UrinalBand/FountainOrchestra

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ABSTRACT
In this paper we will describe and discuss our work and experience with the interactive musical installation UrinalBand/-FountainOrchestra [7] which was designed and exhibited in the spring of 2008. In the lavatory in which it was installed Urinal-Band/FountainOrchestra allowed users of the urinals to create music while covering one's requirements. This was made possible by placing sensors just above each urinal and linking the input from these to a musical track, i.e. drums or vocals. Thus we took advantage of the band metaphor which in turn shaped the title of the installation.

Keywords
Installation Art, Collaboration, Sensor Technology, Gestural Interaction, Mapping Strategies, Human-Computer Interaction, Mixed Reality.

1. INTRODUCTION
Today a progressive proportion of the everyday environments we go about are being computerized. We are monitored by surveillance cameras, doors open by appearance and the amount of contrast and brightness on the screens of our cell phones is controlled by light measuring devices. Most of this mediation of the public sphere is hidden and transparent, as characterized by the concept of *calm technology* [1], and operate without our knowledge or intervention. In fact 98 % of all processors are situated in artefacts outside personal computers which have lead to the diffusion of so called *mixed realities* – a combination of physical and virtual space [2]. Although calm technology is a friendly wish to make our lives easier it can be problematic because it puts a subject in a position where he or she no longer reflects on the fact that actions are being mediated by machines. In contrast, UrinalBand/Fountain-Orchestra attempts to point out the effect of technology as well as the technology itself.

Furthermore, our installation is situated in a public space in which people try to maintain a private sphere. It is a common fact that using public lavatories often lead to feelings of awkwardness and embarrassment because of a very strict unspoken set of rules concerning communication, placement and behaviour. UrinalBand/FountainOrchestra challenges such non-existing fellowship by striving to create community and collaboration.

In doing so we found inspiration and theoretical guidance in Nicolas Bourriauds *Relational Aesthetics* that focuses precisely on artefacts' ability to create inter-subjective communication and collaboration. Bourriaud argues this is achieved by introducing alternative means of exchange in well known spaces. Thereby people are pushed out of their everyday rhythm and see routine tasks in a new light which promotes dialog and discussion. This can cause breaking with ethical, political and social ideas and believes bound by tradition and the forming of new as a result of reflection [3].

Additionally, we hope UrinalBand/FountainOrchestra can generate a discussion about music's more or less constant presence in public spaces nowadays – a development that has resulted in still fewer people listening to music at home. Instead it is increasingly becoming a secondary activity, something that inhabits the background while we carry out other activities such as working or going from one place to another. By locating itself in one of the last public spheres where quietness still prevails UrinalBand/FountainOrchestra marks the complete cloak of sound in public spaces. But in contrast with the general use of music in other public spaces, for example stores and institutions, our installation does not encourage passive appropriation but conscious and contemplative listening. And with that we try to move music away from the background to the front of the stage.

2. DESCRIPTION
Technically UrinalBand/FountainOrchestra is based on inputs from infra-red distance sensors placed just above each urinal in the lavatory where it is installed. These sensors send an analogue signal, in shape of changes in electrical tension, to an external board that converts the signal to digital numerical values. We have used a *Make Controller Kit* [4], but other similar products are available. The Make Controller Kit is a fully programmable, inexpensive, open source hardware platform that communicates with computer applications via *OSC* (Open Sound Control). Within the last decade OSC has quickly become the second most common protocol for transmitting musical data, only exceeded by *MIDI* which it was designed to supersede. One of the applications that enable the utilization of OSC is the musical programming environment Max/MSP. We have used Max/MSP to produce meaningful response to people's interaction with the sensors. Each sensor input is connected to a specific sound file in Max/MSP which sets the volume of the sound file as well as deciding the frequency of a low-pass filter. Each sound file represents a specific instrument, e.g. guitar or piano, meaning that when all sound files are audible the entire instrumentation can be heard. Summarized, the closer a subject is to a given sensor the louder and clearer the connected instrument will sound.

