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Pod: A Multi-Sensory Sound Interface

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Abstract. This paper describes the development and presentation of Pod (2009-present), a multi-sensory sound installation involving sight, sound and touch. Pod consists of large inflatables with speakers inside emitting low-frequency sounds - sounds that the audience are encouraged to touch through the medium of the vibrating skin of the inflatable. A consideration of the use and management of multiple sensory modalities, techniques for combining audio and visual into a cohesive work and the concept of the interface as an exploratory boundary between audience and sound are presented.

Keywords: Sound installation, tactile, multimodality, multisensory, audience engagement, interface metaphors.

Introduction

This paper describes a sound interface, not - as the term is commonly used - a controller for musical parameters such as pitch and volume, but a boundary between the audience and sound; a tactile membrane which converts audible frequencies into tangible vibration. The work described herein is Pod (2009-present), a sound installation which has been presented publicly several times since its debut, at venues such as Oxford's Light Night and the Barbican in London (fig. 1). The piece is an ongoing collaboration between artists Alison Ballard and Mike Blow, and grew from a desire to encapsulate sound in such a way that it was given form and substance.

Aesthetically Pod consists of low-frequency sounds emanating from inside large inflatable spheres (the 'Pods'). The first incarnation, at Shunt under London Bridge station in 2009, used 6 climb-in balloons each with an inflated diameter of around 2m. Each balloon contained a pair of speakers in a cardboard resonator tube fed from an external amplifier and a MAX/MSP patch, which provided low frequency sine waves of around 75Hz. Since 2013 the piece has continuously evolved and is now presented as two 1.8m PVC spheres which are much more robust and allow for outdoor siting. The audience are encouraged to touch and hug the inflatables to feel the sound vibrations with hand and body. The piece is simple in concept but elicits a range of responses and behaviours from visitors and is very much a live sound interface of a tactile and experiential kind. As well as being a sound-touch translator it is also cross-modal work where the colour, shape and sound are all designed to mutually reinforce the audience experience (see discussion).

Figure 1. Pod at the Barbican, London (Mike Blow)

Context

Pod currently consists of two 2-meter inflatable spheres emitting low frequency pulsing sound. The public are invited to touch and hug the spheres, which resonate with the frequencies played inside. Due to its use of inflatables this work has overtones of play, like Jeff Koons' balloon animals (the majority of which were actually steel, e.g. Balloon Dog 1994 - 2000) or Florentijn Hofman's giant Rubber Duck (2009 - 2013) - and indeed the piece can be seen as sonic playground, multimedia artwork or physics demonstration depending on the context in which it is shown. Both Mark Bain's Sonusphere project (2003) and Kurt Perschke's Red Ball Project (2001 -) use large inflatable spheres, Bain's piece being especially relevant as it used the sphere to present sounds coming through the earth beneath the building in which it was situated. However both pieces have at their core an engagement with space and are have architectural motivations, a distinct difference to Pod. Although careful siting is a factor in our installations, the piece has grown out of the idea of the visceral experience of sound rather than trying to comment on the space in which it is sited. It seems to turn the attention inward rather than outward and in this respect it shares more ground with the experiential and meditative motivations of the Luminaria by Architects of the Air (1990 -). With speakers inside, Pod is a tactile listening experience; the low frequency sound and vibrating skin of the spheres encourage the audience to listen to the sound through their bodies as well as their ears. The resonance of the body's internal cavities and the possibilities of corporal listening have been the focus of Bernhard Leitner's Sound Chair (1976) – deriving partly from Leitner's belief that sound affects our physical and mental wellbeing (Licht 2007 p. 42) - and Kaffe Matthews' Sonic Armchair (1997) and Sonic Bed (2005), all with embedded loudspeakers. Works that exploit or make apparent the vibrational quality of sound and its interaction

with materials are at the core of the sound art canon, Alvin Lucier's work and David Tudor's Rainforest IV (1973) being obvious examples. Notable also is Laura Maes' Oorwonde (2011), a multisensory experience that aims to create the experience of an 'aural operation' using speakers and vibrational transducers embedded in a steel hospital trolley. Pod focuses on the whole-body experience of sound, but arguably in a more visual and playful way than these examples. Nevertheless, the idea of a new way to focus on audio (meditative and restful, and often with the eyes closed) seems to be common to most of the corporeal listening works and Matthews' sound bed incorporates the same ideas of a collective sound experience, being big enough for several people to lie side by side.

