# Experio: a Design for Novel Audience Participation in Club Settings

### Bastiaan van Hout
Department of Industrial Design
Eindhoven University of Technology
Eindhoven, The Netherlands
b.f.k.v.hout@student.tue.nl

### Luca Giacolini
Department of Industrial Design
Eindhoven University of Technology
Eindhoven, The Netherlands
l.giacolini@student.tue.nl

### Bart Hengeveld
Department of Industrial Design
Eindhoven University of Technology
Eindhoven, The Netherlands
b.j.hengeveld@tue.nl

### Mathias Funk
Department of Industrial Design
Eindhoven University of Technology
Eindhoven, The Netherlands
m.funk@tue.nl

### Joep Frens
Department of Industrial Design
Eindhoven University of Technology
Eindhoven, The Netherlands
j.w.frens@tue.nl

## ABSTRACT

When looking at modern music club settings, especially in the area of electronic music, music is consumed in a unidirectional way on a sound engineering level – from DJ or producer to the audience – with little direct means to influence and participate. In this paper we challenge this phenomenon and aim for a new bond between the audience and the DJ through the creation of an interactive dance concept: Experio. Experio allows for multiple audience participants influencing the musical performance through dance, facilitated by a musical moderator using a tailored interface. This co-creation of electronic music on both novice and expert levels is a new participatory live performance approach, which is evaluated on the basis of thousands of visitors who interacted with Experio during several international exhibitions.

## Keywords

Dance, electronic music, group improvisation, collaborative performance, co-creation, public social interaction.

## 1. INTRODUCTION

In contemporary live music performances, there is a clear difference between the input of the musician or DJ (in the following *moderator*) and the audience. Typically the former has sole responsibility over the musical design, to which the latter is merely exposed. Yet, both share in the experience. Informed by trends in participatory interactive systems, we became interested in how the aforementioned differences can be overcome in order to come to a truly shared experience; a participatory live performance with the active involvement of moderator *and* audience.

In this paper we approach this by turning physical movement of audience members into sound to create a new interaction between the audience and the musical moderator during a live performance. In specific, the objectives of our research-through-design project are to:

- Encourage co-creation between audience and moderator,

in the way that the parties involved need to (inter)act as a system in order to create a pleasant musical outcome, which will be experimental improvised electronic music;
- Allow for expressivity, exploration, and improvisation, enabling immediate feedback loops, so that expressivity is reinforced by recognizing the personal contribution;
- Guarantee a low threshold system entry point to those who possess limited musical skills, but also to challenge experienced users with more difficult or sophisticated mapping set-ups.

In the following, related work is presented, then Experio is introduced, after which we describe an evaluation of the design and draw conclusions. We conclude with an outlook on future steps.

## 2. BACKGROUND

In group music live performances, the feedback loops between the performers, the instruments and the audience [1] complicate the collaborative nature of music making on the one hand, but also intensify the experience and sophistication of the created music on the other hand. Next to this there is the challenge of creating a bond between the audience and the artist. Some related work can be found here in the area of audience participation systems, such as the work at M.I.T. Media Laboratory on using disposable wireless motion sensors [2] and the work of D. Maynes-Aminzade, R. Pausch and S. Seitz on techniques for interactive audience participation [3]. Inspiring though these examples are, these researchers consider the audience as a whole and as such limit the participatory interaction possibilities. As a result, these systems lack individual feedback loops, in our view hampering expressivity of individuals.

Our work is more in line with "The Interactive Dance Club" [4], which aims at creating a type of venue where people can have the opportunity to become players in a large, interconnected, interactive musical and visual environment. In The Interactive Dance Club, the input that participants generate is analyzed and filtered using both software and a DJ to deliver a musically coherent experience. Similarly, we consider the Jam-O-Drum project [5] as inspiring, even though it was especially keen on visual feedback instead of audio feedback. Our research takes this last step and adds a musician-moderator to allow for more improvisation, collaboration and control, not only enhancing the interplay between moderator and dancers, but also creating a different experience for all parties involved. We do this by focusing on sound influence, using one interaction possibility for the audience to participate: the interaction they are already emerged in, i.e. dance. The first part of the project consisted of a systemic design challenge, more elaborately described in a previous paper [6]. Here we describe the steps taken in a follow-up process.

