Connecting Strangers at a Train Station

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ABSTRACT
In this paper we describe a virtual instrument or a performance space, placed at Høje Tåstrup train station in Denmark, which is meant to establish communicative connections between strangers, by letting users of the system create soundscapes together across the rails.

We discuss mapping strategies and complexity and suggest a possible solution for a final instance of our interactive musical performance system.

Keywords
Motion tracking, mapping strategies, public installation, multiple participants music interfaces.

1. INTRODUCTION
The development of performance systems with gesture-controlled sound output can be understood as related to the research field of digital instruments.

Unlike traditional physical instruments, the interface and the actual sound generator can be regarded as two separate parts.

The result is that the connection between the interface and the instrument becomes important in itself. This paper describes the authors main experiences with motion tracking, mapping strategies and sound designs from user tests in connection to the development of an interactive installation which takes place in Hoje Taastrup train station in Denmark.

2. DESCRIPTION OF THE INSTALLATION
On two opposite platforms at Hoje Taastrup train station, an area that responds to movements which generate sounds is created. A connection between the people moving inside the area can be established if one or more persons move inside the two areas at the same time. The soundscape can be explored, until the train arrives and breaks the connection.

The system uses motion tracking, which via video translates user's movement into sound. Tracking users from above moves hardware out of the field of vision and does not require physical contact from the user in order to control the sound, which does not interrupt the normal behaviour of the users in the public space of the train station.

Each of the two users can trigger sounds, moving around a 2 by 3 meter area. Each person controls an individual system so there is both a process of understanding the system, and the process of understanding the relation between the two areas and users. This happens through the output sonic feedback.

The full setup includes two laptops, connected through WLAN, transmitting control messages and loudspeakers. Each laptop runs a Max/MSP plus Jitter [1] patch, which performs the initial motion tracking and the sound synthesis.

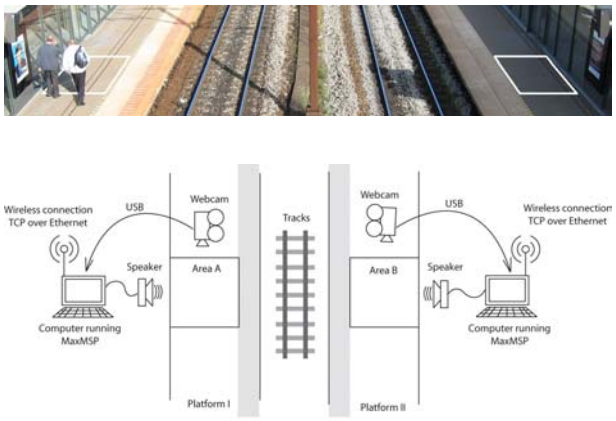

Figure 1 Scheme of the installation at the station

3. RELATED PROJECTS

In our research we have looked at similar and related projects. This was used to discuss different sound constellations or designs, communicative aspects and studies in how people approach and adapt to new interfaces.

3.1 Bubbles and Bouncing Balls

In an early stage in developing our sound aesthetic, we tried to create the sensation of walking among bobbles of sound particles, which would bounce when you pushed them as seen in a performance of "Messa di voce" by Golan Levin et al.[2]

We started designing an implementation of the *bouncing balls* metaphor for Max/MSP, so that the more you moved, the longer the sound would "bounce", and the bigger the jumps would be. Our first implementation failed, but we suspect that this would be a good candidate for our further development of a complex mapping.

3.2 Using the system

Inspired by the people at Boxiganga[1] and the paper *Performing Space* by Pedro Rebelo [3] we have defined some expectations to the development process of a novice user of the system:

First she must explore the system, then learn the basic possibilities, experience the system and at last she can start finding new possibilities.

In these 4 phases the user has different demands to the installation.
In phase 1 the user has to be interested in order to stay. Therefore the installation needs to create some initial attention. In phase 2 she needs to find out what is the intended use of the installation, what is she supposed to do. To make this clear, the system has to react somehow logically to the users actions. In phase 3 the user has learned how to use the installation and can experience it the way it was intended. Here we expect the connection between the two platforms to be established.

