalley's work on spectromorphology provides a detailed taxonomy of 'spectrally moving forms', referring perhaps to Hanslick's tonally moving forms. In this respect, both Schaeffer's and Smalley's work represents a formalist approach to organising sound analogous to formalist approaches to music. Indeed, as the technology of audio recording opened up the possibilities of taking organised sound beyond the symbolic grids of music notation, musical structure and orchestration, the importance of their work lies in the establishing of a language for thinking about this new type of sonic art.

Both Schaeffer's and Smalley's typologies are too detailed to repeat in full here, however it is important to explain how their formalist approach relates to the aesthetic framework I have adopted. Although I take a position that is strongly informed by phenomenology, situating the body and lived experience as central to the creation and in-

terpretation of sacred sound, at the detailed level of embodied cognition, it is essential to be able to discuss sonic features and sonic gestures with respect to fundamental physical movements and composed gestures. Just as Nattiez embraces both phenomenological and formalist aspects with respect to extrinsic and intrinsic aspects of immanent sound material, I find the formalist approaches of Schaeffer and Smalley essential for process of being able to relate the material qualities of sound design to the processes of embodied cognition.

In fact, Smalley's typology is laden with physical metaphors and is sufficiently general so as to be applicable to human movement as much as it is to spectrally moving forms. At the root level, Smalley considers sound in terms of motions, space, structural functions and behaviours. Motions include both the motion of sounding objects, including such categories as ascent, descent, oscillation, rotation, dilation, contraction, convergence, divergence. He also suggests several characteristic motions including floating, drifting, rising, flowing, pushing or dragging. One can easily imagine these categories being applied to human movement, at either the individual or group level.

With respect to space, Smalley examines the position of sonic objects within the "vertical" frame of the frequency spectrum, as well as the density of the sonic space and the localisation of the object in terms of distance from the listener, the paths the object takes through space, the residues it leaves, and so on. Again, analogies can be found to the motion of the body in space.

In terms of structural functions, Smalley considers sound in terms of the sound object's relationship to the overall structure of an organised body of sound, primarily with respect to chronologically linear functions such as onsets, continuations and terminations. Relationships between sound objects are categorised in terms of spectra of behaviour relationships such as equality and inequality, activity and passivity, stability and instability and so on.

My contention in looking at Smalley's typology of spectromorphology is that the physical metaphors he has applied to moving spectral forms find their grounding in the literal physical movements they describe, and that taking an approach to sound design informed by embodied cognition will enable a deeper understanding of how these mov-

ing spectral forms relate to the moving physical forms of the body, and in turn, will enable a deeper understanding of what these moving spectral forms *mean* to humans at a cognitive level.

Developing an understanding of this relationship is fundamental to developing a sacred sound design practice which, by being rooted in the body, is able to speak to, and through the body, to the cognitive, physical, social, cultural and metaphysical spaces inhabited by the body. In this respect, I am seeking an approach to sacred sound design with is neither unconcerned with the body, as perhaps the formalists were, nor materially bound by the body and the limits of its perceptive senses, as perhaps the phenomenologists were, but recognises the centrality of the body in a physical reality which is situated within a broader, unrepresentable Reality.

Embodied Sound: Embodied Space

Sacred sound design as I propose it in practice is situated within an aesthetic framework, which could also be conceived of as a filter on a broader set of practices which fall outside of the focus of *sacred* art, though the boundaries are invariably fuzzy. The elements which all sound design deals with could be considered to be:

- Physical space: the situation in which the sound is placed

- Aural space: the sonic environment or soundscape

- Cultural space: the broader social environment, which encloses and determines, or at least impacts both the physical space and the aural space

- Spectral morphology: moving sonic forms

- Physical morphology: moving physical forms

Figure 1.1 illustrates how these elements relate to each other.

In the case of an actual physical environment, the laws of physics bind the the aural space and the physical space together. In other words, the aural space is a function of
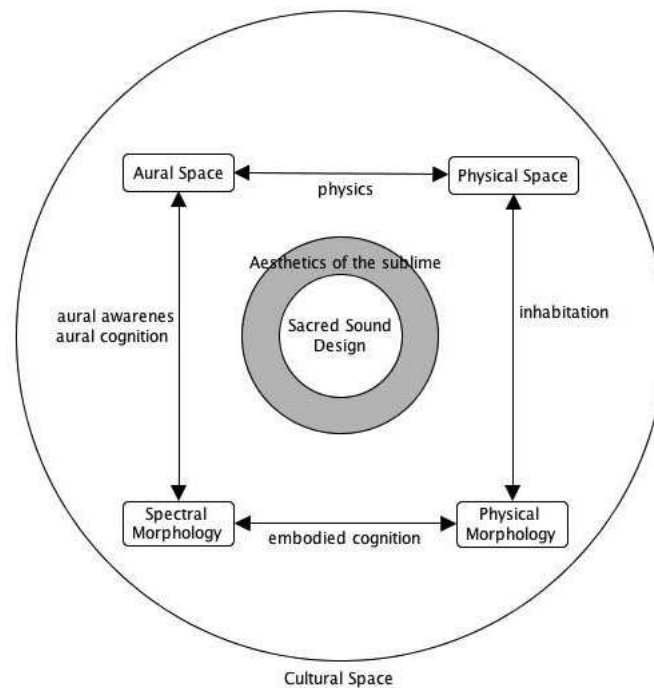
Figure 1.1: Architecture of practice for sacred sound design

whether the physical space is open or enclosed and the material properties of the environment. In the case of virtual environments, then these are (typically) modelled on an existing physical relationship.

These (relatively) static material elements are related to the dynamic elements of moving forms: physical moving forms and spectral moving forms. At this point I suggest that these relationships are mediated by a perceiver/inhabitant, and as such the relationship between the aural space and the spectral morphology of the dynamic spectral forms is a function of the perceiver's aural awareness and aural cognition. The relationship between the physical space and the moving physical forms within it is a function of inhabitation, i.e. the way in which an agent occupying a physical space moves and exists within that space and in relation to that space.

At a perceptual level the relationship between the two dynamic forms is a function of embodied cognition - moving spectral forms are associated with moving physical forms by virtue of commonly neurobiological functions. The physical form may literally inhabit

the physical space, as a dancer would inhabit a performance space for instance, or the sonorous form may "inhabit" the space through the agency imputed to it by embodied cognition, as the imagination supplies an aural "image" when listening to the diffusion of an acousmatic music performance.

The embodied perceiver is, for the purposes of this discussion, the mediating link between sacred sound and sacred space. Perceiving the aural environment and the physical environment (be it built or natural), and linking the dynamic sonic forms to the both the aural and therefore physical context, as well as the cultural context, and the physical motion of a (potential) agent.

Only by situating sacred sound within these dimensions, and particularly *within* the embodied perceiver, can we say that it acquires meaning. For this reason, as a fundamental building block of a sacred sound design practice, it is necessary to understand what relationship might exist between the dynamic physical body and the dynamic spectral 'body'.

Gesture and embodiment

Given the objective of exploring the sublime through sound art, to what extent can sound design transcend cultural context? The dialectic of essence and existence, virtual and actual, potential and event, becoming and being, finds its nexus in the embodied consciousness. Not the mind-body dualism of Descartes, but much more so the body-mind continuum of Marc Leman.

For Leman, knowledge emerges out of need to *act* in the environment, not just collect information for its own sake, and hence the focus of the embodied cognition approach is on action. Key to the embodied perspective is evidence for a close coupling between the cognitive processes for movement and perception. Leman (2008, pp. 77-102) provides extensive discussion of the evidence, including the behavioural observation of infants' innate ability to perceive gestures and replicate them, and the neurobiological observation that some of the same neurons which are fired to create a gesture (e.g. grasping-with-the-hand) also fire when the subject observes another performing the same action. These are the so called mirror neurons.

The tight coupling of movement and perception at a cognitive level gives rise to the idea that just as our movements arise from intentions (simulation of the movement), so perceptions of the external world map back to intentions because of the trace left by the shared cognitive processes. This action-oriented ontology suggests that even at the social level, the actions of others are understood in terms our own intentions, i.e. our own simulated actions. The "moving sonic forms" of music are likewise attributed with intentionality because of the coupling of perception and movement. Thus, because individuals develop their own action-oriented ontology in a similar way by virtue of a common physiology, if not common culture, semantic communication is possible through music (Leman 2008, p. 92).

This perspective is significant in the context of the discussion so far, for it provides both empirical evidence for and an explanatory theory which allows for a basic level of "objective" meaning to inhere in sound due to our common cognitive strategies, while still allowing for individual and cultural differences. In this sense, an embodied cognition approach to music meaning provides some resolution of the debate between formalists/structuralists and phenomenologists/post-structuralists.

Smalley links spectromophological forms of sound art to the morphology of human movement (Smalley 1997), an insight which is backed by work of Leman. From a compositional perspective, Smalley identifies several levels of gestural *surrogacy* - degrees of abstraction away from both the source material the gestural archetype:

- primal gesture: basic proprioceptive gestural awareness, not linked to music making

- first order: recognisable sonic material subject to recognisable gestural *play* without *instrumentalisation*

- second order: traditional instrumental musical performance

- third order: where a gesture is inferred or imagined in the music, but both the source material and the specific gesture are uncertain.

- remote: where "source and cause become unknown and unknowable as any human action behind the sound disappears", but ... "some vestiges of gesture might still

remain", revealed by "those characteristics of effort and resistance perceived in the trajectory of gesture".

The degree to which sound perception and physical gesture are linked underpins my approach to sacred sound design, particularly in the context of interactive installation works. Building on an awareness of the primal gestural level, first order surrogacy provides simple, immediate accessibility for the interactor, while sustained engagement is generated by providing elements which operate at the higher levels of gestural surrogacy. Through sound, the body becomes a site for engaging the sublime, and it is this three way relationship, between the sublime, sound and the listening/vibrating body that I now turn.

1.2.10 Sound and Affect

As is clear from the literature reviewed so far, sound does affect us in myriad ways, from music which soothes or excites, through to anxiety inducing noise pollution. Yet one person's noise is another person's music.

Likewise, the concept of sacred sound is, at first glance, also a purely subjective thing. Certainly at a cultural as well as personal level, it is, and yet there are also collective responses to sound that appear common. The theories of music, and the sonic elements reviewed so far address human responses to sound, but do not directly address the deeper question of shared experience.

