

Sonic City

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Abstract

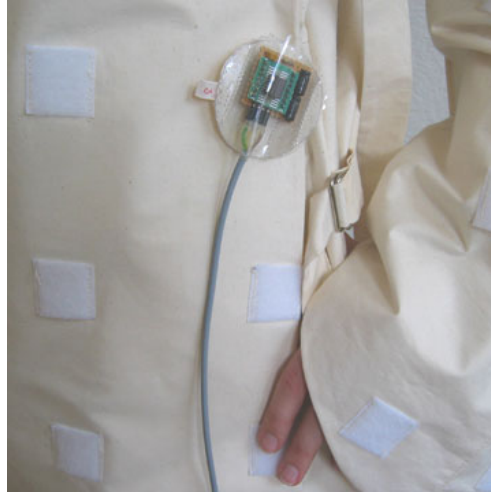
Sonic City is a wearable system for creating electronic music based on sensing bodily and environmental parameters. Context and user action are mapped to sound processing parameters and turn live concrete sounds into music. Thus, a personal soundscape is co-produced by a user's body, local activity and urban ambiance simply by walking through the city. Encounters, events, architecture, weather, (mis)behaviours – all become means of interacting with, appropriating, or 'playing the city'.

We have developed a working prototype that consists of a range of sensors, a microphone, headphones, and a small laptop running the music programming environment PD. In relation to sensor values, concrete urban sounds are processed in real time with a cross-coupled mapping strategy incorporating sound processing objects such as filters, delay loops, envelopes, sampling, playback, mute, and echoes. Currently, the system is embedded into a jacket designed for adaptable sensor placement and experimental tests with 'players' on-site in the city.

In this project, it is our intention to support musical creativity integrated into everyday life. We break out of traditional contexts for music creation to explore the creative potential within our local surroundings and mundane activities. Wearing *Sonic City*, anyone can experience a simple walk down the street as an expressive act, a path through the city as a personal composition. As a complement to lived urban experience, it is a new, intimate soundscape intended to enhance perception and encourage new uses of the urban landscape. Developed as an extensible prototyping platform, it is a vehicle for engaging a wide range of people in playing the city as a musical interface. Thus, *Sonic City* is our platform for exploring emerging urban behaviours and the cultural effect of this type of everyday music creation.

1. The city as an interface for musical expression

Sonic City is a reaction to passive musical consumption through walkmans or mp3 players and the confinement of electronic music creation to recording studios and performance venues. We see a need for applying technology to support music creation embedded in everyday life and cultural contexts. We are inspired by the action in the streets – from informal gatherings around ghetto blasters to street performers – where music can be seen as a way of appropriating public space for individual or community expression (e.g. [5]). In developing music technology, we are interested in supporting personal engagement and active discovery available to everyone in their habitual environments.



Figures 1 & 3. Sonic City in the street and a closer look at one of the sensors (accelerometer)

We are exploring technology for music creation embedded within lived urban experience. Activities such as skateboarding (e.g. [1]) expose the highly personal ways in which we perceive and use the city – in the case of skateboarding, physical and acoustic appropriation of the built environment for personal expression. Terms such as *mental map* and *psychogeography* describe the personal image of the city we each have, characterised by informal landmarks, subjective distances and sizes, and intuitive way-finding. In this way, we understand urban behaviour as a complex personal production, involving habits, emotions, and perception as well as bodily movement in relation to obstacles and local events.

In Sonic City, we consider the city as an interface for musical expression [3]. Reinterpreting the concept of gestural interaction from electronic music and dance technology, we extend it geographically. If a gesture can generally be defined as “a specific movement from part of the body, executed or not in a conscious way, applied or not to a device, that can accompany a discourse or have a meaning by itself”[2], then Sonic City treats mobility through the city as gesture in a large scale, characterized by the built, narrative, and emotional landscape along our paths. By applying this as a means of making music, we intend to encourage personal and expressive inhabitation of public space through music creation.

1.1 Soundscape of events and action

According to our interpretation of gesture, Sonic City incorporates multiple sensors detecting both bodily actions and the environment and integrates these as musical parameters. Combining sensor input together produces a sonic experience that is both highly intimate and inextricable from nearby events and urban conditions. With the working prototype, we have been working towards an interesting balance among these input factors in relation to the sound design. We have situated possibilities in a matrix describing the range of body/environmental influence in relation to random/deterministic characteristics. Trying out these possible directions, we have determined a sonic experience that is clearly linked to perceivable factors with elements of surprise such that the music changes dynamically and remains interesting for daily use.

Music creation in Sonic City is a co-production of the body and urban conditions and is experienced as a dynamic improvisation and continual rediscovery. Voluntary and involuntary actions, visible and imperceptible events all affect the sound – thus blurring the boundary between passive experience and active participation. In this way, Sonic City is a

novel experience in terms of both music consumption and creation, playing with this boundary in real-time and in context.