All sound files are played synchronically to avoid complete musical chaos. To achieve synchronization all sound files are started whenever a subject enters the perimeter of just one of

the distance sensors, however, only the volume of the sound file connected to this sensor will be turned up. We define this as the installation's active state. To hear the other sound files the remaining sensors must also be individually activated by a subject. If none of the sensors have been significantly active for a predetermined and configurable amount of time all sound files will be paused.

This introduces a passive state. The passive state is much simpler than the active state in that it only consists of playing a single ambient soundscape. The soundscape cannot be acoustically influenced in any way but will fade out whenever a subject triggers the active state with movements in front of a given sensor. Our general idea regarding the soundscapes is to create a different space within the space of the public lavatory, i.e. the sound of a shopping mall or a beach. Additionally the use of soundscapes ensure that subjects do not become frightened when the active state is triggered – they will already be aware that something out of the ordinary is going on.

Furthermore a third state is included in UrinalBand/FountainOrchestra which we call the intermissive state. This state occurs when the installation has been active for a particular amount of time specified in advance. The intermissive state begins with a robotic voice declaring that 'he' needs a break. Subsequently the passive state is started and sustained for a given amount of time although sensors may be active. The point of this state is to avoid long queues, caused by eager subjects unwilling to take turns, by suspending system response for a while.

2.1.1 Mapping

As Hunt, Wanderley and Paradis point out, an electronic instrument is more than merely an interface and a sound generator [5]. The invisible middle layer, the so called mapping, is very important in regard to the feel of the instrument. Though UrinalBand/FountainOrchestra makes use of a band/instru-ment metaphor, we do not claim that it possesses the properties necessary to characterize it as an instrument *per se*. Nevertheless, we do claim that it shares some characteristics with musical instruments and that mapping plays a central and essential role in our installation. This part of the article will address our strategies concerning mapping of sensor input.

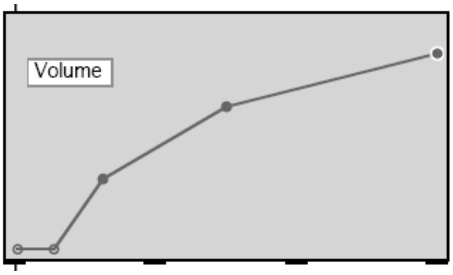

Figure 1. Volume development relation curve.

Our initial and conceptual idea was that each urinal should represent and control the volume of an instrument in 'the band'. Thus, the proximity measured by a given distance sensor is mapped to the volume parameter of a given sound file. However, we have found that the interaction in some ways will become more interesting and engaging if the proximity reflects more than simply the volume. More specifically we have had good experiences with letting sensors control the cut-off frequency and resonance of a low-pass filter (as well as the wet/dry mix of the filter in question) in addition to the volume. Of course this could be other filter types or audio effects (reverb, delay, phaser, step sequencer etc.), but the low-pass filter is easily audible and capable of creating interesting textures of more or less all sounds. An issue we had to deal with was how to define the relations between developments in raw sensor data and the resulting development in volume and low-pass filter parameters. In most cases it proved to be more aesthetically satisfying to define development relations that were non-linear. Therefore, in relation to each sound file, we connected a number of development relation curves and in this way we were able to configure each sound file individually without any difficulties. Figures 1 and 2 are examples of such curves related to a sound file in a Max/MSP patch.

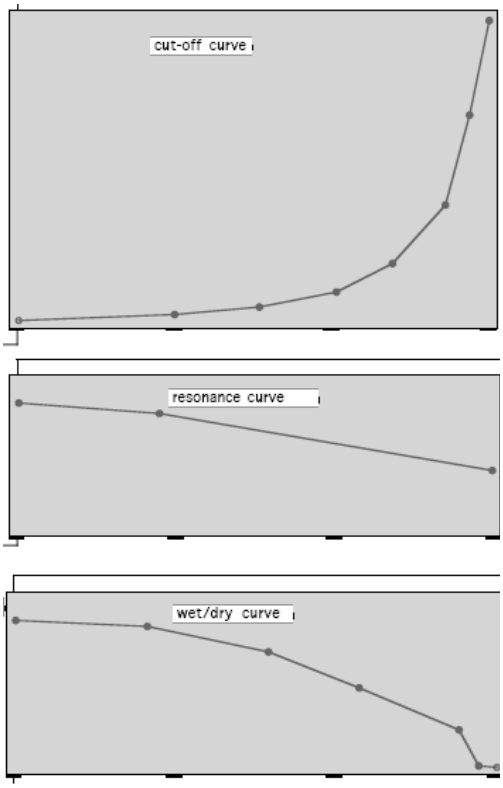

Figure 2. Filter control development relation curves.