The body is a starting point, since embodied beings, human sound cognition is intimately linked with the way our brains also process movement, and as such, embodied sound cognition suggests that there are common elements to (sacred) sound that underly cultural and individual subjective layers of interpretation.

Beyond having a common physiology, what enables sound to be a medium for encountering not only the tangible reality of our physical surroundings, but also the numinous realm of the sublime?

Two concepts are useful here:

- that affect is autonomous of subjective experience, allowing for individual, subjec-

tive experience while not denying the existence of a non-subjective reality

- that sound is likewise autonomous of audition, as a generalisation of the concept of noise being the generative virtual beyond/below perceptual thresholds

Henriques's concept of a *sonic logos* builds upon Lefebvre's (2004) *rhythmanalysis*, embracing a broader framework of vibration as not just the means of *propagating* knowledge and affect, but taking the position that affect *is* vibration. Affect is carried across varying media, be they electromagnetic, corporeal, or sociocultural, and each of these layers of media manifests the rhythms, amplitudes and timbres of vibrational affect in different ways, be that certain patterns of audible frequencies, pulse rates, muscle contractions, patterns of movement, emotional responses, or cycles of social events, styles or fashions (Henriques 2010). The same vibrational analysis is also found in Alfred North Whiteheads process philosophy, which underpins much recent significant theorising of sonic experience, from the work of Steve Goodman (Goodman 2009) to the work of Susanne Langer, as discussed by Priest (2013).

In particular, Scrimshaw (2013) takes up the concept of equating sound, or vibration more generally, and affect, suggesting that sound, like affect, is independent of the subjective experience of audition: just as affection is the subjective experience of affect, and that affect in-itself is that which remains in excess of subjective experience, so too sound in-itself is that which remains in excess of audition. Sound-in-itself in this sense is virtual: real, but not actualised in terms of audition.

This equating of sound and affect generalises Cox's analysis of noise as the generative field for signal. The vibrational-materialist approach restores the transcendent to the immanent field of sound by placing the locus of meaning *within* the relational web of vibrating and listening bodies. Affect finds its meaning in the relational, multi-sensory matrix of repeated patterns, arising from the repetition of a musical phrase, the enactment of ritual, the cycle of seasonal events. This repetition is not the mechanical reproduction that Benjamin speaks of, let alone the digital replication inherent in current modes of information distribution. Rather it is the repetition of the dawn, which is always new. Henriques quotes Lefebvre:

No rhythm without repetition in time and space, without reprises, without
returns . . . but there is no identical absolute repetition, indefinitely. Whence
the relation between repetition and difference . . . Not only does repetition not
exclude differences, it also gives birth to them; it produces them. (Lefebvre
2004, p. 6)

This brings us back to the point of considering the sublime as the site/source of
endless variation, and Kim-Cohen's application of Lyotard's question *"Is it happening?"*.
Movement, sound and affect can be considered as different modes of the same vibra-
tional relation - or rather the same vibration moving through different media. Affect as
meaning sidesteps the issue of representation that confounds both modernist and post-
modernist 'readings' of the sublime by embracing the wave rather than the particle. The
tension between absence and presence teased out in Almond's comparison of Derrida
and Ibn Arabi collapses when, instead of looking at the source of meaning arising from
a text which has no author, or, in the case of Ibn Arabi, has an ever-present Author con-
stantly creating new interpretations, we instead *tune in* to the frequencies of the sublime,
which, although by definition always exceeds perception, nevertheless causes us to res-
onate with it, a nodal point of intersection between the virtual and the actual.

1.3   Summary

Humans have long interpreted sound as sacred, from reverberant spaces, through to con-
ceptions of music as the fundamental substance of the universe. The use of sound in reli-
gious contexts has frequently reflected this concept of sound and music as an expression
of and pathway to spiritual harmony. Western art music continues the trajectory of using
music to 'transcend' everyday experience, but is less directly connected to any particular
theological position. Popular music has incorporated sonic elements which generate sim-
ilar effects (sensation) and has also used spiritual signifiers, either implicit in the social
structures or through the overt use of spiritual symbols.

In a pluralistic society, to utilise sacred sound as a community resource, we need to
allow for an approach which goes beyond any specific religious setting, and beyond any

particular musical taste. In a Cagean sense, we broaden the concept of sacred music to include sound in general, rather than just what is commonly recognised as music. Sacred sound then becomes not just the audible signifier of particular beliefs, but the aural space within which people encounter the sublime.

Indeed, by adopting a vibrational-materialist ontology, the focus of my work becomes inherently relational, rather than representational. Based upon the theories and historical examples surveyed, I want to suggest that sacred sound design operates as a process or as a relationship, rather than representationally, and seeks to engage at the boundaries of virtuality-actuality through the use of the following principles:

- using sound immersively, evoking the reverberant, immersive spaces of pre-history

- juxtaposition of the perfect and imperfect / transcendent and mundane as a means of creating space for encountering the sublime, rather than attempting to represent the sublime;

- use of intrinsic structures and processes which relate to the intrinsic neurophysiological structures and processes of sound cognition;

- engagement with the social context in ways which are resistant to or transformative of that context;

- exploration of the material of sound, drawing the listener into the substance and particularity of the sound in order to move beyond sound/text as rational, linguistic or iconic;

- using material in constant flux: allowing for pattern and rhythm but avoiding replication;

- allowing for meaning to emerge from the interaction of noise and structure, rather an attempting to impose a fixed meaning.

In applying these principles, I seek to establish a framework for sacred sound design which addresses the linkages between intrinsic formal properties, extrinsic contextual

relationships, and the immanent material of the sound itself. This framework is not intended to establish a set of universal principles or definitions of sacred sound, but rather establish a process, a way of working that enables the designer to work effectively with sound within their own particular practice of sacred art.

This objective begs the question of what constitutes sacred art within such a broad, even relativistic, framework? One criteria which appears to emerge from both Adorno as well as Stockhausen, is that art (in both cases music, but let us consider their comments as having wider applicability), should sharpen the consciousness, heighten awareness and the senses, rather than dull them or act only as a salve for the emotions. In other words, sacred sound is that which functions to enable or enhance some encounter with the *real*, the sublime.

immanence

It starts with the feeling of wet sand subsiding beneath each step, the surface breaking, compacting, shifting as I walk. The smell of salt air. The warmth of sunlight on the skin, the gentle swish of cotton against skin. The hiss and rumble of breakers tumbling, sliding over each other, inevitably sucked back into the vacuum they create for themselves as they reach out to caress the shore.

It starts with the dry touch of skin on skin, hands folded just over the navel, left over right, awareness sinking down to that point, groping for the sense of centre, finding only a vague hollowness. Eyes close, lips vibrating with a mantra hum as breath slowly evaporates, soft darkness coalescing in the centre of the hara, *hardening into a kernel of light as the breath runs out, salt air rushes in like a tidal wave, limbs, chest, head, eyes explode open thrusting outward upward with the primal "aaaaah" a shaft of light from heaven, skewering my heart.*

Held taut between sky and sand, lifted onto the balls of my feet, palms open, fingers outstretched, laser vision beaming up between my hands, slicing in an arc down to the horizon as arms sweep forward and feet ground themselves, vocal chords thrumming with a clear, strong "aaaaaaaaaaaay". Knees bend, open palms push down, forward and up, thumbs and forefingers almost meeting in a diamond-shaped frame for vision and voice, a low, building "eeeeeeeee" that rises up from feet, thighs, guts, chest.

Arms arc outward, scooping down, gathering, lifting hands upward with an offering - "auuw".

It ends in a moment of stillness before the breath fades, clarity of vision escapes, and hands fold together, left over right, sinking back down on the gentle contours of "ommmmm" to rest on the centre, eyes close, consciousness settles lightly on the surface of that dark pool, glimmering before being drawn down into the depths.

Chapter 2

SoundLabyrinth

2.1   SoundLabyrinth: an immersive audio-visual installation

SoundLabyrinth is an immersive audio/visual installation exploring the relationship between sound and the body. Set within a 6.5m diameter geodesic dome, *SoundLabyrinth* invites the participant to explore distant lands, lost memories and inner worlds through sound and motion.

Through the use of both representational and abstract audio, immersive sound spatialisaiton, multi-channel video, and the incorporation of gesture-based interaction abstraction, *SoundLabyrinth* applies theories of gesture within electro-acoustic composition, and theories of movement analysis and embodied music cognition, to the examination of the boundaries between virtuality and embodiment, transcendence and immanence, as an exploration of the "sublime within the everyday".

Taking an embodied approach to the work, creating a sense of immersion and providing space for interaction were two key objectives for *SoundLabyrinth*. Technically, *SoundLabyrinth* draws upon the concepts and techniques of the now common immersive CAVE system (Cruz-Neira, Sandin & DeFanti 1993), although with greater emphasis on immersive sound than fully immersive visuals. Such immersive environments are often experienced as trancelike, meditative, or mentally absorbing (Grau 2004, p. 199), and as such, are more suited to the goals of *SoundLabyrinth* than a more open gallery setting.

The other key technology utilised by *SoundLabyrinth* is the natural body interface. By removing the need for any form of physical control apparatus, the distance between the participant and the virtual world of the art work is reduced, heightening both the

immersive quality of the work, and the sense of the participant's embodiment within the work (Grau 2004, p.199). As a work exploring the interface between the embodied and the virtual, this distance-reducing, boundary blurring technology is of great conceptual importance.

SoundLabyrinth is focused on the relationship between sound and the body and the sense of meaning or "sacredness" that emerges from that relationship. The centrepiece of the project is an installation which uses ambisonic sound and immersive video projection set within large geodesic dome. As an installation, participants are able to explore a number of different sound worlds located within the space of the dome.

The audio elements focus on sounds which relate, in broad terms, to the concepts of the sacred and the sublime, as well spoken word material relating to these themes, including material contributed by three poets: Nazid Kimmie (Australia/South Africa), Melike Ülgezer (Australia/Turkey) and Rebecca Lemaire (India/Belgium).

The interactive mechanism of the installation allows participants to explore this sonic material as they move around within the dome, with the quality of the sound responding to their posture and gestures at certain points in the installation. Video projection within the dome provides additional context for the experience.

2.1.1   Audio/visual Infrastructure

The physical structure of the installation comprises a 6.5m diameter, three frequency geodesic dome frame with a translucent white material cover. Within this frame, a 24.2 channel sound system is installed, along with 4 channel video projection. The bare dome frame is pictured in Figure 2.1. Detail of the speaker mounting mechanism is shown in Figure 2.2. Detail of the covered dome with projection is pictured in Figure 2.3[1].