Technical

As mentioned in the introduction the first incarnation of the work used climb-in balloons, which are simply larger and slightly tougher versions of party balloons with a 10cm neck hole. The sound equipment consisted of two 6" woofers facing each other inside a cardboard tube which helped combine and resonate the frequencies from the speakers. The speakers were fed with a sine waves at slightly different pitches to produce slow pulsing beat frequencies. All of these technical decisions were strategies to try and achieve the appearance of very low frequency sound within the limitations of relatively small speakers and restricted entry to the balloons.

In 2013 the piece was commissioned for the Whitley Arts Festival in Reading and as the site was to be outside the fragile climb-in balloons were replaced by two PVC inflatables which, if punctured, just deflate slowly rather than exploding. The internal equipment also evolved, using MP3 players and T-Class 12V amps powering standard installation speakers all being run off a 12V leisure battery. We also fitted a low-wattage omnidirectional LED light to give a subtle glow. As this equipment was inside the Pods they were fully autonomous and able to run for many hours outside without attention.

A desire to be able to adjust volumes on the fly and for more interest in the sounds has led to the current version, which retains the speakers and amp but broadcasts the sounds to the Pods over a proprietary performance radio system. In this way the sounds can be created live from a Pure Data patch and consist of a long drone loop of a low-frequency pulse of around 75Hz with random frequencies chosen by the software of between 100 and 300 Hz superimposed upon the drone, changing every 10-12 seconds. The result of this is that the tactile element of the piece is retained but the sonic element has more movement and interest as the fundamental (lower) and harmonic (higher) frequencies randomly develop dissonant and consonant intervals, a range of beat frequencies and harmonic tension and resolution. The situation is made more variable by the fact there are always two Pods installed and the interactions in the frequencies are not just created by the bass and harmony sounds of one alone but exist in the space between them and between each of their randomly-chosen pitches.

Discussion

Experience not Control

Pod is presented not as a way of controlling sounds (the piece does not react to the actions of visitors) but as a human-sound interface. The experience of being able to feel sound physically at relatively low volume is one which many people seem to find engaging (it is notable that it is very possible to talk at normal levels right next to a Pod as the volumes and frequencies used do not interfere with normal speech). The interface has obvious affordances due to its size and material and visitors often spend quite a long time listening to, touching, hugging and even lying against the Pods (fig. 2). We have had instances of people sitting at the base of them and 'soundbathing' and one visitor, in an installation in a hall with a sprung floor, lay between them to experience the vibrations through his whole body. Our intention is not educational as such, although of course there is an element of revealing that sound is in its very essence movement and vibration to people who perhaps had not previously considered this, but more as a way to give the audience a new experience - a combined sensory event of sight, sound and touch, a tangible version of Michel Chion's synchresis (1994 p. 63). The piece creates a situation where people are encouraged to spend time and focus their perception, which we agree with Viktor Shklovsky is "an aesthetic end in itself and must be prolonged" (1917).

Figure 2. A visitor interacting with the Pods (Alison Ballard)

We try not to impose any readings onto the work apart from the name which perhaps implies something containing an unknown life or technology. In addition the sounds used are abstract and non-referential. This engineered gap in the audiences' knowledge conforms to Umberto Eco's idea of the 'open work' - a purposeful 'non-explanation' which encourages the audience to form their own readings of the Pods at the intersection of the work itself and their immediate (perceptual) and prior (remembered) experiences. Eco suggests that:

> The search for suggestiveness is a deliberate move to “open” the work to the free response of the addressee. An artistic work that suggests is also one that can be performed with the full emotional and imaginative resources of the interpreter. (Eco 1989 p. 9)