## 3. EXPERIO

Experio allows for participants from the general audience in a dance club to step (i.e., dance) into several designated areas on the dance floor, marked and illuminated through laser beams. By doing this, audience members interrupt the laser in certain spots, as such influencing (layers in) the music. By interacting with other dancers, and by responding to their co-created layered music piece, a new live music experience emerges that is explicitly not limited to consuming music, but instead extends to shaping the experience.

Three parties participate together in a *live* performance, each being located in a different area of the club:
- The dance club as a whole, where the (passive) crowd gathers for dancing and socialising. People who are here passively participate but have the option to adopt a more active role. (area A in Figure 1);
- Multiple modular interactive dancing areas, where one or more audience participants can dance and actively participate in the musical experience. People who are in this area co-create the music through their dance moves. (area B in Figure 1);
- A central stand for a moderator (area C in Figure 1). This role shares some skills with the a DJ's role, but at the same time, it shares skills with a Producer's role, being open to the (co-)creation of music and also improvisation.

The next section describes the concept devised in this project in more detail and the context in which it should be implemented.
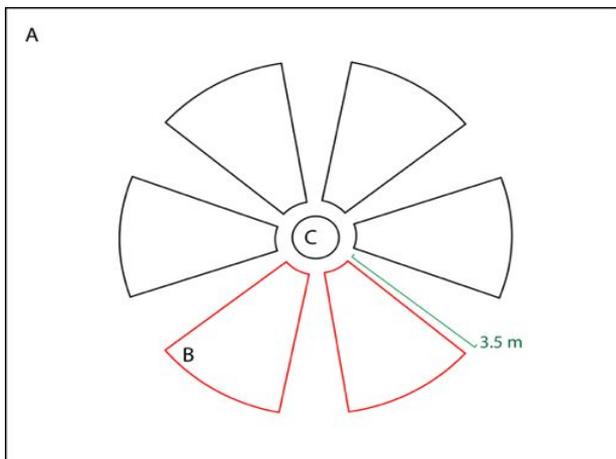


**Figure 1. Experio system with three main areas for the general crowd (A), the audience participants (B), and the moderator (C) in the centre.**

### 3.1 Interactive Dance Floor

Experio's interactive dance areas allow multiple participants from the audience to simultaneously translate their bodily expression (i.e., their dance moves) into a musically blended outcome. The current design consists of two of these sections, but this could be extended to as many as six (Figure 1).
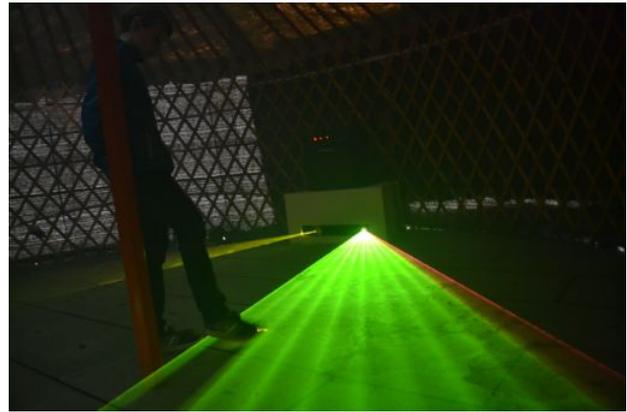


