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Sonic Strategies

Sound in the Networked City

Investigating the Role of Sonic Experience in the Informational Society

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Current discourses in urban computing explore the possibilities for new forms of sociality and aesthetic experience over networked media platforms, referencing practices that utilise the potential for geo-location, wifi coverage, and inter-device connectivity in urban space in order to consume, produce, and distribute diverse media content. The convergence of urban space, mobile actors and dynamic network topologies provoke new sociotechnical possibilities for the city dweller. While research in urban computing is frequently biased towards urban screens and visual interfacing, it can be argued that such an enquiry is particularly relevant to contemporary auditory experience. Increasingly, our everyday sonic experiences are interleaved with new mobilities, spatialities and networked infrastructure. It is relevant therefore to investigate how mobile sound and its exploration through media art and design practices could provide a platform for engaging with networked space, both in terms of possibilities for new cultural practices, but furthermore with regard to its critical engagement with network topology, often sonifying the complex interplay of social and informational networks that occurs with mobile media distribution in urban space.

Ways of conceiving urban space have shifted dramatically as a result of new mobilities, telecommunications infrastructures and virtual spatialities. The ubiquity of mobile media in the city engenders what is sometimes termed 'hybrid space' understood as multiple modes of spatiality enfolded together, as electromagnetic signals interleave and virtual platforms migrate from traditional desktop scenarios, becoming nested in the everyday rhythms of the urban environment. With these practices we witness a shift from bounded ontological accounts of space, with strict dichotomies between public and private, real and virtual, towards a metastable geography constantly performed by the mobility of people, objects and information. Mobile audio devices are arguably the first instance in which hybrid spatiality occurs, blending the physical spaces moved through with the virtual soundscape the listener carries on their person. Where the predominant listening experience of the city dweller is now channelled in this fashion, it is intricately connected with the management and production of urban experience. Until recently this auditory practice was largely individuated, limited in correspondence between the space traversed and the possibilities for

co-present interaction. However, as mobile devices become increasingly amorphous, often combining communicative capabilities with media production and consumption, they afford new practices involved in the networking of sonic experience. How might these media practices provide listeners with tactics to articulate and engage with the networked city?

The shift away from individuated listening towards interconnected soundscapes is endemic of a broader shift in mobile media ecologies from passive audiences towards what Varnelis et al. term the 'networked public' model (Varnelis, 2008), referencing linked practices of production, consumption and distribution that have emerged from decentralised networks and convergent media technologies. When these new practices: peer-to-peer music distribution, podcasting and networked composition and performance, migrate into mobile platforms, they provide new agencies for media publics in city spaces. While a number of different approaches within media art and critical design explore these possibilities, situating audio work within geo-spatial contexts, sonifying electromagnetic signals, and utilising various urban mobilities for musical composition, this paper focuses on the use of mobile ad hoc and personal area networks to consume, produce, and distribute sonic artefacts in urban spaces. These are network topologies which, rather than relying on a centralised relay structure, utilise pair-wise connectivity between mobile devices in proximity, producing a highly dynamic and decentralised topology that reflects the correspondence between social and informational networks in contemporary cities. Instead of a soundscape that is propagated on the air, here it is carried by the various mobilities already present in the city, the "chorus of idle footsteps" (de Certeau, 1984, p97), public transport infrastructures, crowd behaviours and the episodic connectivity of friends and familiar strangers.

Notable works such as Atau Tanaka's Mobile Music Making (Tanaka, 2004) and Bassoli et al.'s Undersound (Bassoli, 2007) are examples of media art and design initiatives that engage mobile networks to produce soundscapes, leveraging the sociotechnical possibilities of music on the move. Not only do these designs suggest new aesthetic and social practices for city spaces; through the interconnection of human mobility with the network architecture, they suggest novel ways of mapping and articulating the intricacies of networked space. This is an important area of enquiry therefore, not only for the novel listening experiences it facilitates, but also for the critical insight into networked space it provides; knowledge that in turn can be applied to the design of future mobile devices, networks and urban planning policy for the city.

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Making the Inaudible Audible: Strategies and Disagreements

The study of environmental sound highlights the limitations of human perception. Sonification and audification predominantly use scientific methods that favor transformation of sound to the sweet spot in the middle of our hearing range. This approach overlooks the different perceptual effects of high and low, loud and soft, fast and slow sounds. It is my contention that in our interpretation of how to make inaudible sound audible, we must consider the strengths and limits of human hearing and listening.