Cross Modal Correspondences and Sound-Object Binding

Pod explores the perceptual relationship between the seen and heard; it has been found through experience that low-frequency drones match the shape and colour of the inflatables better than high-pitched or narrative sounds, and that there is an optimum volume of sound to match the size of the object. While this is clearly subjective, ubiquitous cross-modal correspondences (as distinct from synaesthetic mappings which are unique to one person) have been a focus of my own work in recent years and there is some research from other areas to back the idea up. Psychologist Charles Spence notes that “people consistently match high-pitched sounds with small, bright objects that are located high up in space” (Spence 2011), revealing common correspondences between pitch, size, physical location and brightness. Certain colours are often thought of as being associated with particular types of sounds; bright colours for high pitch and dark for low; in ‘Concerning the Spiritual in Art’, Kandinsky uses colour and timbre almost interchangeably, pairing red with “a sound of trumpets, strong, harsh and ringing” (Kandinsky 1977, p.40) and blue with flutes, cellos and double bass (ibid.

p.38), and futurist Carlo Carrà talks of painting “Reds, rrrrreds, the rrrrrreddest rrrrrrreds that shouuuuuuut” (Carrà 1913 p.54). It is difficult to say if these effects are universal or cross cultures, but there is some evidence for intuitive sound-shape mappings. Ramachandran and Hubbard’s ‘Bouba Kiki’ experiment (a restaging of an original experiment by Köhler (1992. p224)) asked participants to match two shapes, one rounded and one spiky, with the words ‘bouba’ and ‘kiki’. 95% of respondents chose the rounded shape as Bouba and the Spiky one as Kiki, lending credence to the idea of sound-shape correspondences as a basis for language and suggesting “that there may be natural constraints on the ways in which sounds are mapped on to objects” (Ramachandran and Hubbard 2001, 2003).

Deriving from the idea of crossmodal correspondences, an important consideration in the piece is that the look, feel and sound of the Pods work coherently to create an enhanced multisensory experience. In practical terms this means that:

- the shape of the pods should be matched to a 'round' sound, in our judgement one that is continuous, fairly soft and changes slowly without spikes or sudden transients (there is also of course the common musical usage of 'round' which roughly equates to sound rich in low-mid frequencies and without much treble). Sounds of electrical hums and buzzes were tried in the pods and rejected as the sounds were far too dynamic to appear as a unified whole with the shape, an observation which recalls the Buba Kiki experiment described above. When auditioning sounds, the rule of thumb is that if we become aware of the speaker - that is, if the Pod loses its sensory unity and starts to feel merely like an audio clip within an inflatable - the sound is dismissed. Although this may appear an esoteric test, it is usually clear what works and what doesn't, and Alison and I tend to agree without much discussion on which sounds are successful.
- the sound of the Pods needs to suit their colour and soft glow. Kandinsky equated low sounds with blues, and from experimentation low pulsing sounds seem to work most effectively with the shape and colour of the inflatables.
- the volume of the pods matches the volume of the sounds. A subtle observation but it has proved important to match the size of the physical and audible elements of the work. The volume of a sound is not simply a measure of loudness, but of physical volume occupied by the soundwaves. A sound’s physical size increases with volume; with more energy it spreads further and fills more space. This would indicate that the volume of a sound in a multimodal work should be carefully controlled to match the size of the object it is presented with if the desire is to create the best possible match. Rolf Julius, a master of work exploring audiovisual relationships, shows just how seriously he took this topic in this quote:

  > My problem with the glass plate onto which I had sifted gray cement pigments: the glass was $1m^2$ in size and the cement color a little too dark for the gray sounds I had prepared for the piece [...] But what about the size of the surface, how do color surface and sound surface relate to each other? And how dense were the musical molecules? I had the feeling my music would just barely be enough for an 0.8m2 plate. So I had to make corrections, I had no choice but to purchase a smaller plate of glass (Julius 1995).