**Figure 2. Experio dance floor with a single audience participant interacting with the laser beams.**

Each area allows for one audience participant to voluntarily step in and dance for the length of one or more tracks. Instead of dancing to externally provided music, they are given the possibility to join in the music making themselves. The current design consists of two laser machines projecting laser light parallel to the floor for an approximate distance of 3.5 meters from the moderator booth towards a sensor bar. Using an additional haze machine emphasizes the visual effect. When the laser light is interrupted, a MIDI signal is generated and sent to a computer. Detection of player activity happens with 16 photo diodes for each of the two sensor bars. This detection could have been facilitated with other types of sensors, e.g., by using motion tracking or pressure sensors on floor tiles. However, the directness of the combination of photo diodes and interrupted laser light was the most appealing and effectual solution–apart from that this was the least constraint method of obtaining reliable signals in the club context specifically. By dancing in the designated area and interrupting the laser light with their feet, the audience participants are invited to move around the platform and explore the bond between their movement and the final musical outcome (Figure 2). While musical sounds can be triggered like this, continuous control of sounds effects is likewise possible.

### 3.2 Moderator Interface

In addition to the interactive dance floor, a touch screen interface was developed to let the moderator perform three tasks (Figure 3). This interface is mounted in the center of the Experio system (area C in Figure 1), so the moderator has live access to all Experio parameters and can directly interact with the dancers in area B (cf. Figure 1).
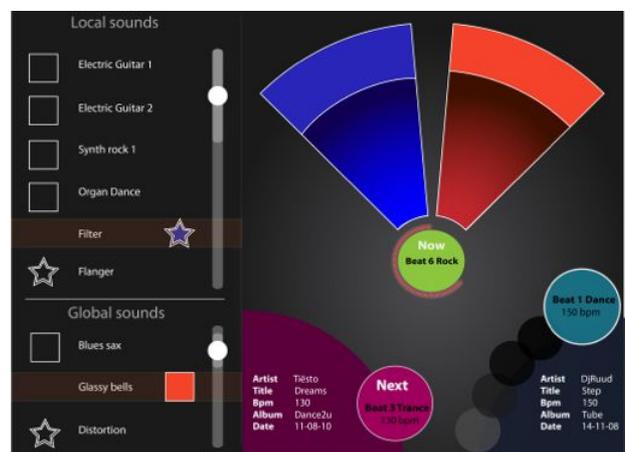


**Figure 3. Moderator live interface design.**

First, much like a contemporary DJ mixes tunes, the moderator prepares tracks in advance, which are built up from a base beat (providing a solid base to dance to). They are prepared using different audio editing software and subsequently loaded into the system interface. Similar to the beat, the moderator preselects a collection of sounds to be assigned to the individual dancing areas to be played live by the audience participants. This might involve fine-tuning and pitching, so that the overall sound is pleasant. A second task is performed live and consists of assigning certain sounds and effects to each section. However, the moderator has access to global sounds at all times to allow for improvising beyond the predefined settings. A third task of the moderator is to mix the inputs he receives from the dance floor. The volume of each individual dancing area can be defined by sliding either up or down the digital dancing area on the interface according to the moment. Apart from that, the moderator can prepare up to two tracks in advance for a smooth transition to the next beat. Detailed information about each track allows for quick browsing and easy selection.

## 4. IMPLEMENTATION

In this section we describe how Experio works and the context it would ideally be placed in. On a social level the audience participants and the moderator communicate through audible and visual contact. On a technical level, the role of the audience participant and the moderator are integrated into a bigger musical organism consisting of users and technology. We describe the feedback loops between the individual entities as shown in Figure 4. In each individual dancing area, a laser machine projects a laser light on the sensor bar in the form of a line parallel and in close proximity with the ground. The laser machine is controlled by a DMX (Digital Multiplex) communication protocol and detected by photo diodes in the sensor bar. When the light is uninterrupted, nothing happens. As soon as the light is interrupted, the sensor that is not receiving light input anymore sends a serial signal to a MIDI (Musical Instrument Digital Interface) converter. This MIDI signal is than interpreted by a code written in Processing. This code processes them and sends out another MIDI signal according to the settings applied by the moderator on the user interface. This processed MIDI signal together with the beats selected in the user interface are then sent to a music processing program, in our case Fruity Loops, where it is mapped to trigger a certain musical output.