The work of acoustic ecology focuses on listening to emphasise an awareness of the overall soundscape (Schafer 1977). This is usually limited to areas where it directly affects human presence, and it is largely because underwater and ultrasonic are inaudible to us that we are unaware of the impact of anthropogenic over biotic and abiotic sounds. Acoustic levels underwater are unregulated, and given that sound is essential to marine life, the impact of additional sounds is having considerable consequences. (Stocker 2002, Slabbekoorn 2010)

Sounds can be inaudible or unperceivable to us in different ways. The basic parameters are sounds that lie out of our frequency range (above 20,000 hz and below 20 hz), beyond our amplitude sensitivity (either too quiet or loud), and of a time frame that may be imperceptible to us (too fast or slow). To compare the scientific to musical terminologies: frequency/pitch, amplitude/volume, and time/rhythm or form. In what ways can these sounds be folded into our relatively narrow perceptual bandwidth?

Scientists and composers, limited to discipline-specific methodologies, are driven by different motivations and priorities in the analysis and use of sound. As a result approaches to making the inaudible audible generally fall into two camps of analytically strict systems or more intuitive translations. Can

scientists, musicians and artists learn from each other in this relatively new area? To what extent do we question the “ostensible neutrality of these listening technologies” (Kahn 1999; 200), given that listening is both personal and contextual? (LaBelle 2007) When making the inaudible audible, what happens if we consider not simply what we hear, but how we listen?

I identify two distinct but overlapping approaches to making the inaudible audible: audification by scaling existing vibratory signals into human hearing range; and sonification of data by translation and mapping onto a choice of sounds. Audification uses the existing signal as its basis, while sonification requires compositional strategies of mapping data (non-vibratory information) onto sounds. Another common strategy is visualisation where sound is represented graphically depicting the parameters of frequency and amplitude over time. The analysis of humpback whale sounds (Payne and McVay 1971) demanded visualising the sound waves to reveal recognisable patterns, now called ‘songs’, which are too slow to recognise by ear.

Alvin Lucier’s work can be said to be making the inaudible audible or at times visual in space (Lucier 1995; 152). In “Music for Solo Performer: for enormously amplified brain waves and percussion” (1965) EEG electrodes on the performer’s head translate alpha waves into electrical signals which are amplified, but not frequency shifted, so they remain below our hearing range at between 8 to 12 hertz. These are made audible by using the loudspeakers to physically activate percussion instruments placed throughout the space. This early piece combines audification of existing signals and sonification of those signals into sounds.

In “Listening To What I Cannot Hear” (2009), composer David Dunn lowers the overall frequency of ultrasonic recordings of bats and household appliances, to make us audibly aware of sounds we create but cannot usually hear. Dunn and scientist Crutchfield’s groundbreaking environmental work highlights sound as the key to a series of feedback loops relating climate change to drought stressed trees to bark beetle infestation. By placing Dunn’s custom-made microphones in infested trees and amplifying the results, this example of audification has advanced scientific research. (Dunn and Crutchfield 2009)

Even when we can hear sound, it does not mean that we can understand it. Music offers profound insights into listening and making sense of previously inaudible sound. Underwater bio-acoustic scientist Michel Andre called on Senegalese drum master Arona N’Daye Rose to help interpret possible rhythmic structures in sperm whale echo-location clicks. From the apparent cacophony, Rose rapidly deduced the number of whales in the group, a conclusion that took the scientific team six months to determine. (Andre and Kamminga 2000)

Sonification needs to take into account our physical abilities, including how clearly and quickly we can perceive changes and patterns. In Sun Run Sun I explored the sonification of live GPS navigation data, listening to the satellites moving in and out of focus overhead while walking through the environment. In a continuation of Lucier and Dunn’s work, this sonification provokes

an aesthetic rather than practical response. When there is no change in data, 'silent spots' emerge, and this draws ones attention back to the immediate environment (Dekker 2009). These projects illustrate that the choice of sounds we use in sonification, and the choice of scaling factor in audification, will inevitably affect what we hear and ultimately how we interpret it.

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Detektors

Rhythms of Electromagnetic Emissions, their Psychogeophysics and Micrological Auscultation

Almost any electronic gadget can be transformed into an audible and sometimes rhythmical sound object. “Detektors” presents such a transforming device, making manifest both a cartography of user-generated geolocational sound recordings, logs and walks, which reveal hidden electromagnetic geographies of our urban areas, and a database or catalogue of sonic studies of electromagnetic emissions produced by our everyday electronic devices.

