

Disrupted Architecture: Reimagining Buildings through Sound

Michael Paul Blow

Plymouth University
Drake Circus, Plymouth, PL4 8AA, U.K.
michael.blow@plymouth.ac.uk
www.evolutionaryart.co.uk

Abstract

This paper discusses work which changes our perceptions of the built environment, and uses as examples two sound installations, *Machines for Singing* (2006) and *Torch Song* (2011), which are designed to make audible hidden forces and events within the fabric of a building and to disrupt our preconceived ideas of architecture. Continuing a long lineage of soundart works which engage with architectural space, the pieces stream sounds collected from around a building to a listening point. By hearing the effect of human and environmental forces on the sounds (*Machines for Singing*) or controlling them via a custom-made interface (*Torch Song*), visitors gain a renewed understanding of the forces at play within the structures around them.

Keywords

Sound Art, Architecture, Interactive Art, Installation, Composition, Music Concrete

Introduction

This paper discusses one of the longest-running themes in soundart practice, that of the disrupting our understanding of architectural space using sound, referencing the works *Machines for Singing* (2006) and *Torch Song* (2011). These pieces disturb our concept of architecture as merely a static stage set against which human life is played out, and recast it as a living, breathing entity. Buildings are usually perceived as immobile structures, built of impermeable materials, solid and unchanging. However buildings respond to their environment in a similar way to their builders, expanding in heat, contracting in cold, weathering, creaking and decaying over time. Like us they are born, live, and die.

The works aim to increase peoples' awareness of the hidden life of a building and disrupt our preconceptions about the built environment by presenting sounds captured in real time from the building's structure as an audio composition. Both pieces stream sounds from around a building using a mixture of microphones, contact mics and electrical transducers. *Machines for Singing* creates a composition from sensors responding to the behavior of the structure and its inhabitants, while *Torch Song* allows visitors to activate and play with the sounds directly by shining torches onto light sensors in a custom-built control panel. In

both cases the soundscape of disembodied clicks, hums and drones that results brings new readings to the room and building in which the pieces are presented; the sounds seem at times soothing, at others mysterious and threatening and confront assumptions that buildings are silent, static and dead. The sound extends the architecture, giving it a sense of a building as a living thing – to paraphrase Goethe, ‘unfreezing the music’ – a place full of unseen, unexplained events, subject to time and decay, and shot through with electrical and hydraulic nervous systems.

Sound and Architecture

Soundart as a discipline – especially as it emerged in the 1970's and 80's - has historically been concerned more with the physics of sound and audio phenomena, and exploring frequencies and wave dynamics, than with established musical qualities. That is not to say soundart can't possess harmony and rhythm, but the freeing of sound from distinct tuning systems and instrumental composition by early practitioners yielded a freedom to explore the medium rather than the message, including its relationship to the environment. By focusing on space, sound artists immediately aligned themselves with sculpture and installation, and made a claim on the territory of fine art. From Goethe's famous quote ‘Architecture is frozen music’ has developed a distinguished body of work investigating the relationship between sound and space [1].

One of the canonical works in soundart history is *I Am Sitting in a Room* by Alvin Lucier. In this piece a recording of Lucier talking is repeatedly played back and re-recorded in the same room, so that over time the resonant frequencies of the room and audio equipment become dominant and turn the speech into a series of notes - as Lucier says, “any semblance of my speech, with perhaps the exception of rhythm, is destroyed. What you will hear, then, are the natural resonant frequencies of the room articulated by speech” [2]. There are many other works which deal with sound and the built environment; Max Neuhaus' *Times Square* in which a composition emerges from a grate in the street and mixes with the sounds of New York city [3]; LaMonte Young's *Dream House* which uses standing waves caused by sound bouncing off the walls to create areas of high and low intensity sound that the visitor can

walk through [4]; more recently Susan Phillipsz made recordings of London's medieval songs which were then played into outdoor spaces in the city, and songs that were long ago heard in those streets once again rang out, collapsing the centuries in a sort of sonic psychogeography [5]. There are many other practitioners in sound-space; Bernhard Leitner, Bill Fontana and Mary-Ann Amacher are more artists who deal with sound, spatiality and architecture. Of course the topic is also of concern to architects; Juhani Pallasmaa suggests that "we stroke the boundaries of the space with our ears" [6]. When formalized as scientific enquiry the collision of sound and architecture forms a large part of the field of psychoacoustics, the phenomena of which (reflection, refraction, interference etc.) video artist Bill Viola refers to as "like a set of mystical visions of nature" [7].