Experio is designed to be portable so it can be placed in many different environments with a free (semi-) circular space. The targeted visitors of such a venue are creative people with openness towards participation and improvisation, not restricted to indoor locations. As far as the sound design is concerned, the platform allows for several genres to be played. However, in this prototype demonstrator we decided to scope it in terms of contemporary music and a fitting age group, leading to a selection deep house and techno music.

## 5. PRELIMINARY EVALUATION

We showcased Experio in several well visited venues with more than 7000 visitors both in The Netherlands as well as in China during the period September 2013 to December 2013. These experiences allowed the designers to observe many users interacting with the system, as well as collect a significant amount of qualitative data in the form of verbal comments.
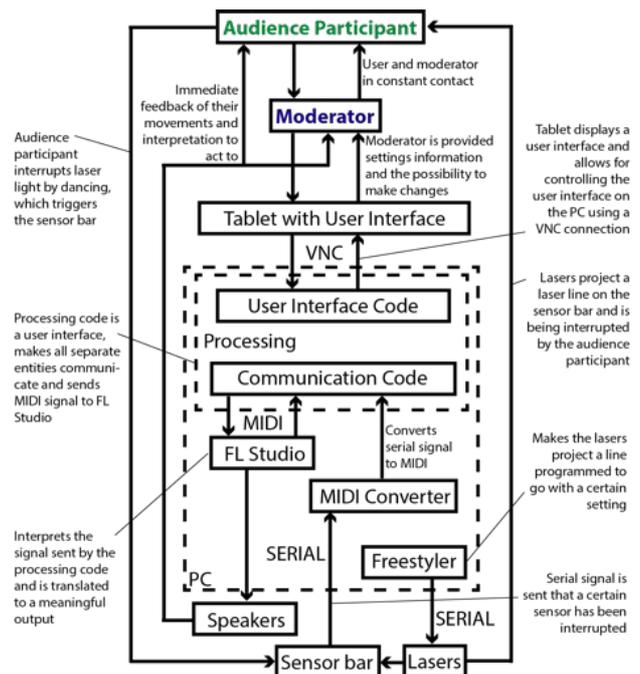


**Figure 4. Schematics with feedback loops of the Experio system.**

## 5.1 Physical Interaction

We observed that audience participants are willing to interact and explore, as long as they are able to distinguish their personal input and there is an instant synchronisation between the movement and the sound produced. As pointed out in the work performed by Todd Winkler [7], the different body parameters (i.e. weight, range of motion and force among others) should be mapped to similar sound characteristics. For example, in our case, the audience participants would expect different audio feedback when they applied little pressure on the ground compared to pounding their feet onto the floor. As far as the technology itself is concerned, a few people pointed out how detection only on the x axis could be sometimes limiting, as one expects something different to happen the closer they get to the moderator booth. When it comes to free body expressivity, we purposely limited to feet expression for two reasons: first, the audience participants can benefit from the natural tendency of first moving the feet to the beat. Second, the moderator would be overwhelmed by too many inputs to master.

Overall, the low threshold to join the experience was confirmed, since many audience participants understood and participated in the interaction without instruction.

## 5.2 Social Interaction

The overall atmosphere is based on the increased social interaction between audience (participants), since all entities involved co-create a new musical experience based on socially mediated, reciprocal influence. Our observations in China and the Netherlands have shown us an increase in social interaction among people, in particular among people that did not know each other before. Additionally, the circular shape of Experio was chosen to achieve maximum social interaction through establishing visual contact. Resulting from a certain hierarchy in responsibility for the overall experience [8] we derive hierarchy in control as follows. The moderator has control of the whole system and the audience participants have control

over individual aspects of the musical experience. However, they can always be overruled by the moderator for the sake of living up to the responsibility of the overall experience.. On a social level, Experio works because it well exploits the expertises of the two entities involved: on the one hand the audience participant is most likely skilled at dancing to the beat, while on the other hand the moderator is not only triggered by the visual contact with the audience in front of him, but also from real interaction on a musical level.