At the beginning of the 21st century we are surrounded by ubiquitous electromagnetic oscillations, which are more and more results of computational protocolled processes, which turns them to algorhythms. “Detektors” suggests a new form or methodology of the dérive, possibilities afforded by a novel geophysical terrain. Psychogeophysics meets algorhythmics, as use of the detectors in city space allows for novel city play algorhythms.

“Detektors” is an open, collaborative project and uses sonic strategies to make audible the hidden infoscapes of our time. Unlike similar projects, with “Detektors” you can also hear the high frequency band. This means that you are able to hear modulations of WiFi, Bluetooth, GSM, UMTS, GPS and other transmission systems which are in the 100MHz-5GHz region of the spectrum. With a special built-in mini-coil you can listen to your computer, iPod, iPhone and other electronic devices. It is planned to build up progressivly an online database of electromagnetic field recordings, where collaborateurs can upload individual recordings of their environments. The database will be linked to a map of the world (google maps), where you can browse through the diverse recordings similar to wandering through map-based

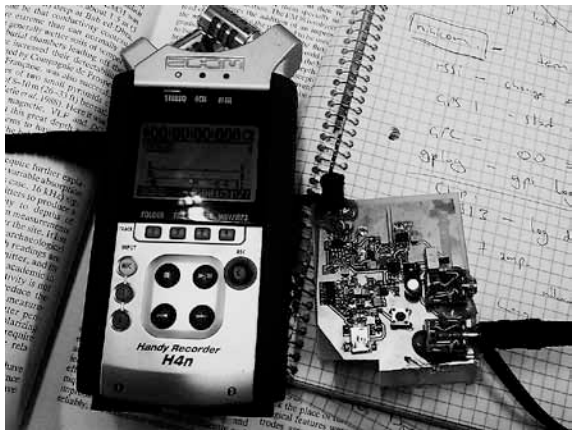

Fig. 1: Prototype Detektor Photo: Martin Howse

social networking sites. User-generated sound log-files shall reveal a hidden electromagnetic geography of our urban, but also rural areas. Additionally it is planned to generate not only a location based, but both a category and object based browsing and archive method.

The notion of algorhythm (Miyazaki 2009) is a result of the transversal thinking of algorithm with rhythmic, therefore to think the symbolico-calculational with the sonic, thus the physical. The notion of rhythms gets viral in this kind of thinking. As rhythm is defined by Plato as the order of movement it is easy to understand changes of voltage in semiconductor circuits and movements of molecules in the air as rhythmic fluctuations. As soon as there is a combination of abstract sequence-controlling scheduling and the idea of automation with real world signals or actions, thus, as soon as it is possible to integrate the real with the symbolic, in a way that humans don't notice differences between them anymore, we can speak of a time critical discrete control of electric signals, thus of algorhythms. They occur when real matter is controlled by symbolic and logic structures like instructions written as code. "Algorhythms" let us hear that our digital culture is not immaterial, but consists of lively, rhythmical, performative, tactile and physical behaving machinic assemblages.

With psychogeography readily defined as a playful examination of the total effects of geography and place on the individual, psychogeophysics extends such research to embrace the geophysical, namely earth science measurements and study.

Psychogeophysics thus as a novel discipline can be defined as crossing the particle/wave and code distinction, offering a speculative take on future code; an uncovering of potentials in code as a new phase of software studies. The extension of psychogeographics into geophysics implies a collision between fiction (as software) and materiality, with geophysics defined as the quantitative observation of the earth's physical properties, with an emphasis on the magnetic field. Geophysics equally encompasses archaeological

geophysics, with measurement of such properties allowing for the mapping of previous traces; an extension into questions of detection and forensics.

Expanding a clear concern with electromagnetic [EM] phenomena as a question of substance, and extending the spectrum of artistic concerns to embrace modern data space, the research attempts to bridge an impossible divide between the physical and the protocol (code); asking how, within complex spectral ecologies, it is possible to examine and embrace both the carrier and the signal, to observe subtle interactions and inherent abstractions. In this context, such an examination becomes a manner of revealing; revealing another city, revealing new modes of communication and transmission (hidden networks).