[1] Boxiganga is a Danish performance, and stage-art group. for further info visit : www.boxiganga.dk

In phase 4 which is running parallel in time with phase 3, the user will try to find new possibilities in the system, if not she will become uninterested and leave. Therefore the complexity of the installation has to develop along with users ability to use and understand the system.

3.3 Communication

The communication is not the primary objective - rather the ideal product. If this can happen with our system, we will be more than happy.

We expect a byproduct, which may be just as important as the relations: By installing a system on in a public space, we hope to see secondary communication between people *about* the system, as seen with other installations (For instance the installation of the Process console by Oval [4].).

4. MAPPING STRATEGIES

Using human motion as interface for control of sound parameters, frees the user of the restraints of physical objects like, a mouse or other objects used to manipulate data.

We need to balance between making intuitive mappings without loosing the users' interest [5]. We have to limit the complexity of the movements that we define as controllers, since we can not expect the users to do weird gestures. This would be uncomfortable for the users and not encourage participation. Moreover a very complex definition of gestures as controllers for the system would make it very hard for a new user to learn how to control it [6]. Since most users are likely to have no experience with the installation and since they probably only have a few minutes to explore the interactive installation there are natural limits for the complexity of the interaction.

The mapping strategy mainly used is a simple one-to-one [7], connecting all motion tracking parameters directly to instrument inputs in the MSP patch. Various tests were done with more complex mappings (one to many, and cooperation based), and different sound designs.

4.1 Simple mapping strategies

To get to the point of communication across the rails as fast as possible, by minimizing all parts of the interaction. This was tested by mapping horizontal position to frequency of user A and amplitude of user B.

Even though we knew how the mapping was done, we as users had great difficulties defining who controlled what. Also, the changes was so uninspiring that the urge to explore the system quickly fainted.

This suggests that a common control of one instrument is not necessarily very easy to comprehend.

4.2 Complex soundscape design

This idea was to make a more complex soundscape, as opposite to the previous. Here the complexity of the soundscape should blur the simplicity of the mappings, making the exploration of the system more interesting. By only letting the users explore the complete soundscape when working together, the cooperative aspect was highly emphasized.

We used samples in this test, but still with a *one to one* mapping strategy: Sample end-point controlled by user A and playback speed by user B.

4.3 Simple soundscape design with one to many mapping strategy

The concept here was to assign one unique instrument to each user. Giving them their own distinct voice. There is no actual dependency between the 2 users. They are free to use their voice for some kind of play or communication with the other user, or they can choose to explore their own instrument.

This idea was tested on an airplane like synth sound with a different frequency spectrum assigned to each user. The mapping strategy was *one to many* and the controlled sound parameters were frequency and volume.

The user easily understands what she controls but there is made no clear connection between the two users. The process of controlling the sound seems to capture the main focus of each user. From this test we concluded that the use of samples could not stand alone since the interaction would be too controlled and predictable. But the idea of making a more game-like interaction between the two users, was very engaging, at least on a short timescale.

4.4 Mirroring movements

Mirroring movements means to force the user to cooperate by making them do the same action. In case this happens, a clear reward exists. Otherwise no sound output should be produced.

Users trigger samples by standing in corresponding sub-areas of each their assigned area. When both users are in the same area a sample is played in loop.

The mappings are quite easily understood, but the interaction is very restraint, which makes the users loose interest fast. The cooperation is very game-like, almost too childish for the context of the project.

From the above tests and the experience we have gained during the development process of this performance system we have tried do develop a refined set of mappings corresponding to the defined sound design.

The mapping strategy preferred is the simple *one to one*, connecting all motion tracking parameters directly to sound parameters.

We have defined a set of mapping rules based on two main approaches: the learning process the user goes through during a session [3], and the direct connection between sound and motion.