## 5.3 Musical Outcome

The system is designed in such a way that the parties involved, namely the moderator and the audience participant, have to actively participate in the performance: the base beat would be boring if not completed with the sounds that are generated by the dance floor. In the same way, only audience participants would produce casual musical patterns, without a solid rhythmic base provided by a moderator. It is a fact that most of the people, in order to be able to dance, need to hear a beat playing [4]. Therefore, a parameter distinction was made, with the moderator responsible for both the beat as well as the output choice at each section, and the audience participants adding new layers of either instruments or effects (i.e. the output choice) on top of the existing rhythm. In short, a moderator appeared to be necessary as too much improvisation could lead to chaotic musical output.

## 6. CONCLUSIONS

In this paper we described Experio as a design case that was used to address the issues concerning audience participation in live performances. The result of the project is in line with the goals we set for ourselves at the beginning of the paper. Our findings that are stated throughout the paper show us that we reached a compelling interaction between the audience and the musician in a club. The different areas of expertise among the musician and the audience participants are exploited more using Experio, allowing the audience participants to express, and requiring the moderator to improvise. The low-threshold entrance level for audience participants allows for quick exploration and understanding of the system to induce improvisation. In living up to these goals, the system manages to create a pleasant outcome without having to accommodate on any of them, despite the experimental trait of the concept.

For the future we believe that such an experimental set-up could be implemented in real clubs. On the design side, we aim at fine-tuning some technical aspects and the final sound design, as well as investigating whether the moderator interface should be strengthened with the introduction of physical buttons, instead of a touch screen. Also, the expansion of the system to six dancing areas with possibly more sensors per section will generate new challenges regarding sound design and the role of the musician. To conclude, the system should

have different entrance thresholds as audience participant become more and more skilled over time.

## 8. REFERENCES

[1] B. Hengeveld, J. Frens, M. Funk. Investigating how to design for system through designing a group music improvisation system. In *Proc. of the IASDR Conference* (Tokyo, Japan, August 26-30, 2013)

[2] M. Feldmeier, J. A. Paradiso. An interactive music environment for large groups with giveaway wireless motion sensors. In *Computer Music Journal* (pp. 50-67, Spring 2007)

[3] D. Maynes-Aminzade, R. Pausch, S. Seitz. Techniques for interactive audience participation. In *Proc. of the 4th IEEE International Conference on Multimodal Interfaces* (Pittsburgh, Pennsylvania, USA, October 14-16, 2002)

[4] R. Ulyate, D. Bianciardi. The interactive dance club: avoiding chaos in a multi-participant environment. In *Proc. of the International Conference on New Interfaces for Musical Expression* (Seattle, Washington, April 1-2, 2001)

[5] T. Blaine, T. Perkis. The jam-o-drum interactive music system: a study in interaction design. In *DIS '00: Proceedings of the conference on Designing interactive systems* (Brooklin, New York, USA, August 17-19, 2000)

[6] Junggeburth, M., Giacolini, L., Rooij, T. van, Hout, B. van, Hengeveld, B.J., Funk, M. & Frens, J.W. Experio: a laser-triggered dance music generator. In *Proc. of the DeSForM Conference* (Wuxi, China, September 22-25, 2013)

[7] T. Winkler. Making motion musical: gesture mapping strategies for interactive computer music. In *Proc. of the International Computer Music Conference* (Banff, Canada, September 3-7, 1995)

[8] S. Jorda'. Multi-user instruments: models, examples and promises. In *Proc. of the International Conference on New Interfaces for Musical Expression* (Vancouver, BC, Canada, May 26-28, 2005)