Technical Details

The detektor hardware is designed to record emissions under a wide range of (signal) conditions. An operational amplifier circuit amplifies induced current within a small coil of wire to detect highly localised, nearfield low frequency emissions. An Analog Devices AD8313 Logarithmic Detector chip demodulates and amplifies wide band higher frequency signals which extend widely through space. These twin signals are sampled (by a microcontroller) and recorded on micro-SD card with a direct USB connection (mass storage) implemented for easy uploading to the computer, and thus Internet. The device uses a small rechargeable battery, and a headphone amplifier is also included to monitor either of the two signals. The design is under active development at the prototype stage.

Further Directions

"Detektors" is an ongoing project. We are looking for collaborateurs and supporters all over the world.

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From Aleatoric Machines to the Future Sounds of Folk

Introduction

What follows is a condensed run through of the various processes that have directed my research and practice over the past years, in search for my own narrative in relation to my sound/performance practice and the sounds of the *post-folk*.

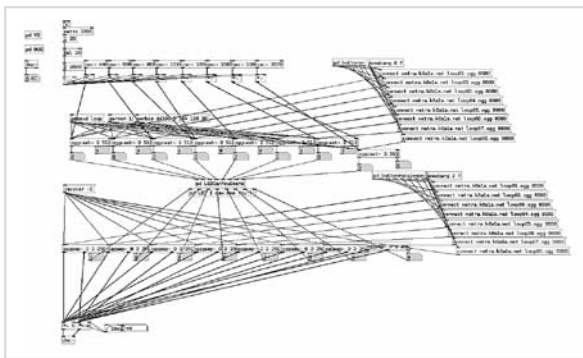

Fig. 1: Bufferrrbreakkkdownnn Arkestra

Sun Ra Lives on in the Fiber-optics

Around 2007, after trying my hand at building various stochastic musical instruments based on simple deterministic and non-deterministic systems, I turned to streaming networks to provide the ever present instability and randomness to the instrument, mixed with an equal dosage of system overloads, the *Bufferrrbreakkkdownnn* Arkestra was born. Rather than playing notes, or triggering samples, I was playing the networks, by controlling the

concurrent sending and receiving of 8 sine tones of different frequencies to and from 8 separate streaming servers. This manipulation creates fluctuations in the networks which in turn causes the computer to overload (as sometimes it's trying to receive when the sending signal is cut temporarily) leading to the cacophonous rhythmic glitchfest that erupted semi-aleatorically. Sun Ra lives on – in the fiber-optics.

Putting The Soul Back Into The Electronics

As a musician whose main instrument is the computer, one of my early goals is to turn this unintuitive, intangible Pandora's box into a legitimate musical instrument capable of being the medium in the transmission of my expression. By using a serial controller that has LEDs behind each of its 64 buttons (monome.org), I was able to finally do away with the computer screen altogether; this controller was augmented with a traditional midi controller that has piezoelectric elements installed into its guts to pick up all the subtle movements of faders and knobs. With this, I was able to put the incidental sounds which are inherent in all acoustic instruments back into an electronic music instrument.

Fig. 2: One Man Nation

Medium; Transmissions From The Aether

My solo sound/performance work as One Man Nation was described by Portuguese collective Soopa as a performance that transmitted a deep narrative feeling of geopolitical disenchantment, ingrained into dark textures. This disenchantment exists on more levels than purely narrative, it is exircised by the use of every part of my body as a whole, that presence with the inclusion of the sounds produced by the intended or accidental gestures and physical actions – everything is technology making anything and everything potentially an instrument, a source of sound, a critique – the avoidance of a

Fig. 3: The Future Sounds Of Folk – Bambu Wukir with One Man Nation

priori drawn ways, ontologically reinventing the possibilities of life, and as a living performer/artist, exploring all the possibilities in the here – in the now.

Since earlier mutations of the current performance, the goal has ultimately been to seamlessly mix different elements such as, but not limited to, computer/traditional/ritual music/processes, performance art and improvisation together into a cohesive piece that takes the end user into a state of intimate unreality.

The Future Sounds Of Folk: In the search for the Post-Folk

Since the beginning of 2010, I have been in Indonesia doing field work on a project I developed a year and a half prior with Steim and The UnifiedField called The Future Sounds Of Folk. The project tries to explore different ways of interpreting the past musical heritage of Indonesia with a contemporary vision and attempts to create an emerging musical movement based on the preservation/diffusion of declining and/or lesser known musical forms.

HTTP://

- One Man Nation – http://www.onemannation.com
- The UnifiedField – http://www.theunifiedfield.org
- The Future Sounds Of Folk – http://www.thefuturesoundsoffolk.com.