While this has been our main mapping strategy we have also experimented with other types of sensor mapping. One of these, which we consequently decided to use, was to let a sensor control the pitch of a synthesizer restricted to an appropriate melodic scale. This was achieved by converting sensor signals into MIDI-note messages which could be redirected to any sequencer or software synthesizer. While experimenting we found that the most suitable synthesizer sound had a fast attack and a relatively short decay – it became annoying if its notes were sustained for too long. Moreover it proved to be a good idea to use a portamento effect and hereby make the transition from one note to another more seamless. This Theremin-like functionality worked well when only connected to one of the sensors but became chaotic and nauseating when used on several. Nevertheless, used with caution it provided 'the band' with an expanded possibility of expression.

In our work with UrinalBand/FountainOrchestra we have been operating with a four speaker setup. This enabled us to direct the sound of a given instrument towards the urinal controlling it quite precisely. However, in order to create a sense of playing together collectively it is important that the subjects can hear

their fellow 'band members' as well. It is a delicate balance between receiving individual feedback and maintaining awareness of the whole.

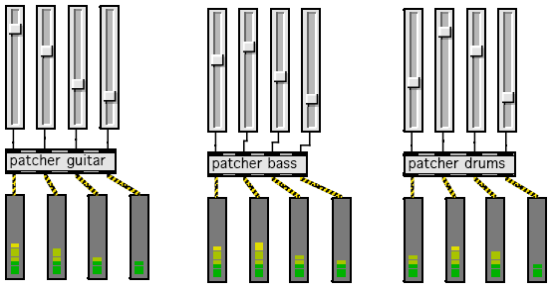

Figure 3. Volume and panning configuration.

Allthough Hunt, Wanderley and Paradis speak in favour of an even more complex mapping strategy than the one described above, we have chosen to keep it fairly simple. Partly because of the relatively short amount of time the subject's are in contact with the installation which means they have to be able to understand and interpret its content rapidly.

3. RELATED WORK

Many other musicians as well as academics have used sensor based input to make digital instruments imitate the gestural interaction of acoustic instruments. What sets our project apart from most of these is a primary focus on the sociological processes the installation causes instead of the technology itself.

One of the projects we have used as inspiration is Transition Soundings by Birchfield, Phillips, Kidané and Lorig [8]. It is similar to our project in the sense that it is placed in a public space where people do not expect to come upon an interactive artefact. Transition Soundings also use infra-red distance sensors to activate and deactivate sounds and sequences. Therefore people are not just spectators but also participants. Studying Transition Soundings we became aware that our installation had to address the participants in an immediate and transparent way because of the short amount of time people would be present.

In the conceptual stage we were also inspired by the thoughts of Dunne and Raby described in [9] as well as those of Thompson in [10] dealing with design strategies and intervention.

4. EMPERICAL STUDIES

Very early in the concept development process we visualized the lavatory in which UrinalBand/FountainOrchestra would be perfectly situated. This lavatory would contain around about five to eight urinals so by that means the installation could present fully orchestrated songs while still connecting only one instrument to each urinal. Additionally it would be placed where subjects could be expected to behave in a decent manner. Because of this we excluded night clubs and bars in general to avoid situations of malicious vandalism. Furthermore we preferred if UrinalBand/FountainOrchestra could be a part of an already somewhat musical sphere because it would improve the chances of subjects being able to understand and make use of the installation's interactive space of possibilities.

The only public lavatory in Aarhus we could think of that meet the above listed conditions was the one at Musikhuset Aarhus – the largest concert hall in the city. As soon as the concept of UrinalBand/FountainOrchestra was fully developed we made contact with representatives from precisely this institution. To our luck they were interested in the project and we arranged a meeting to clarify our points. For this purpose we decided to make a mock-up presentation of the installation using roughly shot video and post-production audio editing to mediate our ideas and goals.