Another important aspect of the work is that the visual and sonic aspects enhance each other to create something that is greater than the sum of their parts. An interesting exercise when experiencing a multisensory work is to imagine it with only one sense at a time and note what is lost compared to the complete work. In this case, a low hum or a glowing blue ball on their own carry much less interest than when the two are combined, at which point the piece seems to become imbued with new readings not attainable by either element alone. It can be argued that the point of a multimedia piece is not the senses themselves but the space between them that is created by their interaction, the phenomenon Michel Chion calls ‘added value’ (Chion 1994 p. 5).

Finally the audience needs to be convinced that the sound and object are part of the same entity. In addition to the quality of the sound matching the object as described above, the two need to be perceptually bound. Sound-object binding is a vital part of any multisensory work and in this case spatial proximity (the speakers being physically inside the object) is used to join the sonic and visual elements in the perception of the audience (for a detailed treatment of sound-object binding, including other strategies and the use of cross-modal correspondences in audiovisual work, see Blow 2014).

Pod as an Interface

Pod is obviously not the normal type of interface or control surface we are used to, with defined and repeatable mappings between actions and results, and it doesn't allow us to directly change the nature of what is happening inside. What it does do is conform to some of the basic functions of an interface. Like Tony Smith's Die (1968) and every game controller, it is ergonomic, being built to the scale of a grown human - as Smith has said, neither smaller ('an ornament') or larger ('a monument'). Pod meets us at our own scale and invites us to engage. As Juhani Pallasmaa says "A work of art functions as another person, with whom one unconsciously converses" (p. 66). This is probably rarely as literal as in the case of Pod, with its affordances of touch and hugging initiating a tactile conversation. The sense of touch is key to the work and rewards the sensitivity of the fingertips and the resonance of the chest with a haptic rendition of sound, which grows and fades in time with the sonic pulsing of the soundtrack. The material is important, the welcoming bounciness, relative warmth and resonance of the skin lending the work an apparent vitality and life; for all that it does not respond electronically to the actions of visitors (a deliberate strategy to stop audiences getting caught up in a 'button pushing' mentality), Pod is a live interface that accords new experiences in response to varying pressures from the hands and body, and sounds quite different if you press your ear against the skin.

A few visitor reactions from recent trials with schools at the Science Museum in London:

> '[I like that] it's blue, really big, soft, squashy, nice to hug!' (Student, 8-9)
>
> 'It vibrates so the sound bounces off!' (Student, 8-9)
>
> 'That's how deaf people hear, right? By feeling it' (Child 9)
>
> 'It makes you relax' (Student, 9-10)
>
> 'I could sleep on it!' (Adult)

The Interface as Metaphor

Finally this example leads us to consider the idea of an interface which tries to represent the same information in a number of ways. Explored in computer science, where users' prior knowledge of the affordances of desktops and folders is leveraged to facilitate intuitive interaction with the underlying digital system, Pod raises the idea of sensory correspondences between elements of an interface as an aid to interaction - of using one modality as a metaphor for another. Indeed this exact idea has been tried in Apple's Sonic Finder (Gaver 1989) and a colleague who regularly used it remarked that when it disappeared in an OSX update, "everything felt slippery".

Of course aligning the look, interaction technique, and sound of an interface in order to produce a stronger experience is often at odds with the idea of a reusable 'abstract' control surface which can be mapped and remapped onto any musical parameters. However when transposed to compositional and live music interfaces the thought leads one to ask which control techniques or visual forms intuitively map to particular sounds, and whether any added value in terms of playability and understanding of sound or performance might be created by exploiting these associations.

Conclusion and Further Work

This paper has described the evolution and presentation of the work Pod by Alison Ballard and Mike Blow. The work was presented in Oxford and Reading earlier this year and is still in active development. It has recently received a commission by the Science Museum in London which has promoted the educational aspects of the work. It has also won Arts Council funding to develop a spatially extended version with more inflatables for public display outdoors. For such a simple piece Pod seems able to capture and hold the visitor's attention with great success and we believe this is due to the fact that the shape, colour, feel and sound of the piece work together to create an intriguing and very physical multi-

sensory experience. It is also an interface with sound which requires absolutely no prior knowledge to use, with obvious affordances and playful associations. Pod is perhaps as close to hugging sound as it is possible to get.

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