A piece that allows the public to engage sonically with architecture like *Torch Song* is *Playing the Building* by Talking Heads frontman David Byrne, in which an old organ controls solenoids and vibration motors to allow the public to sonically activate parts of a building by pressing its keys. The piece is interactive and focuses on the sounds of the building, and not (as in many other works, and psychoacoustics) what buildings *do* to sound. However this work imposes artificial excitation into the building and is heard acoustically, whereas *Torch Song* and *Machines for Singing* use amplification to reveal sounds of the structure that are already present.

The sound of *Machines for Singing* and *Torch Song* continue the traditions of composition based on chance events, championed by John Cage in the 1960's [8], and of composing with environmental noise; layers of hums, buzzes, crackles, whistles, gurgles and so on are overlaid into a surprisingly musical collage. This idea was expounded by Luigi Russolo in the Art of Noises Manifesto and realised using his *Itonarumori* noise machines in the early 20th century [9], continuing through the music concrete of Edgard Varese, Pierre Schaeffer and Iannis Xenakis, utilizing the new-fangled tape machines to chop, join and reverse sounds in the 1950's. Schaeffer's idea of 'reduced listening' leads to today's acousmatic music which attempts to divorce sound from referent altogether, resulting in computer-generated and manipulated sounds which share the spirit of Russolo's work but are aesthetically a world away [10].

Machines for Singing

The first piece in this series is a collaboration with UK artist Rowena Easton. The installation, with its title derived from Le Corbusier's dictum 'a house is a machine for living in', aims to give voice to a building. It consists of a seating unit and a number of speakers in the listening room – in the original installation this was a ring of 8 speakers on concrete plinths arranged around the edge of the gallery. A hidden computer, audio interface and amplifiers in an adjoining room collected sounds from transducers around the building, processed them and fed them into the listen-

ing area. There was no direct interactivity, no visual representation of the sounds and the visual impact of the piece was kept purposely minimal in order to force visitors to attend to the sounds themselves and the originating structure around them.

Eight sound transducers were used around the building. Accelerometers (high-gain contact microphones) were placed on heat exchanger units, studs in the walls, scaffolding supporting the auditorium seating, air conditioning ducts and ceiling beams. The sounds gathered were fed via an audio interface into a Mac running MAX/MSP. Four of the sounds were defined as 'background voices' and played constantly, but were programmed in MAX to move around the listening space using an ambisonic patch; as the volume of the sounds was proportional to their proximity to the center of the listening circle, they appeared to fade up and down in volume as they moved. The remaining four sounds were defined 'foreground voices' and had a more instantaneous quality, being switched on and off abruptly by the activation of PIR and magnetic reed switches around the building.

The sounds were processed within MAX but the amount of digital manipulation was kept to a minimum so the character of the original sounds was preserved. Consequently all the voices were filtered (to remove the high-frequency hiss characteristic of the accelerometers, and to bring out the character of each sound) and the background voices were pitch shifted to give them a broad overall harmonic range, and to render audible infrasonic parts of the sound spectrum.

Four strain gauges were placed on metal and glass areas of the building to measure the expansion of the structure due to heat. These were mapped to the pitch of the background voices, meaning the composition was higher in pitch during the day and lower at night. In addition two PIR sensors (in the cafe and entrance hall) and two reed switches on the toilet doors gave an indication of the occupants' use of the building (visitors would be reassured to know that the sounds triggered by the toilet door switches were sourced from elsewhere in the building). These sensors were fed into MAX via an analogue-digital interface, and triggered the foreground sounds.