1.2 Sonic subcultures

In order to explore the cultural effect of such an experience of music creation, we have attempted to design Sonic City as an open-ended platform for exploring a wide range of possible (or not yet existing) uses. Rather than starting from a target audience or from ourselves, we have used scenarios to imagine alternatives for the sound design, control factors, and aesthetics. In order to explore the limits of possibility, these scenarios were based on interviews with people that perceive the city or music in diverse and extreme ways. For instance, we held a lifestyle workshop with French practitioners of Parkour, a physical art or sport making use of urban infrastructures [4].

From these scenarios, we drew inspiration for making decisions that leveraged and complemented existing perceptions and projected how Sonic City could be used in the future by a wide variety of people for both personal and cultural expression. This has helped us to imagine and design for Sonic City as a platform supporting emerging urban behaviours and potential sonic subcultures. These aspects are currently being explored in a series of urban experiments with the prototype and as ideas for future applications of the system, including collaborative and performative versions.

2. An extensible and experiential prototype

The Sonic City prototype has been designed to work both experientially and technically. In the project, technology and design have been developed in parallel, involving perspectives from sociology, architecture, fashion design, engineering, sound and installation art. Through a collaborative and interdisciplinary process, our intention is to include social, spatial, and aesthetic issues in decision-making. By working with the technical prototype in an iterative and modular way, we are able to try out possibilities collaboratively and – as much as possible – in the streets.

For experimenting with particular aspects of the system, our latest iteration of Sonic City includes a selective range of sensors – including a light-to-frequency converter, sound gate (microphone), metal detector, accelerometer, thermometer, and pollution sensor. Together with the other hardware components necessary for sound processing, these are housed in an adjustable jacket in order ‘try on’ and iterate interaction, musical, and aesthetic variables on the spot in the city.

The evolution of Sonic City has included hardware and sensor development, sound design, a strategy for mapping sensor perception to musical parameters, and design of the wearable garment. Given our intention to build a prototype that involves both engaging music creation and an experience of how it would look and feel to make music in the city, each of these aspects is inseparable from the others. To this end, we have developed each to a certain resolution – however, as an extensible platform, these aspects are intentionally left open and designed for reiteration in the future in response to collaboration and feedback. In this sense, the sounds, choice of sensors, and visual aesthetics should be seen as a stage in development rather than as a finished product.

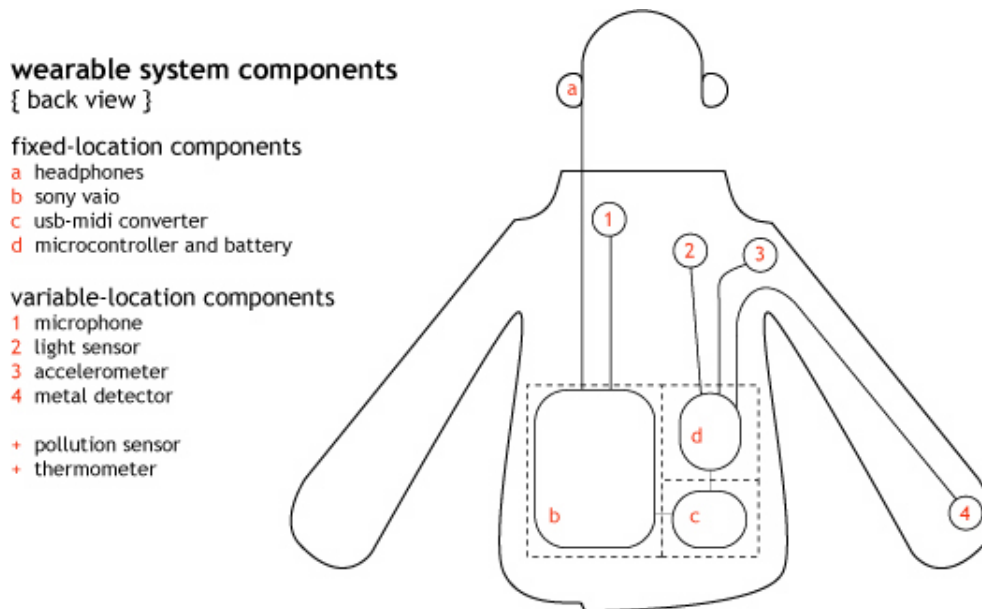


Figure 3. System component

2.3 Open system

In this version of Sonic City, we have prioritised robustness, portability, and modularity in technical decision-making. Ideally, processing would happen on a very small computer and we are considering available platforms for implementing a future version with multiple, miniature sensors wirelessly networked together. For the sake of rapid calibration of the software, we are working with a small laptop in this prototype, but have used the open-source software PD in order to also be able to implement future versions on a PDA.

Currently, each sensor extends on a cable from the micro-controller – while not optimal in terms of aesthetics and tidiness, this supports ‘plug-and-play’-style connectivity. Thus, individual sensors are easily isolated, combinations quickly tested, and damaged components simply replaced. Additionally, cables provide helpful visual cues as to current sensor configuration when testing multiple options. The design of the jacket incorporates a Velcro grid for flexible reconfiguration and orientation of the sensors. In this way, input parameters are fully in the control of the player who can, for instance, hide the microphone inside the collar to isolate the sound of the breath or extend it down to pick up the rhythm of the feet.