The emphasis of *SoundLabyrinth* is toward the audio experience, and for this reason, an acoustically transparent structure was required. Hence the speakers were mounted inside the dome, and a light cloth cover was used in order to avoid the material of the cover creating unwanted audio reflections within the dome while still providing a sense of seclusion for participants within the dome.

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[1]Image credit Brigid Burke.

Figure 2.1: Geodesic dome frame

Figure 2.2: Speaker mounting

Figure 2.3: Detail of dome with projections

The 24.2 channel system consists of 24 matched mid-range Grover Notting CR-1 reference monitors (Classic Audio Designs 2013) and 2 powered subwoofers. The 24 mid-range speakers are laid out in three levels: 12 speakers in the bottom layer evenly distributed around the circumference of the dome (approximately 1m from the ground), 10 speakers in the mid layer, approximately 2.5m from the ground, and 2 speakers directly overhead approximately 0.5m either side of the centre of the top of the dome. The crossover between the mid-range and subwoofers is at 100Hz, making the low frequency speakers slightly localisable. Two subwoofers are used, and are distributed on either side of the dome so as to not disrupt the overall sound image. The signal structure for the system is shown in Figure 2.4. Figures 2.5 and 2.6 show the layout of components in plan and elevation views respectively.

Spatialisation of the audio content is controlled via Max/MSP, using the ICST ambisonic externals (Schacher 2010). Fourth order Furse-Malham encoding was found to give the best result in terms of sound image.
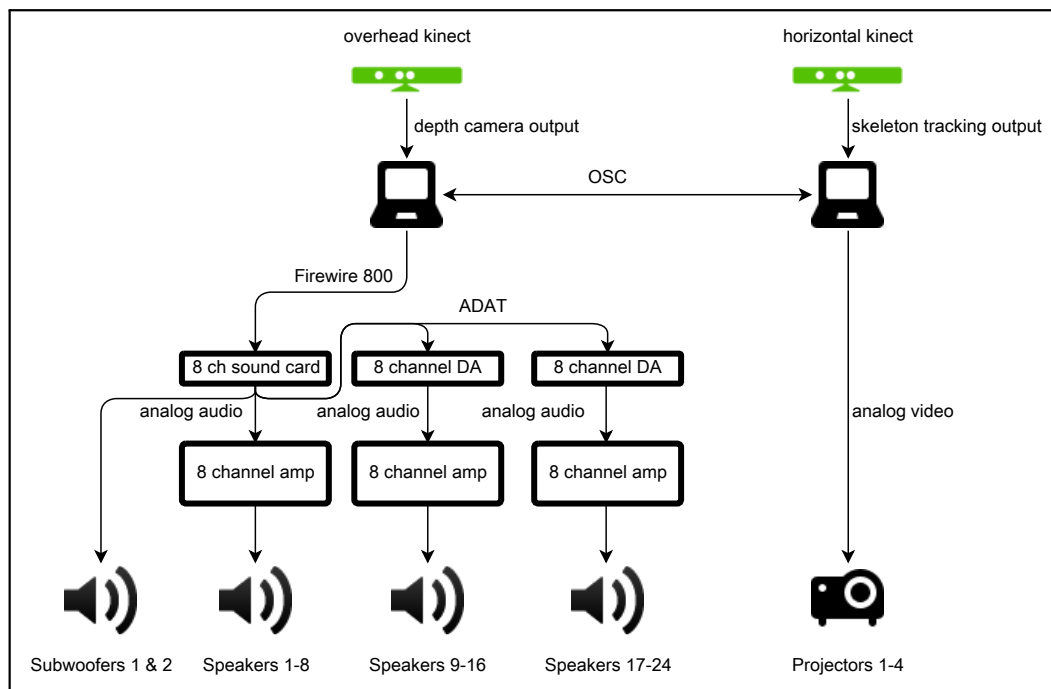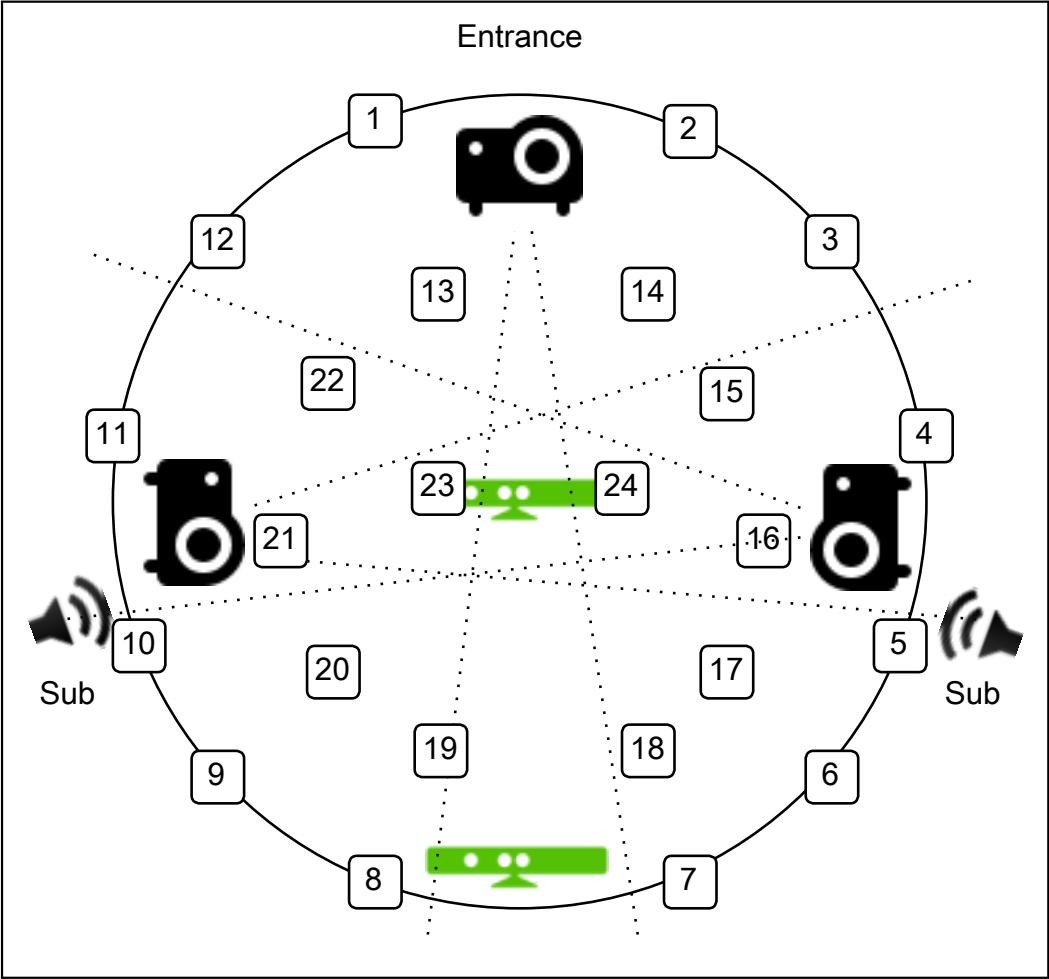

Figure 2.4: Signal flow in SoundLabyrinth

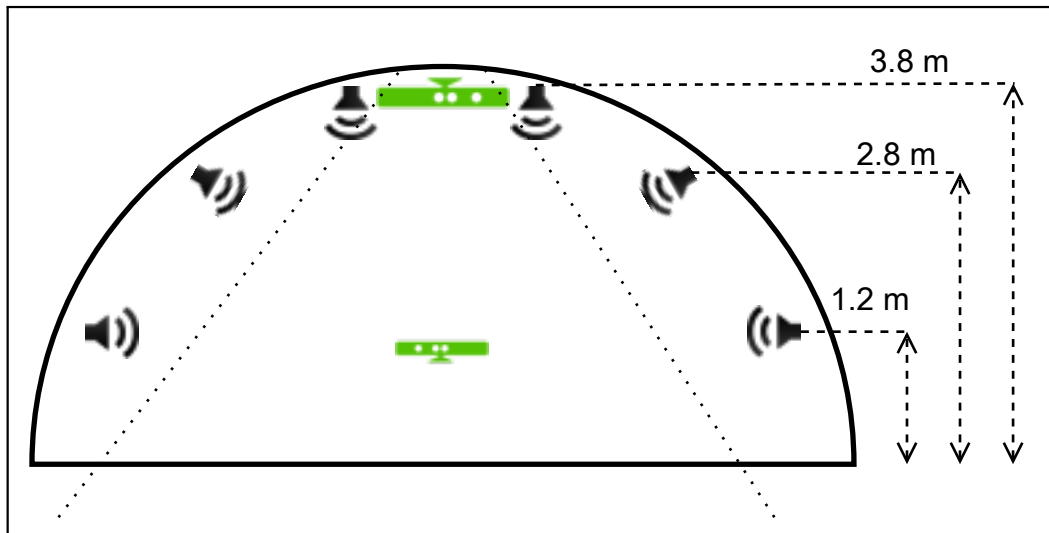Figure 2.5: Speaker, projector and sensor layout

Figure 2.6: Speaker and sensor elevation

2.1.2 Audio content and spatialisation

The starting point for the audio content of the *SoundLabyrinth* lies in field recordings presented in a representational style, recognisably source-bonded.

This material is used to construct a (hyper)realist soundscape: a distant creek bed, slightly to the right of the entrance, with bell birds in the middle distance, and wind chimes to the left. As participants journey through the physical space, the soundscape content shifts, allowing the visitor to pass through urban streetscapes, waterfront ports, desert zones, storms, cathedral interiors. Additional non-representational layers are revealed as the participant explores the space.

This material functions representationally and symbolically, evoking experiences of the natural and built environment, overlaid with sound abstracted from Other spaces, the sublime in the everyday. Samples were drawn from field recordings I had made in a variety of spaces, some explicitly sacred space, including the St. Sulpice Cathedral in Paris and the Zaouia Moulay Idriss II in Fes, and field recordings of traditional sacred performances, including baul chanting, zikhr chanting, qawwali performances, and amplified Hindu temples. This material was contrasted with field recordings of urban and industrial spaces, including train stations, electric motors and mechanisms, traffic and streetscapes, and field recordings of natural environments, including creeks, bell birds,

wind chimes, and wind. An ambisonic sound field recording of a thunderstorm periodically envelopes the space, connecting the the participant to primal sonic experiences of rain and rumbling thunder.