Figure 4. Image capture from the mock-up video.

The mock-up video convinced them to initiate a cooperation leading to the realization of UrinalBand/FountainOrchestra. They suggested exhibiting the installation during the annual SPOT festival from the 5th to the 8th of June which we enthusiastically agreed upon. SPOT festival is the largest festival in Denmark specifically directed towards the music industry. The audience of the festival could without a doubt be expected to have either a very interested in music or be practising musicians and therefore they would be likely to appreciate and make the most of the installation. During the festival we observed how people reacted to the installation and also questioned people about their experience.

4.1.1 Preparing songs

Beforehand we prepared six songs consisting of six sound files with six different instruments to the six urinals present at Musikhuset's lavatory. We produced five of these songs ourselves – in part of existing material and in part of tracks made specifically to UrinalBand/FountainOrchestra. The sixth song, *Muse*, was kindly lent to us by the Danish band *Vincent van Go Go* who performed at the Festival. They divided the song into six sound files with almost constant musical activity. We had attempted to get hold of more songs by artists performing at SPOT because we thought it would be interesting for the audience to arrange songs they knew in advance or could hear during the festival. Unfortunately it turned out not to be possible because very few of the artists had access to the individual tracks of their songs. We did not observe any remarkable difference in the reception of the different songs. Instead we argue that the mapping, especially concerning panning, rather than the sound is what decides whether a song provides a good experience for the installations audience.

4.1.2 Setting it up

We set up UrinalBand/FountainOrchestra the day before the festival began. This gave us a chance to test and modify the installation to the space of the lavatory in question. The most time consuming modification proved to be setting the panning level of each sound file to reach the desired effect of subjects being able to point out the sound file connected to ones urinal as well as hearing the instrumentation as a whole. We decided to use provisional and easy-to-use materials such as duct tape and cable ties partly because it was the most rapid method, partly because Musikhuset didn't want the installation to leave

behind any marks and partly because we wanted to draw attention to the used technology.

Figure 5. Distance sensor mounted on the wall.

This rather primitive and fragile setup proved to work very well. The audience became aware of the sensors and started contemplating what it meant and affected. Additionally we believe that it contributed to avoiding vandalism since it appeared so frail not a single subject we observed tried to touch or tamper with any part of the installation.

Furthermore it was very easily and quickly dismounted. Therefore we conclude that UrinalBand/FountainOrchestra is an incredibly mobile installation that unproblematically can be exhibited in a variety of situations and spaces.

Figure 6. The setup at Musikhuset Aarhus.

4.1.3 Lavatory behaviour

We were anxious to see how people would react to UrinalBand/FountainOrchestra on account of its placement in a public lavatory. How would it change the way people acted and communicated? In our experience the public lavatory is a space characterized by many unspoken rules and norms. E.g. if a person chooses the urinal furthest to the left the next person who enters the lavatory must use the one furthest to the right – often even though the two persons know each other. Trying to commence a conversation with a stranger is most definitely not appropriate etiquette. Altogether the public lavatory is one of the last public spaces in which a person can preserve and uphold his or her private sphere. One of the purposes of UrinalBand/FountainOrchestra is to suspend the sense of private sphere and thereby generate a less tense and more communication encouraging atmosphere.

By examining Nicolas Bourriauds theory of the relational aesthetics we became aware of a number of properties the installation should contain in order to create inter-subjective communication and reflective dialogue [5]. First of all its shape had to be open and mouldable. In other words the audience should not feel like observers but like participants. Moreover Bourriaud argues it is of great importance that artefacts allow immediate conversation at any time. To meet this requirement we meticulously tested different overall volumes before we obtained a level that allowed conversation as well as hearing all details of a given song. Thus it is possible for the audience to attain an entirely different experience from an everyday situation and hence question the tradition bound rules and norms it is marked by.