2.4 Sonic experience

We have collaborated closely with Daniel Skoglund from the sound art duo 8Tunnel2 [6] in order to design a dynamic and interesting sound experience. Together, we determined a modular sound mapping strategy that enables easy calibration and rapid iteration of high-level variables. In the software program, concrete urban sounds input through the microphone take manifold parallel and serial paths through sound processing objects. These paths can be flexibly deviated and redirected in response to multiple incoming sensor values, resulting in a highly dynamic sonic output. Sensor input itself is processed in two ways: it is mapped directly to short events and spectral variables in the music and it is abstracted and coupled with other sensor values to shape the overall compositional structure. Thus, the sound design is designed to be dynamic and interesting, providing both immediate and perceptible relation to sensor input and contributing to the whole and evolving sonic experience.

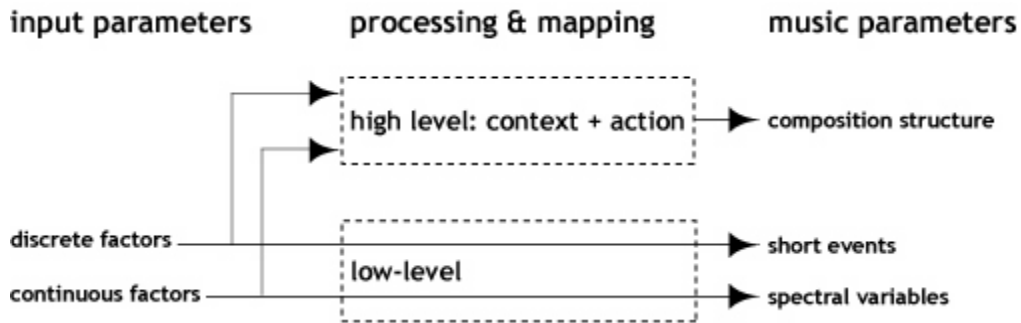


Figure 4. Sound mapping strategy

We have implemented the sound mapping in our current prototype. In this version, the incoming urban sounds are processed through filters that are opened and closed rhythmically at a tempo corresponding to the pace of the player. The frequencies of these filters are determined by the intensity of light detected. The noise level of the local environment is mapped to the amount of rhythm in the music, such that rising volume increases the number of rhythmic layers that are overlaid on each other. Proximity to metallic objects or surfaces triggers brief echoes, the delay of which depend on the pollution level. At night, samples recorded randomly are echoed and filtered in relation to sudden flashes of light detected from street lamps. The dynamics of noise in the city naturally results in an organic rhythmic sound. We have designed the mapping such that it requires activity on the part of the player – if they stop walking or moving, the rhythm is muted just as quickly and eventually all the music fades away.

3. Urban experimentation

We have performed some initial experiments with Sonic City in the streets of Göteborg. Our immediate intentions are to try out all the variables of the sound and mapping, sonic implications of various sensor configuration, and perceptions of using it for extended periods and in different sorts of urban contexts. Thus, we are working with individual players that we take to three different sites over the course of one day. In order to capture experiential and technical feedback, we have a 'crew' including one person who calibrates and reconfigures the music software on the spot, a person who documents sensor placement and qualitative feedback about specific aspects of the experience, and camera people.

Since the Sonic City experience is so embedded in an experience and physical context, we have discovered the necessity of both active experimentation in the streets and reflective evaluation after the fact. Being actually in the city helps to elicit strong and emotional reactions to the prototype from a sonic and experiential perspective. Besides verbal feedback, we observed how specific events triggered strong facial expressions and an evolution from self-consciousness to involuntary humming and self-absorption. One of the players started jumping around and playing his body against shadows and metal objects, improvising musically while waiting on a corner for the traffic light to change. Much of this was learned from after the fact, in relation to videos that synched the player's personal soundtrack with our video footage of their behaviour – as well as that of passers-by!

Based on these and future experiments, we are contemplating future directions for the project. Already, we are refining some aspects of the sound mapping and sound design and configuring multiple versions of the music program to try out variations on the sound

concepts. As an explicit goal of the project, we would like to extend the idea of urban experimentation to try out emerging perceptions and cultural effects of this kind of music creation in everyday life. In this sense, it would be ideal to develop multiple prototypes for distribution and use over time by multiple players. This, however, poses certain challenges in terms of robustness, autonomy, wearability, and available resources.

A more immediate strategy will be to stage a more performative use of the prototype with external speakers in specific localities, in order to elicit feedback from both the general public and specific cultures and communities. We would like to start experimenting in more extreme contexts of use, such as at night and in different cities. Additionally, we are looking to work with a wide variety of players – including musicians and performers, existing sonic communities, and extreme users of the city – to explore new aspects and (mis)uses of Sonic City as a platform for everyday musical creativity.

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