My selection of material deliberately sought to juxtapose elements of melodic and harmonic content with noise, as well as contrast elements which may be identified as culturally 'sacred' against the mundane. Some samples, in particular vocal elements from chant performances, were granularised and stretched to highlight the texture of the material and abstract away from the text and the overt human voice.

Hidden within these sonic landscapes are fragments of poetic spoken word performances, multi-lingual expressions of the experience of engagement with the transcendent sublime, the prophetic voice of the Other. These spatialised voices are elusive, revealed as the participant moves through the space, but unstable and fragmentary, switching between voices at arbitrary times.

In addition to the representational field recordings and narrative/poetic spoken word, synthetically generated sound in the form of spectrally shifting drones, is used to mark entry into a zone of abstracted audio content, in which the participant's gestures and posture interactively effect the soundscape.

The significance of the gestural control aspects of the installation are discussed further in Section 3.1.3, however before discussing these aspects, it useful to cover the basic gestural sensor infrastructure.

2.1.3   Sensor System

SoundLabyrinth uses two Kinect depth sensing cameras: one installed overhead in the centre of the dome, and one installed horizontally at far side of the entrace (see Figure 2.5). The overhead camera provides input into a Max/MSP patch which uses a cv.jit based blob tracking algorithm to provide participant locations as XY coordinates via Open Sound Control (OSC) to the main sound management and spatialisation patch. Figure 2.7 provides a more detailed view of the analysis and spatialisation subsystems. The depth-sensing feature of the Kinect camera simplifies the blob tracking algorithm, as the camera subsystem can be set to ignore data below a threshold depth, eliminating the

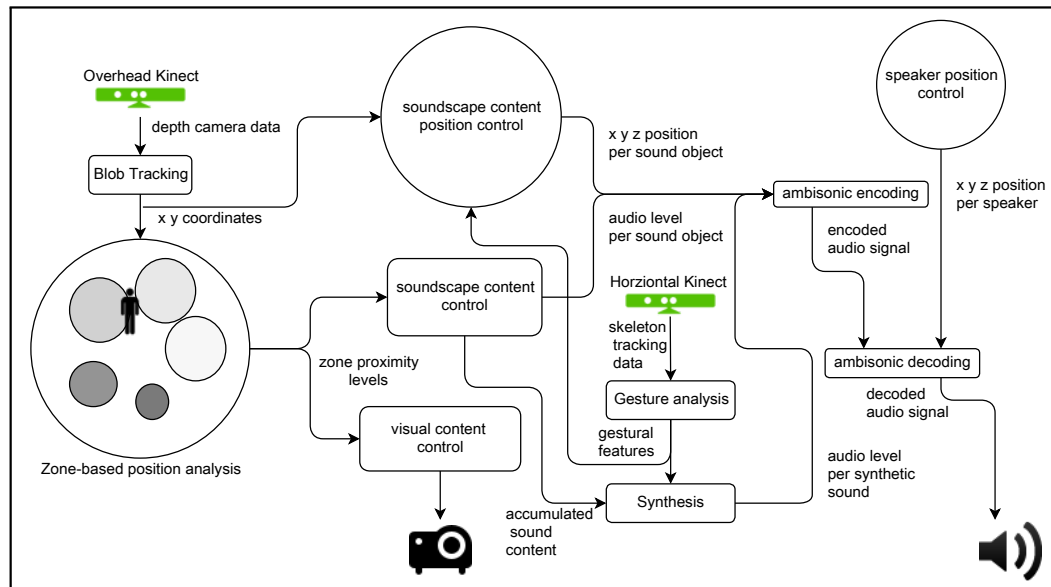need to algorithmically separate the subject from the background.

Figure 2.7: Analysis, spatialisation and synthesis subsystems

Position within the dome is used to smoothly transition between different soundscapes. The Max/MSP *nodes* object provides a zone-based tracking system which provides weighted output from each proximal zone, allowing interpolation between elements of the soundscapes.

This approach provides a natural mechanism for exploration of the *SoundLabyrinth*, as sonic material fades in and out of hearing in response to position, alerting the participant to some level of agency within the system. Rather than operating as a trigger-based system, this approach follows the concept of "pools of potentiality" proposed by Paine (2009, p. 2). Conceptually, the space of the dome is charged with latent sonic material which is actualised by the listening body moving through each zone of potential. The sounds latent within each zone of interaction can spatialised independently from the zone itself. For example, upon entering the installation, the sound of a running creek is encountered almost immediately - in terms of the interaction zone, the sound belongs to a zone immediately in front of the entrance to the installation, yet it is spatialised to come from the far right of the dome. Other sounds in proximal interaction zones are spatialised to the left and the right of the creek. Figure 2.8 shows the interaction zones labelled with

content type. Note that the position of the zones has been adjusted slightly to improve readability and that the colours used in the diagram do not have special significance, but are used to help distinguish one zone from another.

The fluidity of the "pools of potential" model avoids a simplistic one-to-one mapping which would make the transitions from one trigger point to another completely obvious. Rather, the smooth interpolation between zones means that the interactive mechanism is only revealed as the participant continues to explore the space, and also allows the participant to create their own mix of sonic material as their awareness of each zone emerges. The participant's agency within the space is, in effect, an emergent signal which is initially obscured by the 'noise' of the soundscape content itself.

The horizontally installed Kinect is used for gesture tracking of a single participant at a time. The effective range of the Kinect means that participants are only tracked in the rear half of the dome closest to the Kinect. Improvements in the gesture tracking subsystem mean that the system will automatically recognise and calibrate to any humanoid shape within range, without the need for a specific calibration gesture. Hence, engagement of the gestural interaction is seamless with respect to the rest of the installation.

When the participant is within the tracked zone, the visual projection immediately above the Kinect switches to a display which mirrors the participant's gestures. This visual cue assists participants recognise the gestural input capability of the system, by prompting them to interact with the visual display, and thus leading them to discover an additional layer of audio interaction. Figure 2.9 shows detail of participant interaction with the gestural synthesis part of the *SoundLabyrinth*.

2.1.4   Visual Elements

The visual elements of *SoundLabyrinth* consist of three display zones: one immediately above the horizontal Kinect sensor, as described above, and another two on either side of the entrance (see Figure 2.5). A fourth projector is used to highlight the structural elements of the dome itself, using full dome projection from a spherical mirror installed close to the entrace.

The visual elements of the installation are designed to heighten the participant's sense
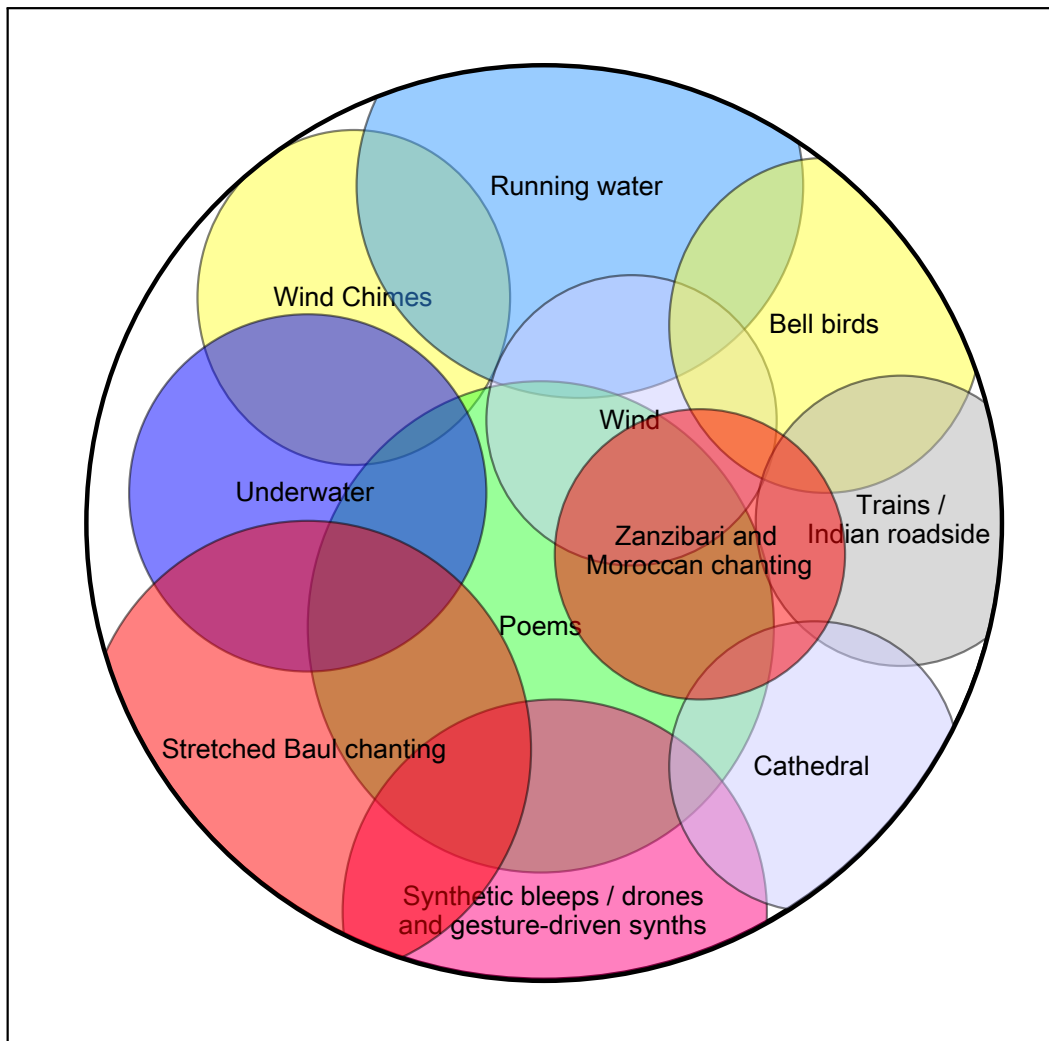
Figure 2.8: Audio interaction zones within SoundLabyrinth

Figure 2.9: Detail of gestural interaction and visual feedback

of immersion in an alternate environment. The two lateral display zones act to visually evoke the sound worlds being explored, expanding the space contained within the physical dome to also include (the memory of) distant locations, while the distal display zone looks into an abstract realm, inviting exploration, and the full dome projection superimposes an ephemeral 'virtual' dome structure on top of the physical structure, hinting at the enfolding of the potential into the actual.