It should be said that we did not expect UrinalBand/FountainOrchestra to create communication in the sense of lengthy conversation in the space of the lavatory. We would be contempt with subjects sharing a nod, a laugh or being able to look each other in the eyes without feeling embarrassed or insistent. During the SPOT festival we observed that the installation in fact was able to cause a more communication encouraging atmosphere. People did not engage in dialogue with strangers but did speak with friends about their experience both during and after the actual visit. We even came across a few women who had followed their male friends so they could see and try for themselves what was going on. Many continued talking about the installation after they left the lavatory – mostly about how it was technologically possible. A few times we even heard people humming bits and pieces of the song they had just heard.

5. DISCUSSION AND EVALUATION

Although we see the exhibition at SPOT as a success we did encounter some problems and minor disappointments. First of all we had hoped that more people would play with and explore the limitations of the installation. In other words use gestures to manipulate sound. Instead most people did what they were supposed to do and left although they understood they controlled a part of the orchestration. In addition we expected the installation to mediate its purpose best when most of or all sensors were active. This turned out not to be the case. Instead subjects found it very difficult to understand their part in the installation as a whole. The best amount of people interacting with the sensors proved to be between two and four because the audience then gradually could hear instruments add and disappear from the orchestration and as a result fully understand the consequence of their interaction.

UrinalBand/FountainOrchestra was open for the entire public throughout the day following the end of the festival. This gave us an opportunity to observe how the typical audience of Musikhuset Aarhus, who is somewhat older than the audience at SPOT, reacted to the installation. Fortunately they found it just as interesting. Actually, they tended to have a more playful approach which we ascribe to the fact that they generally experienced the installation in smaller groups.

Our largest challenge was to ensure stabile and durable operation. The computer, Make Controller Kit, audio interface and amplifier were stored in a locked adjoining toilet. This turned out to become somewhat of a problem since the heat generated by the equipment increased the temperature in the toilet to a degree where it influenced stability. Especially the Make Controller Kit crashed on quite a few occasions which meant we had to check the installation at short intervals. However,

whether this merely was due to the increasing temperature in the room or also hardware errors and bad wiring on our own account, we have yet to find out. Altogether the stability of the installation proved to be its Achilles' heel. During the exhibition we had to use provisional solutions in order to keep it operating. But it is of great importance that we find a long-term solution to these problems if UrinalBand/FountainOrchestra should be exhibited again.

Figure 7. The equipment placed at the toilet.

6. FUTURE WORK

As above mentioned we were a little disappointed that people did not play with and explore the possibilities and limitations of the installation to a higher degree. Subsequently we have considered what could generate such a reflective form of interaction. One solution worth investigating is to place a picture of the instrument connected to the given urinal in combination with an illustration of how to produce interesting sensor input.

It would also be exciting to expand the interaction possibilities by adding different types of sensors to the setup. I.e. by placing weight sensitive pads behind each urinal, giving people waiting in queue a chance to participate, or by putting sensors in the actual urinal measuring water flow, pH value, or even blood alcohol level – all of which in fact are realizable.

Furthermore we would like to experiment with other effects than the low-pass filter as a supplement to volume control. One of the most promising ideas as regards this aspect is to gradually apply reverb to a sound file the further away from the sensor a subject gets, thus working with the metaphor of moving away from the origin of the sound.

Many times during the development and exhibition of UrinalBand/FountainOrchestra we were asked: *"What about the women?"* The fact is that a situation similar to using the urinals does not exist at the ladies' room (as far as we have been told). But if we come across another situation characterized by unspoken rules and norms that is not specifically directed towards the male gender we will definitely investigate the possibility of modifying the concept to such a particular situation.

However, the most important future work is to examine what can be done to increase the stability of the installation.

7. CONCLUSIONS

Altogether developing the concept of UrinalBand/FountainOrchestra and exhibiting it at SPOT Festival has been a positive and insightful experience. Roughly all of our goals regarding the technological construction of the installation as well as its reception and perception were achieved. We definitely believe the installation changed the atmosphere of the public lavatory, generating communication and temporarily suspending the tradition bound rules and norms attached to its sphere.

At the moment we are in contact with representatives from Skanderborg Festival, the second largest music festival in Denmark, about exhibiting UrinalBand/FountainOrchestra later this summer.

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