The sound of the installation can best be described as waves of ambient sound washes punctuated by more aggressive and sometimes narrative bursts from the foreground voices. Judging by the comments book and conversations at the exhibition, visitors appeared incredulous that a building could produce the sounds they were hearing, and found the experience absorbing, contemplative and sometimes threatening. Many visitors thought the sounds were recorded or highly processed, and until reading the accompanying information panels, did not realise that what they were hearing was a fairly true-to-life version of sounds that were happening at that moment in other parts of the building. An aim of the installation was to incorporate some element of the special use of the building; in this case, sounds from the theatre which provided an interesting dynamic to the composition when performances were taking place.

Torch Song

Torch Song develops the ideas first explored in *Machines for Singing* into an interactive artwork, presented in a dark room, that creates a sonic composition from the infrastructure of a building.

The piece combines a custom made control panel with readily-available DIY electronics and open source software. The interface presented to the public is a white-painted wooden cabinet with a transparent Perspex top, resembling a display cabinet, approximately 158 cm wide x 42 cm deep x 7 cm high. It contains a line of 8 photocells, 16 cm apart, each mapped in control software to a sound sourced from around the building as a live stream using a selection of contact microphones and electrical transducers. The origin of each sound is written underneath the photocell on a piece of card. Torches are provided fastened to the front of the cabinet on wires (fig. 1).

Behind the control panel is an arduino microcontroller, which reads the values from the photocells and sends them to a Pure Data software patch running on a computer. The patch takes in the audio streams from around the building via an 8-channel soundcard and sets the volume of each one depending on the brightness of its respective photocell. The outputs are panned across a stereo mix and presented on two speakers placed either side of the control panel.

The interface presented to the visitor is purposefully minimal comprising just the control panel, torches and loudspeakers; the rest of the equipment is hidden out of sight. Although there is a lot more technology involved in *Torch Song* than meets the eye, it is vital to the purpose of the piece that the visitor is drawn into the soundworld of the building and the joy of composing with ambient noises, and not distracted by bright computer screens or blinking LEDs.

Presentation starts by selecting the sounds. For the first presentation, at the exhibition *Spotlight*, Oxford U.K., on 2nd December 2011, approximately 50 sounds were recorded on a pre-installation research visit to the site, from which 8 were chosen, focusing on pitched drones and hums and rhythmic clicks and glitches. The final sounds were sourced from a window, a radiator, the air conditioning, a cast iron staircase, a wooden floor, an electrical junction box, a power supply, and a data router. On installation day these sources were rigged with contact microphones or electrical transducers.

Visitors controlled the live-streamed sounds of the building by shining torches onto the photocells - the brighter the light, the louder that sound. The torches could be set to flash, creating rhythmic effects, or faded across the face of the photocells, encouraging experimentation with composition. Many people spent time with the work playing and composing with the sounds. Visitors enjoyed the audiovisual link and the quality of the sounds, but were often unaware at first that the sounds originated in real-time from the building as they were so unlike our normal experience of architecture (and were fascinated when they