Each display zone is responsive to the position of the participant within the space, changing content as the virtual soundscape changed, providing a multi-sensory clue to the participant's agency within the installation. In particular, when participants entered the effective zone of the horizontal depth sensing camera at the rear of the dome, the rear display zone switched to a stylised mirror image of the participant, providing an invitation to interact gesturally (as often happens when people see themselves in a mirror). Visual content for the display zones is handled by a separate system running VDMX (VidVox 2013) for content management and playback and Mad Mapper (garageCUBE 2013) for geometry adjustment. OSC data is sent from the main sound control patch to VDMX in order to trigger changes in content for each display zone.

The content of each display zone reflects the audio content of the soundscape, some-

times directly, such as images of water and reflection used in conjunction with the creek soundscape, while other scenes use more abstract visual impressions, such as layered footage of streetscapes and abstracted images of night time traffic used with urban ambience.

2.2 Summary

SoundLabyrinth functions as a multi-layered audio/visual installation work which participants can engage with on a number of levels, including:

- architectural space, through the physical structure of the installation itself

- aural space, through immersive ambisonic audio content

- visual space, through multi-channel visual projection

- gestural space, through the interactive affordances of the sensor system, in terms of both the spatial position of the participant within the installation, and their postural position when within the gesture tracking zone

- cognitive space, through the participant's own embodied responses to the sonic and linguistic material they encounter within the installation

In the next chapter, I reflect on how *SoundLabyrinth* operates in each of these dimension, and examine how the work employed the aesthetic principles developed in the first chapter.

encounter

It starts with hands folded just over the navel, right over left, eyes resting on the woven patterns at my feet, soft syllables on my tongue as hands are raised to ears, palms forward, and then close again, resting over the heart, listening, repeating the recitation. Hands on thighs, head, shoulders, torso drop forward in a deep honorific bow to the divine. Language, sweet on the tongue, like secrets whispered to a lover, lilts upward with the straightening body, and then drops down again, into the back of the throat, knees sink to the floor, palms sink into the weave of carpet, forehead kisses the ground. Lips move, language permeates everything.

Later, beads flick through fingers, words lick lips and hang on the breath, moment by moment, breath by breath, experiencing nothing, experiencing the Real.

Chapter 3

Early Reflections

3.1 SoundLabyrinth in operation

In reflecting on *SoundLabyrinth* as an installation work, I first examine the operational realities of the work on the levels of physical, aural, visual, gestural and cognitive space, and then consider the work as a whole in terms of the aesthetic principles developed in Chapter 1.

3.1.1 Physical space

Situated within a 7m x 8m x 4m gallery space, the dome frame filled the room, operating as a self-contained space within the gallery walls. Two sliding doors opened to reveal a low entrance through parted curtains of the dome covering. Participants were requested to remove their shoes before entering the installation itself. Figure 3.1 shows detail of the entrance.

The process of entering the installation was significant in framing the work as a liminal space - sitting in between the typical conventions of a gallery site and an overt sacred site. By requesting participants to remove their shoes, there is an invitation to slow down and enter more deliberately, intimately and vulnerably into the space. Removing footware can be symbolically understood as both an action of humility and an engagement with the present moment. The process of removing shoes required a greater commitment from participants and provided some resistance to the kind of casual engagement that I have observed with other gallery installations of sound art. A soft carpet covering provided an inviting tactile element which differs from the typical gallery experience.
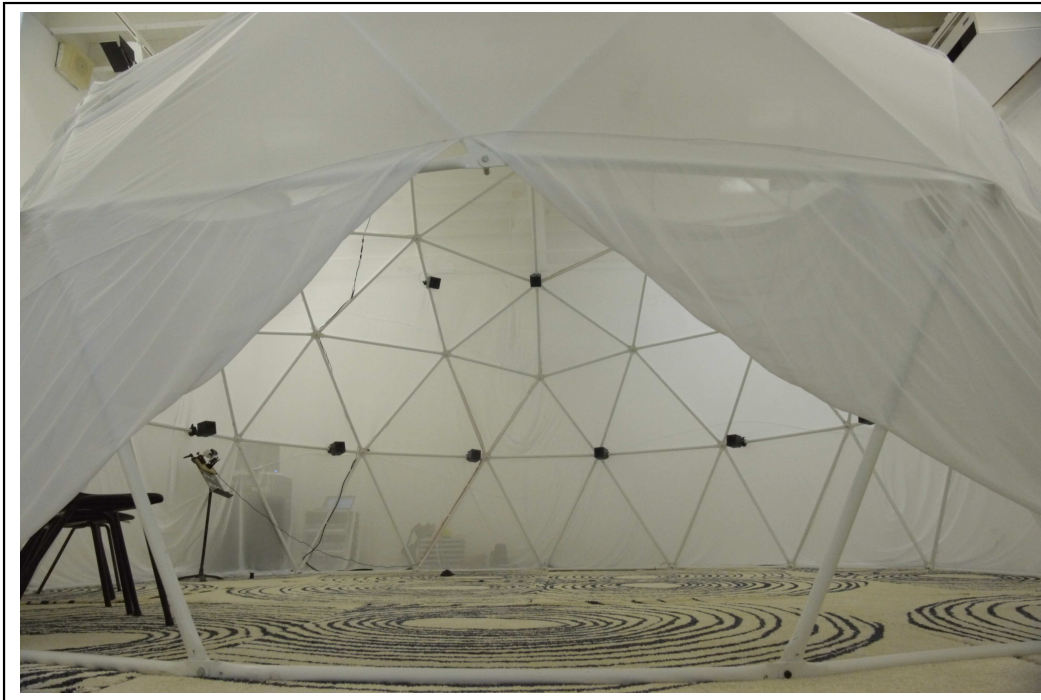
Figure 3.1: Detail of dome entrance

The low entrance required participants to stoop down in order to enter into the structure, further encouraging engagement with the work, echoing both the playful childlike experience of entering a 'cubby', and also the architecture of medieval Arabian fortresses, which frequently employed small doorways as entrances into royal reception rooms. The use of small or tight entrances opening on to large spaces is common feature in sacred spaces, harkening back to the use of caves, but also echoed in the open space of a mosque courtyard which opens up suddenly within the cramped confines of the surrounding bazaar (Nasr 1987, pp. 189-190), and also reflected in more contemporary sacred architecture, such as Mount Rokko chapel is Kobe-shi, Japan (Ando 1986). Once inside, the dome structure opens up the sense of space dramatically. The contrast between the low entrance and the openness of the interior space is intended to evoke the joy of expansion spoken of by Nasr.

The intentional use of these physical elements drew strong reactions from participants, with some remarking that they experienced a unique shift in feeling as soon as they stepped inside the dome, and in their comments participants often connected the

spatial qualities of the installation with feelings of contemplation, calmness and meditation.

3.1.2 Aural space

In terms of the aesthetic principles established in Chapter 1, four points relate specifically to the sound design itself:

- using sound immersively

- using material constantly in flux

- juxtaposition of the perfect and imperfect

- emphasis of texture over text/symbol

The ambisonic speaker array delivered the desired immersive sound environment very satisfactorily. Audio material was able to be dispersed evenly throughout the space without noticeably jumping from one speaker to another, and a reasonable degree of localisation was achievable, including height perception. During initial development, trials were done with only two layers of speakers, however traversals through the space and overhead had an obvious hole, limiting the movement of sound to the circumference as is typical in a single level 8 channel surround diffusion system. The addition of two speakers directly overhead helped significantly in increasing the apparent immersivity of the sonic environment[1].

In terms of Smalley's spatiomorphology (Smalley 1997), the diffused, immersive listening space more closely matches the scale of the composed space than is commonly experienced in headphone or stereophonic listening. The composed space of *Sound-Labyrinth* traverses the spectrum of interior-exterior spatiomorphology. Frequently the setting is external, outdoor spaces - weather features and the natural environment - however the transition to urban spaces and then interior, reverberant spaces, such as St. Sulpice Cathedral, and then to more intimate, internal spaces of chanting, close-miked

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[1] I must gratefully acknowledge the contributions of Angela Grant and Alex Stinson in the tuning of the ambisonic array. Angela's feedback on the use of overhead speakers in particular was of great value.

poetry recitations and abstract synthetic sound, act to lead the participant on a journey through the same process of attending to the external to attending to the internal, even as the participant themselves retains agency in terms of their own physical journey through both the physical space and the compositional space of the installation.

The shifting perspective of different zones is likewise reflected in the gestural surrogacy and source bonding discourse of the material. While the field recordings of natural environments are largely unmodified and recognisable in terms of source, perspectives shift to include less familiar submerged aquatic spaces that give way to desert winds, snatches of language, perhaps not understood by the listener, strange juxtapositions of bell birds and trains, unnaturally echoing spaces, and alien synthetic drones.

Hirst's SIAM analysis framework (Hirst 2006) is useful for reflecting upon the aural content in detail, and thus helps address questions of sonic flux in the material and contrasting juxtaposition in particular. The analysis process consists of sequential stages of Segregation, Integration, Assimilation and Meaning, whereby the sonic objects of the work are identified by their features, their relationship to other another, temporally and spectrally, is established, and then the overall formal structure and emergent meaning is examined. In the case of installation works, the temporal relationships and formal structure is somewhat variable.

In terms of Segregation - recognition of sonic objects - Table 3.1 shows a catalogue of the selected sonic material used in *SoundLabyrinth*. Figure 3.2 shows a paradigmatic analysis of the soundscape in terms of instances of different sonic objects and their temporal relationship in a six minute excerpt of a typical journey through the installation. The instance labels are overlaid on a spectrogram of a stereo mix down of the diffused material. The amplitude wave form is shown above, and the spectral variation of the material is plotted in white over the spectrogram. The audio example is included on the accompanying DVD of documentary material described in Appendix A.