In general, we are foreseeing the following behaviour:

Exploration of the system:

the user wants to be interested in order to stay. Therefore the installation needs to create some initial attention.

Learn the basic possibilities:

The user needs to find out what is the intended use of the installation, what is he supposed to do. To make this clear the installation has to react somehow logically to the users actions

Experience the system:

When the user have learned how to use the installation he can experience it the way it was intended. Here we expect the connection between the two platforms is being established.

Finding new possibilities (running parallel in time with phase 3) the user will try to find new possibilities in the system, if he does not he will loose interest and leave. Therefore the complexity of the installation has to develop along with users ability to use and understand the system.

We have used a straightforward instrument analogy in the mapping strategy where e.g. a movement from left to right changes the pitch of a played tone as running the fingers over a piano. Furthermore we have defined a set of rules for the control of the energy of the sound, which is also inspired by the nature of musical instruments:

Fast movements mapped to percussive sounds as when you punch an instrument you get a short loud sound.

Slow movements mapped to atmospheric sounds (e.g. like stroked string instruments).

The more movement the more complex soundscape and higher amplitude (2 persons create more movement and thereby more sound).

These simple rules are intended to give the user a chance to grasp the connection between his movements and the sound output rather fast.

From our tests we have experienced that there is a big chance that users will find the experience boring if there is no development or "resistance" in the system. So the goal with the mapping strategy was to create a mapping that would not be too hard to learn, not too easy and not too controlled.

By combining ideas from our experiments in a multi-layer mapping system, we have gained a certain complexity with possibilities for exploration, and by using only one to one mapping strategies in every layer, we have sustained a simple and comprehensible connection between movement and sound.

5. CREATING THE INSTRUMENTS

The considerations on the sound was split between making controlled sequences which would resemble conventional pieces of music put together from small bits according to the user movements, and an open sound system determined by the users and the situation. The first, suited for the atmosphere of Høje Tåstrup railway station, yet inevitably very determined by the *taste* of the authors. The goal was also to create as little predefined structure or composition as possible, leaving this control to the movement of the users.

Then there is the consideration about users only exploring their own area, and not recognising the opposite area. The marked out areas visible to both users will hint a similarity between them. The complexity of the mappings and the sound should make the period users spend on the system, long enough for them to discover the area on the other side. However, there is a risk that the complexity or abstract sound will intimidate users. The question is, if we can make a sound design that intimidate less people than another, and if the sound is really that important.

6. CONCLUSIONS

Since we only need fast reactions to the movement, and accurate position data of the whole body, we chose a cheap tracking method based on background subtraction.

We found the one-layered mappings too tedious and added complexity. We built a multi layered mapping system, where the single user had control of some instruments and the control of other instruments depended on both users. This complexity is not only adding depth to the experience but more over confusing users.

We intend to develop evolving behaviours for the instruments, which e.g. depend on the surroundings (the weather, the number of people at the station or the distance of the approaching train), to substitute the above mentioned complexity.

The prototype sound design was mainly based on the testing of mappings, and not an aesthetic consideration. We find it necessary to work on a more consistent design to make a system that will be appealing to users, and encourage them to use it.

However, we are not sure of the importance of the sound design, since we suspect the users' exploration of the interactive possibilities, will be enough to establish the communicative connection we try to create.

The prototype did not facilitate the amount of cooperation that we intended. The test persons spent too much time and attention exploring their own area. In the further development we have to work on clearer mappings, but still implement an increasing complexity.

We still need to test the system at the station, and in spite of the many problems with the technical side of our installation, we are confidant that we will be able to establish a connection between people. We believe this will make the installation relevant, by proposing a break in peoples everyday routines, in a space regarded as uninspiring and intended only for waiting; a chance to play – even with others. To us, it has merely been an investigation in the use of modern multimedia technology, but we see it as a chance to bring a little color to the gray train stations, and maybe even a bit of poetry.

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