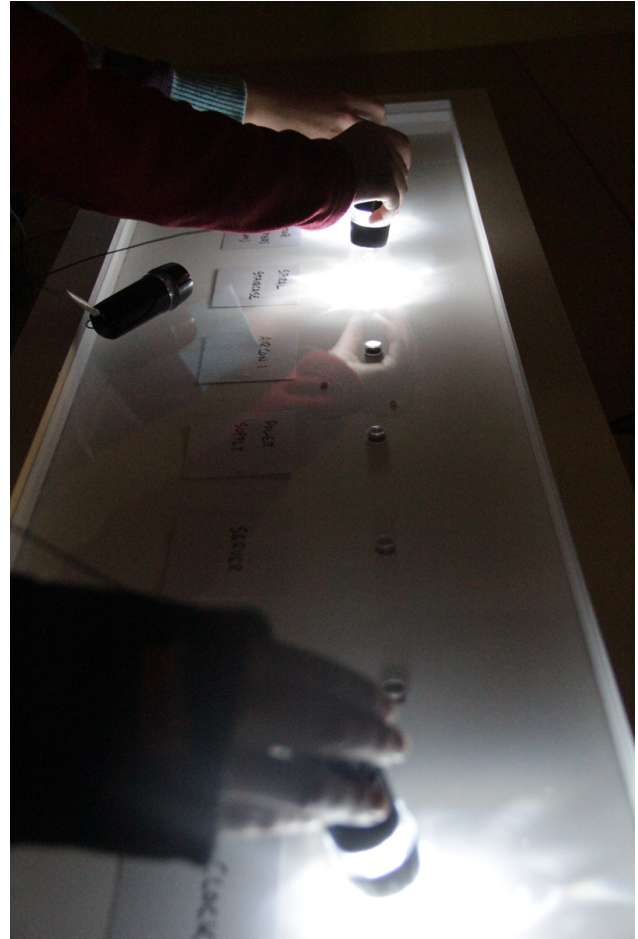


Figure 1. The *Torch Song* interface in use. Photo: Adrian Pawley.

were informed of this). The control panel was large enough to accommodate multiple players; visitors engaged in collaborative compositions and a lone composer, engrossed in the work for about 10 minutes, seemed annoyed to find their work interrupted by the arrival of a stranger.

Disrupted Architecture

“Wow ... amazing! So used to having quiet gallery spaces, where the space falls into the background in favour of the work. Refreshing for the building to finally speak up and be the main focus.”

“...after a time huge variety of sounds and moods, sometimes like gears starting up. Found the whole experience very calm, but also absorbing. Threatening sometimes.”

“Made me think about living buildings in a very different way.”

The quotes above, from visitors to a *Machines for Singing* install, indicate the shift in perception that the works hope to encourage. Both of these pieces emerge from, and contribute to, one of the longest-running themes in soundart practice – that of redefining spaces using sound, and have themselves been used by the author as the basis for further explorations into the relationship between sound and the built and natural environment in *Presence Room* and *SolarWork#2* (both 2012). As we have seen soundart has long courted the built environment, although *Torch Song* and *Machines for Singing* seem somewhat unusual in using the architectural space as a source of sounds rather than a modulator of pre-made audio content.

The focus of both of these works is a disruption of our preconceptions about architecture. By hearing amplified creaks, crackles and groans, electrical flows, water in pipes, the hum of motors and external sounds filtered through the structure – many of which are hard to comprehend as emerging from a building – we are forced to reconsider what a building is and how it responds to both environmental and human forces. By linking sounds to strain gauges measuring the expansion and contraction of the building we get an idea of how it ‘breathes’ – in during the day, and out at night. By pitch-shifting infrasonic audio events in its fabric into audible range we gain an extended understanding of structural forces at play. By setting sensors on doors and walls in remote parts of the building we sense the passage of people through the structure, and by linking sounds to a control panel we are able to make waves of industrial, ominous or beautiful sound emerge from the darkness by simply waving a torch over a sensor. The building is not physically disrupted, apart from perhaps drilling a few holes ... but in the minds of visitors it is pulled apart and opened out into something new and transformed. This form of playful, thoughtful engagement with sound and architecture is the *raison d’être* of both works and the hope is that having experienced them the visitor’s idea of what a building is are forever disrupted. Both pieces force us to consider the building not as a container or backdrop for the living, but as a living thing itself.

Acknowledgements

I would like to thank my collaborator on ‘Machines for Singing’ Rowena Easton, Brüel & Kjær, Sound Solutions and Oxfordshire Visual Arts Development Agency for their help in realizing these projects. The interface in *Torch Song* was inspired by a visit to an exhibition by Peter Vogel, whose amazing work I can never say enough good things about [11].

Documentation

Documentation of the pieces can be found on my website:
Machines for Singing: <http://evolutionaryart.co.uk/mfs.php>
Torch Song: <http://evolutionaryart.co.uk/torch.php>

C|NET blog post about *Torch Song*:
<http://cnet.co/1tPw9Hm>

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