Category	Source	Spectrorphological Features
Environmental	Stream	Rapid, undulating, full frequency, iterative texture, opaque density, centre layer, graduated continuant
	Underwater	Slower, undulating, low-pass filtered, iterative texture, packed density, root layer, graduated continuant
	Rain	Unpitched, sharp, infrequent attacks, patterned, transparent density, canopy layer, attack only
	Wind	White noise, modulating band-pass filtered, translucent density, centre layer, graduated continuant
	Thunder	Full frequency white noise, filled density, attack-decay, root layer
	Windchimes	Pitched, sharp attack, resonant decay, opaqe density, canopy layer
	Bell birds	Pitched, sharp attack, sustained resonant decay, translucent, reverberant, canopy layer, exterior

Category	Source	Spectrorphological Features
Urban	Trains	Broad spectrum, iterative texture, rhythmic structure
	European Cathedral	Highly reverberant, empty density, amalgamated textures (bells, footsteps), interior
	Indian roadside	Distorted, contrasting textures (chanting, traffic noise)
Human	Zanzibari male chanting	Pitched, attack-decay with sustained notes, root-middle layer, packed density
	Morrocan female chanting	Pitched, attack-decay with sustained notes, middle-canopy layer, translucent density
	Stretched baul chanting	Pitched, graduated continuant, canopy layer, transparent density
	French female poetry recitation	Pitched, attack-decay, middle-canopy layer, translucent
	English male poetry recitation	Pitched, attack-decay, root-middle layer, packed density
Synthetic	Cosmic drone	Broad spectrum, sustained, empty density, granular texture, continuant
	Analog synth bleeps	Variable pitched and noise amalgamation, attack-decay, empty density, all layers

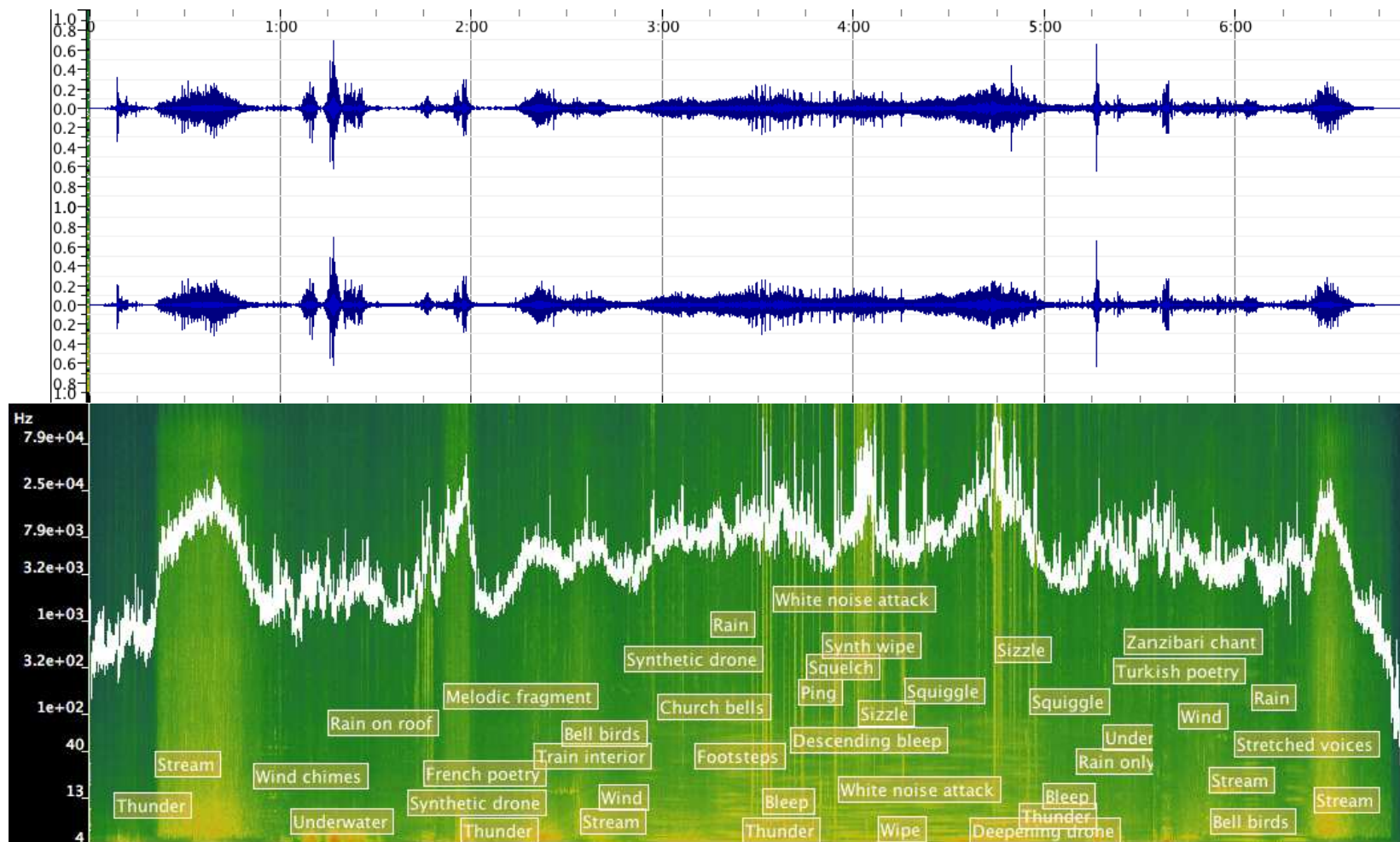Table 3.1: Catalogue of selected sonic objects in *SoundLabyrinth*

Figure 3.2: Temporal and spectral analysis of sonic objects in a SoundLabyrinth traversal

In considering textural Integration, the ambisonic sound field recording of a thunderstorm forms the underlying substrate for the soundscape, and acts as a continuant in Smalley's terms. In developing the soundscape for SoundLabyrinth, the need to create an immersive sound world required some continuing background material in which the various sounds emerging from different interactions zones could emerge. Purely synthetic drones were tried, however this created too much of a 'disembodied', or 'cosmic' atmosphere across the whole installation, and were often spectrally too dense. The more natural feel of the moving storm provided a subtly evolving, spectrally transparent ambience, with sudden punctuations of dense thunder, that connected more strongly to the visceral sense of embodiment that I was seeking to evoke as a backdrop within the installation. The contrast in the spectral relationship between some of the sonic objects increases through the centre space of the dome, and peaks within the gestural interaction zone, where natural sounds are largely replaced by synthetic drones and other synthetic sound objects intended for manipulation through gesture, as seen in the contour of the spectral variation plot in Figure 3.2.

From a temporal perspective, the transition between different sonic zones within the installation serve to create temporal sections to the overall soundscape. The interaction zones clustered around the entrance to the installation contained spectrally related sonic material, such as the running creek and the underwater sounds, or the wind chimes and the bell birds, and because the of the spatial proximity of the zones, these sounds were often temporally related. This approach provides the participant with a relatively natural sonic environment to explore early on in their interaction. As the participant ventures deeper into the space, the temporal relationships between different sonic objects continue to unfold, according to the specific journey of the participant. Figure 3.3 shows the sample journey taken to generate the audio sample analysed in Figure 3.2.
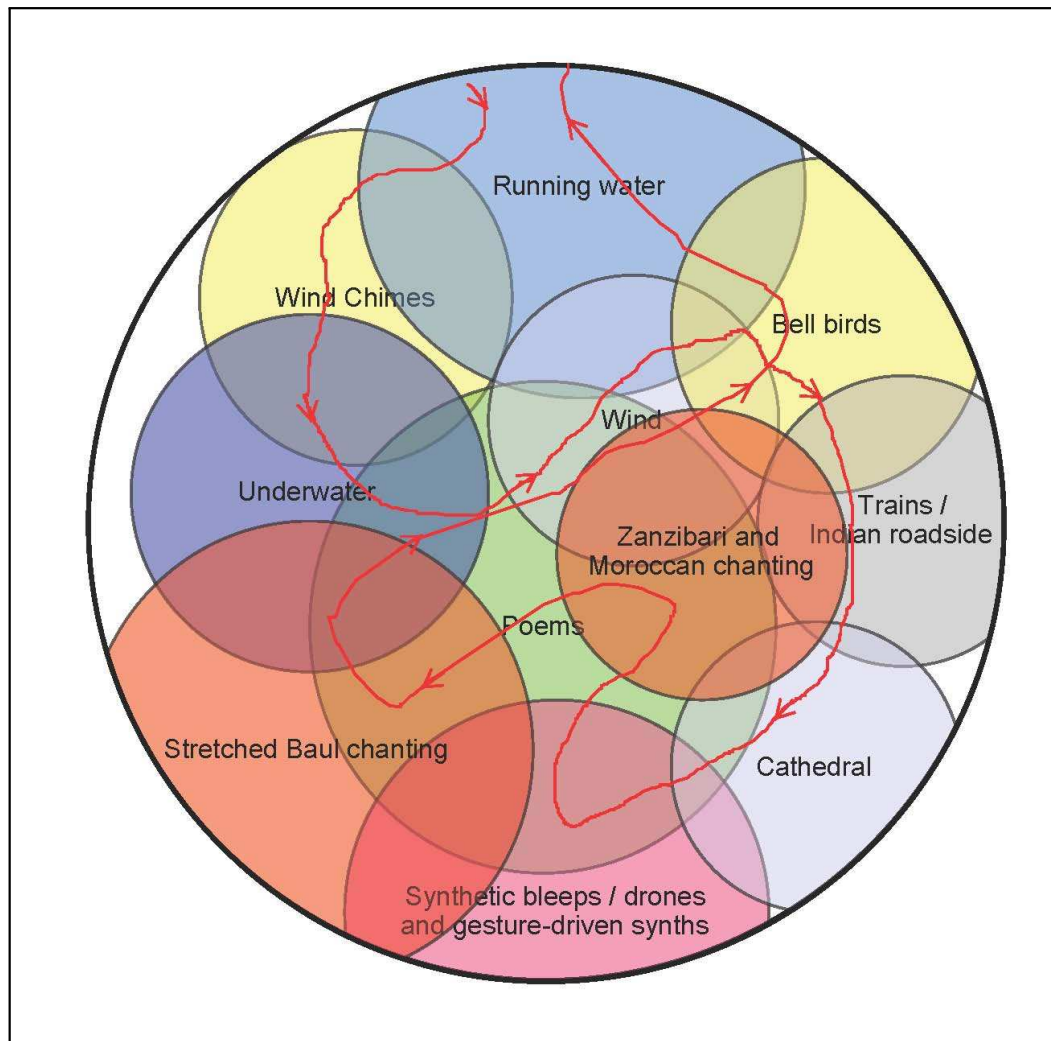
Figure 3.3: Example journey through the interaction zones of SoundLabyrinth

3.1.3   Gestural space

Smalley defines gestural space as "the intimate space of individual performer and instrument" in which the space is "activated by the nature of causal gesture moving through that space in relation to the instrumental source, the whole event being united in the resulting spectromorphology" and in which the "sounding body and performance gesture are physically indissolubly linked" (Smalley 2007, p. 41). It is this kind of intimacy that I seek to create within *SoundLabyrinth*, with the installation itself acting as an instrument which invites the participant to perform within the physical and aural space of *Sound-Labyrinth*. This performance is initially unconscious, as a first-time participant does not necessarily know what to expect in terms of interactive affordances of the system. One design goal of the system is that as these affordances are discovered (if they are discovered), a participant's interaction can become more conscious, and they can enter more deeply into the gestural space of the installation and experience some aspect of the "indissoluble link" between their physical gestures and the spectromophology of the aural space, and beyond that, the affect space to which *SoundLabyrinth* alludes.

Limitations of the Sensor System

As with any technical system, there were a number of limitations in the sensor system which impacted the design and operation of SoundLabyrinth. The primary challenge was that of the range of the overhead depth sensing camera. The coverage achieved in the Melbourne installation of SoundLabyrinth extended from the entrance of the dome to just past the centre and out to approximately 80 cm from the edge of the dome. The horizontal depth sensing camera would pick up a participant from just past the centre point of the dome, covering a triangular area out from the sensor to approximately 4m across the at the widest point. The result of these coverage patterns is that the edges of the dome were not trackable by the system.

Another issue that arises with the use of a blob tracking approach to getting the position of the participants within the dome is that of visual noise in the camera signal. In order to simplify the tracking process, the overhead depth-sensing camera was set to a

range of 3.2m - approximately 60cm above the ground - meaning that an upright adult would be tracked without having to account for any light bouncing off the floor. Camera input was also filtered by blob size, so as to ignore spurious signals picked up by the system.

In practice, both of these limitations were problematic. Upon entering the dome, many participants immediately circumambulated the space, walking around the dome in precisely the area that was not tracked by any part of the system. Others walked into the centre, and then sat or lay down, putting them either outside the range of the valid blob tracking size when sitting, or, when lying down, outside the range the overhead camera altogether.

An additional impact arising from the limited range of the horizontal depth sensing camera was that gestural interaction was confined to the back half of the dome, requiring participants to recognise when this mode of interaction was available. In practice, the visual and audio cues associated with this interactive zone were not sufficient to communicate the modal change in the system. On many occasions, participants experimented with gesture at points in the space where the gestural interaction was not active, and as a result of not experiencing any response, did not continue to explore gestural interaction, even when within the active zone.

The result was that it was too easy for participants to bypass the primary mechanisms around which interaction was designed, making the experience non-interactive and failing to meet expectations.

Performative interventions

To overcome the issues with the interactive system, the installation also had a manually performable mode, which allowed participants to experience the sonic content of the space within SoundLabyrinth, albeit without the same degree of agency.

In instances where the interactive system was unable to adequately respond to the participant, the manual operator became an intermediary between participant and the mechanism of the installation. In the case of ambulatory participants, the manual operator tracked a participant's movement manually so as to activate the aural space of the

installation in the manner in which it was intended to respond. In the case of stationary participants, the operator generated an improvised activation of the aural space. While, activation of the aural space by simulating tracking of the participant position within the dome was possible, simulation of gestural interactions was not possible, due to the complexity of gestural input at a system level. Even if a dual gestural input capability was possible, the manual operator would not be able to adequately mimic, let alone predict, the kind of gestural input a participant might generate.

The intermediary nature of the manual operation mode inevitably restricted the responsiveness of the system, reducing the agency of the participant and limiting the degree to which the participant was able to explore the gestural space of the installation.

3.1.4   Cognitive space

The syntactic, semantic and interpretive overlays engendered by SoundLabyrinth are no doubt unique to each individual participant, however it is useful to consider the general cognitive space of work within the analytical framework of Hirst's SIAM methodology. In particular, Hirst makes use of the difference between sounds which have an indexical function (associated with a extra-musical object or event) and those that operate as symbols, that is, sounds which derive their meaning from their position within the overall syntax of a broader sonic experience (Hirst 2006, p. 66). Hirst suggests that by their nature, concrete sounds are indexical, generating meaning through the associations a listener has with the recognised sounds, whereas more abstract sounds are symbolic, and can only be interpreted in the context of the syntactic structure of the auditory setting in which they are encountered (Hirst 2006, p. 193).

This is not to say that the contrast is only between natural environmental sounds and synthetic sounds. Even synthetic sounds can operate in a indexical fashion if they are recognised by the listener. For example, the sound of a TB-303 synthesiser is distinctive and may carry with it certain associative meaning for a listener who is familiar with it. It is more useful then to speak in Smalley's terms of source-bonding and the progression from concrete (source-bonded) to abstract (source-severed) sound.

As described in the reflection on the aural space, SoundLabyrinth uses a lot of con-

crete sound material, in the form of field recordings and speech, particularly in the zones around the entrance and through to the centre of the space, as shown in Figure 3.3. The more abstract sounds, such as synthetic bleeps and drones, and granularly stretched vocal chants, are encountered deeper into the physical space of dome.

Although the participant is free to head directly into these areas, the typical journey we observed did involve more gradual exploration of the space, and thus participants tended to encounter the more abstract material temporally later in their journey. The transition from concrete to abstract sound is intended to evoke a similar cognitive 'shift' from the mundane to the transcendent, as it were, in as much as direct recognition and association drops away and the listener's attention increasingly shifts toward the purely spectral and temporal aspects of auditory experience. This could also be described as a shift from meaning arising from the memory of past experiences to meaning arising from the experience of the present moment.

In this regard, the cognitive shift from the concrete to the abstract, is simultaneously a shift from the 'abstract' disembodied space of memory to the 'concrete' embodied experience. At the point of greatest sonic abstraction, the participant encounters a new mode of interaction: one that responds to gesture, rather than just location. Through linking physical gesture and sound, there is an intensification of the inherent connection between sound and movement. The gestural interaction is, by its nature, more of an 'intentional' interaction with sound than the ambulatory interaction with the sonically charged space. The participant's movement is imprinted upon the (latent) sonic material, bringing it from the abstract into the actual. In parallel, the participant is immersed in sound: abstracted, virtualised material is not just triggered by movement, or forced upon the participant, but 'brought to life' by them, in a sense, emerging from their movement.

Through the parallel trajectories of concrete to abstract, indexical to symbolic, associative to embodied, *SoundLaybrinth* focuses on the intersection of the embodied/actual and the abstract/virtual. It is in this sense that the work embraces the concept of the embodied sublime.

3.1.5   Participant responses

Participant reactions to the work were quite varied. Common feedback from participants included comments on the meditative quality of the installation, that they found it relaxing, immersive, disorienting or trippy. Some wanted to immediately sit still, lie down, and be passively immersed in the sound field, rather than actively exploring it. Others were initially overactive in their movement and took some time to discover the subtleties of the work that are revealed from more careful movement and exploration within the space. The immersive quality of the audio was frequently commented on.

While some participants remained unaware of the shift to the deeper gestural control mode, for the reasons discussed above, others found the gestural zone added another layer of engagement and spent time exploring this aspect of the work. The responsiveness of the gestural interaction was sufficient to engage those who encountered it, though based on their comments, their conscious attention was often directed to working out how the mechanism of interaction worked.

Engagement with the visual elements of the installation was strong, always drawing comment from participants. A number of participants connected with the linguistic layers of the audio content, enquiring about the languages used and the content and origin of the texts.

3.2   SoundLabyrinth as an instance of sacred sound design

Drawing upon the design principles established in Chapter 1, SoundLabyrinth operates as an instance of sacred sound design in the following ways:

- use of immersive sound, particularly the use of ambisonic field recordings of storms and wind as large scale sound environments;

- juxtaposition of the perfect and imperfect: selection of field recordings included rough / noisy elements as well as more harmonious elements and the transition between different pools of audio material was sometimes smooth and sometimes sudden, allowing scope for experiences of relaxation, surprise or disorientation;

- transformative interaction with geographic place and context through the use of field recordings from diverse locations, dynamic spatialisation of sound to create a shifting, and potentially disorienting sense of space and position;

- interaction with the social context: the installation incorporated elements of ritual space, resistant to the commodification of sound/music through presentation as a unique experience, rather than a possessable object; the removal of shoes and low entrance also created a liminal space separate from the everyday;

- exploration of the material of sound/text, through the use of granularisation and temporal stretching of source sources, and the elision/disruption of spoken word content;

- being structurally and temporally non-deterministic, allowing the participant to structure the audio content through their interaction, with the content varying over time in order to strike a balance between repetition and flux (e.g. similar or same sounds associated with the same position within the installation allow for gesture-sound pairs to acquire meaning, while always undergoing changes so as to not become mere replications of a previous moment).

In reflecting upon *Sound Labyrinth* as a work oriented toward enabling exploration of, or encounter with the sublime, a number of layers to the work emerge as significant.

If the representational sound content operates at the level of memory and association (recalled experience), and the poetic spoken word operates at a linguistic level of thought (abstracted experience), the synthetic, gesturally controlled content operates at the level of sensation (immediate experience), that is, as the level of the sub-liminal. In Smalley's terms, this material operates at the level of first order gestural surrogacy.

The representational sound is at once specific (concrete), as a recording of an actual instance of water flowing, birds calling, thunder rumbling, etc., and general (abstract), as a *type* of any such instance, by virtue of the generalising operation of human memory extending the specific subject into the abstract object.

The same material, granularised, is at once abstract, in as much as it has been disconnected from its source and is "unrecognisable", and concrete, in the sense of being *only*

sound, disconnected from the objectifying process of recognition.

Upon this material, the specific gestural patterns of the participant, in the form of their exploratory trajectory (their specific personal history) as well as their immediate physical gestures, are imprinted.

This forms the *sublime* layer of sound content, operating beneath the threshold of thought, beneath the threshold of recognition, at the third or, even remote, level of gestural surrogacy. The participant, as an immersed subject within the immanent field of the installation, *embodies the sublime*.

Where *SoundLabyrinth's* technology failed to actively enfold aspects of a participant's interaction, the space of the geodesic dome still succeed in creating a context for engagement that was commonly commented on as in some way transformative. Whether these experiences constitute an encounter with the sublime can not be known. Approaches to the sublime, when considered as the constant flux beneath each moment of experience, are always asymptotic.

From my own perspective, *Sound Labyrinth* functions as a powerful space in which to work with sound. The immersive qualities of three dimensional surround sound connected to gesture and responsive to movement within the space open up the deeper conceptual space of the interface between embodiment and the abstract. Likewise the relationship between embodied sound cognition, emotion and detailed design of audio content offers a significant area of future work. The sublime, by its nature, can never be grasped, and there is still much more to explore.

anamnesis

The hum and clunk of an escalator forever looping, the drone of its motor wavering in the air beneath the rhythmic cycle of steps that carry me forward without walking, destination unknown.

The dense cloud of cicada song, pulsing, pushing in through skin, ears, breath, until nothing remains but sunlight and insect drone.

The fluttering echo of a single clap inside the stone hillside tomb in Petra, carrying with it the resonance of past chants, prayers, and mournful cries . . . now dust.

The metallic distorted blare of chanting blends with the anaemic bleats of scooter horns and two stroke motors. The traffic noise gradually fades, but the chanting goes all night, dulled only by the thick, green concrete walls of the hostel. In the morning it is still there.

The sharp, dry crack of bone hitting sun-bleached bone. Eucalyptus forest and dry granite hills swallow the sound. The sun beats down. The dry creek bed lies below, full of smooth stones sitting in the sand.

The silence on top of Jabal Shams - not a breath of wind, no trees, no birds, no leaves underfoot, as if the world itself has been erased.

The thrumming pulse of hand drums, chants and clapping hands, pierced by sporadic ululations from the crowd in Dar Tazi. One girl falls into a trance, held by a friend until the ecstatic moment passes.

Snatches of white noise, glitched beats and alien textures leak from one hundred pairs of headphones holding their captive audience entranced. Lacking a connection, I remain stranded on the shore of sounds just beyond reach.

Chapter 4

Sound, Memory and the Present Moment

Anamnesis: an effect of reminiscence in which a past situation or atmosphere is brought back to the listener's consciousness, provoked by a particular signal or sonic context.

Synecdoche: for someone listening to a complex sound ambience, the ability to valorise one specific element through selection.

(Augoyard & Torgue 2006, pp. 21, 123)

Sound art is inescapably temporal, and in closing, I am bound to rely upon you, the reader, to recall sonic experiences that give context to this text, and likewise to have selected those threads of meaning and continuity from which meaning can be woven. If, after Bergson (1988, p. 176), we can consider perception of the present moment to consist of recollection of the accumulation of experience, triggered by selective 'listening' to this text, then it is appropriate to build this final chapter around the concepts of anamnesis and the synecdoche.

In setting out to explore the concept of sacred sound - experiences of sound that in some way transcend or exceed both rationality and sensation, and in so doing, create a connection, however fleeting, to something beyond thought and experience - I sought to establish a aesthetics of the sublime for sound design.

Reviewing the history of sonic experience, both sacred and mundane, a thread of selective reading and listening connected various points upon the journey, recapped in Figure 4.1.
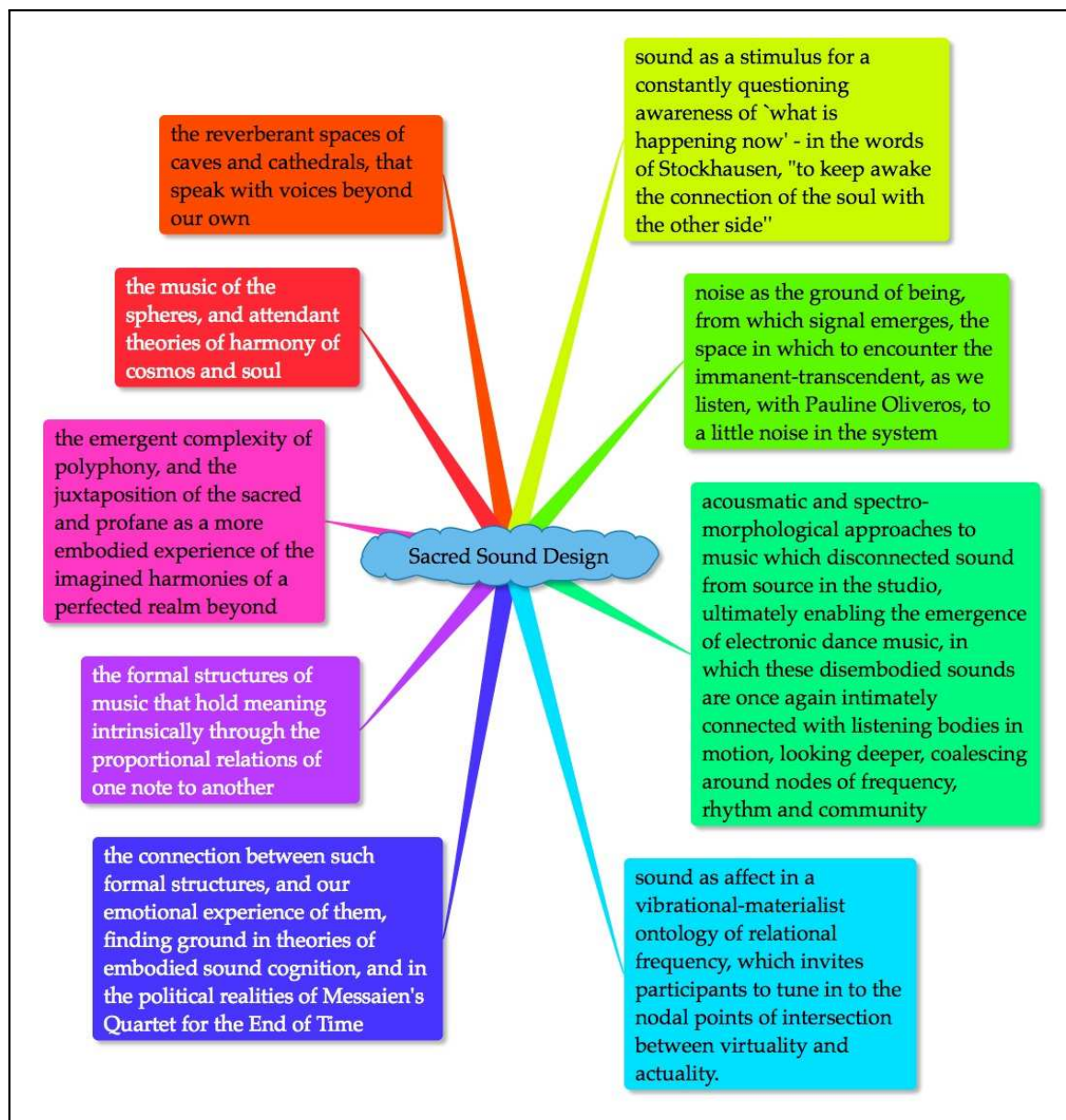

Figure 4.1: Concepts of sacred sound design

In seeking to put these points into practice, *SoundLabyrinth* was conceived as an immersive sound installation, responsive to the movements of participants who enter into it, the potentialised sonic space of the installation activated by the participant, who's jour-

ney is marked by intertwined trajectories of transformation, from concrete to abstract, indexical to symbolic, associative to embodied. Despite limitations in the technical aspects of the interactive system, which limited its responsiveness, this focus on the intersection of actual and virtual, sacred and mundane, the embodied sublime, and the immersiveness of the experience, appears to have succeeded in creating a space in which the aesthetics of the sublime I proposed for sound design were operating.

Since the initial exhibition, *SoundLabyrinth* has been installed at the 2013 International Symposium of Electronic Arts in Sydney (Alsop & Pedersen 2013), and at the 2013 Village Festival in Edinburgh Gardens, Fitzroy, Melbourne. In these instances, the overhead blob tracking approach to position tracking was replaced with two horizontal Kinect sensors which fused data from skeleton tracking to provide more robust coverage of the space. This was an improvement on the overhead blob tracking approach, but still did not provide full coverage of the space. It is expected that in future iterations, three or four horizontal Kinect sensors will provide full coverage and improve the ability of the system to handle multiple participants.

As an experiment, gestural interaction was also adjusted to provide more direct manipulation of concrete sound material. Participants with a knowledge of gestural systems, particularly those who recognized the Kinect sensor, used arm-waving gestures to explore the gestural affordance of the system. Some participants noted that they would not normally use such gestures in an installation setting, and did not discover these aspects of the system until prompted. Participants remarked on a sense of satisfaction with gestures which mapped to obvious changes in sound, such as the 3D panning of a sound, but were frustrated by other more subtle effects, such as reverb changes, as they did not get a clear sense of agency or relationship.

One element emerging from the various installations of *SoundLabyrinth* is the importance of relational gestures - i.e. gestural interactions between human participants, rather than gestural interactions between the participant and the system. *SoundLabyrinth* had been conceived as a solo experience for the participant, with interactive elements designed to heighten the participants individual experience of the sonic space of the installation. Early work on enabling the *SoundLabyrinth* system to respond to the gestural

relationships between two or more participants, such as linking the volume of a sound to the distance between two participants, with other effects on the sound being controlled by individual gestures, have produced greater sustained interest in the interactivity of the system compared to the solo gestural mode.

In analysing the overall structure of *SoundLabyrinth* as a work, Hirst's SIAM framework (Hirst 2006) proved useful in helping to reflect on the way in which individual auditory components of the work functioned as an integrated whole, and in the context of an interactive work, generate meaning for the participant. Further application of this approach will help to refine the content of future iterations of *SoundLabyrinth* and related works, and a more fully developed exploration of the SIAM methodology as a tool for analysing interactive works is a topic worthy of further work.

At a philosophical level, the process of developing *SoundLabyrinth* has uncovered many avenues for further investigation, not the least of which being the comparative analysis of contemporary theories of sound and affect with theories of sound from antiquity. Thinking about sound itself appears to move in cycles or waves, and perhaps we are once again coming into phase with many of the cosmic intuitions about sound and human experience. The ideas of sound and vibration being somehow fundamental to existence, indicative of eternity, exceeding not only audition, but experience itself, arising from the generative ground of chaotic noise or abyssal silence, all point to sound as a medium in which human experience and the sublime intersect.

Keep listening. . .

Appendix A

Supporting Documentation

The attached DVD contains documentary footage of the *SoundLabyrinth* installation, including comments from participants, a stereo audio rendering of the example journey analysed in Chapter 3, and other supporting material, including a copy of the Max 6 patch as it was used during the initial installation. Generic versions of the ambisonic installation control system are available from the author for research purposes upon request.

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