

# Observations on visitors' behaviour in The Music Room

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## ABSTRACT

In this paper, we reflect on the evaluation of The Music Room, an interactive installation that was designed with the aim of allowing everybody to experience musical creativity. Couples entering The Music Room can compose original piano music by moving throughout the space. The metaphor of emotion mediates the interaction between people's behaviour and an algorithmic composer. Specifically, the distance between people and their average speed map the emotionality of music: distance influences the pleasantness of the music, while speed influences the intensity. This paper focuses on the off-line analysis of the player experience exploiting log-data and video analysis, as well as on subjective evaluations collected through interviews and questionnaires collected in two public exhibitions of the installation. We elaborate on this data to understand how players appropriated the original design idea and which factors contributed to fun and engagement. Reconsidering our design assumptions against behavioural data, we notice a number of unexpected behaviours. Elaborating on them, we contribute some reflection on the design of musical interfaces and the understanding of visitors' engagement.

## Keywords

Evaluation, interactive installations, user experience

## 1. INTRODUCTION

In recent years an increasing number of studies have been working to open musical creativity to the general public. We contributed to this research by developing The Music Room, an interactive installation where pairs of visitors can intuitively direct the emotional character of music by means of their movements in a room [6]. The music, automatically generated by an algorithmic composer, is modulated with respect to pleasantness and intensity, attributes that are communicated by the visitors by means of their distance and speed. Evaluating The Music Room turned out to be a particularly demanding task. First, the identification of the objects of evaluation was not trivial. Our visitors can influence the musical outcome but they do not have direct control over musical parameters, as they would with traditional controllers. Thus, the evaluation of the music is a proper test of the quality of the algorithm rather than the creativity of the visitors. Our analysis therefore focused on the experience of the visitors in the room.

In this paper we discuss our experience with the evaluation of The Music Room as presented at two public events. In particular, we reflect on the qualitative and quantitative methods adopted to evaluate the experience of the visitors, discussing the difficulties of evaluating this kind of experience in a live context. Results reveal that almost all the visitors (N=140) regarded their experience as extremely exciting. Also, an interesting finding disclosed a

remarkable dichotomy: half of the people interviewed felt as if they were actively controlling the music, while the other half declared that they were mainly following the music, only having the impression of playing an active role in a few situations. We believe that this result offers an interesting debate for the workshop: The Music Room, ideated by the designers as a novel musical controller, shows its status only when analysed with the interactions and the behaviours of the users taken into account. User interviews and in-situ observations also contributed to improving the quality of the installation by revealing minor issues connected with the tracking system and to the latency of the musical engine.

Section 2 describes how The Music Room was ideated, designed and prototyped. In Section 3 we discuss the success criteria related to our objectives and the evaluation procedure and results. Furthermore, this section discusses the difficulties of evaluating this kind of system in a live context. In Section 4 we discuss the results of the evaluation.

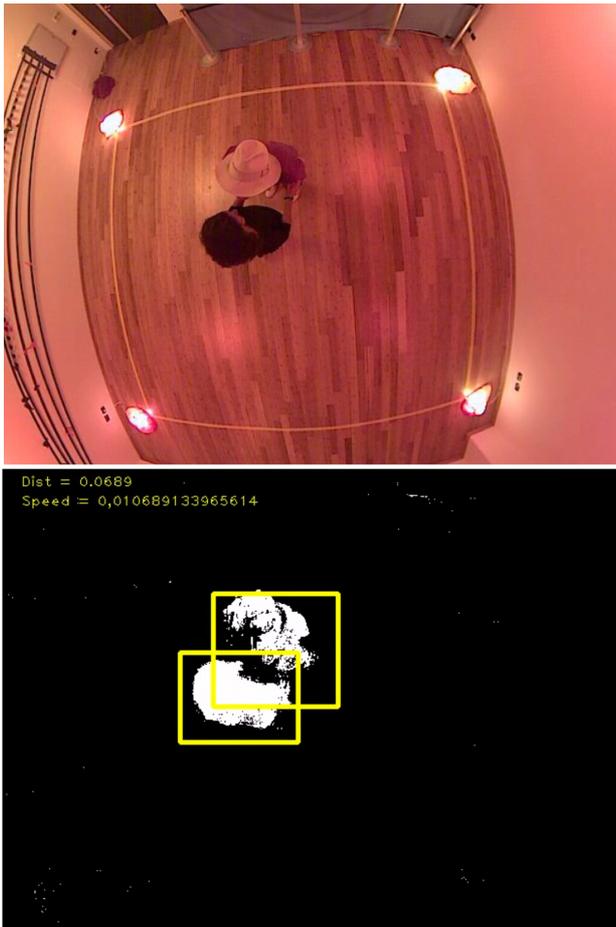
## 2. THE MUSIC ROOM

The Music Room combines emotions and movements by providing a space where visitors can compose music by expressing emotions through movements. It is experienced by couple of people that, moving throughout a private room, provide information about the emotionality of the music they wish to create. In order to communicate these factors, participants have to interact with each other: the distance between them maps the pleasantness of the music, while their speed influences the intensity. A vision tracking system acquires this proxemics information, which is then converted into emotional cues and finally passed to the music engine (Fig 1). The music is composed in real time by Robin, an algorithmic composer that generates tonal classical music [7]. The algorithmic nature of the composition, combined with the two parameters of interaction (i.e. distance and speed), allows for a broad range of original musical combinations and requires no musical expertise.

This interactive system was developed with a research through design approach, involving a conceptual stage enriched by early evaluations of scenarios and storyboards and continuous testing of an evolving experience prototype. The conceptual design phase evidenced two basic interactive scenarios. In the *acting scenario* users perform a play while creating the soundtrack. They explore the interactive dimensions of proximity and speed to try all musical combinations. In the *dancing scenario*, users enjoy the installation by dancing to the music played in the room. The Music Room was exhibited in Trento (Italy) at the 2012 edition of the EU Researchers' Night and on the occasion of the 2013 edition of the ICT Days. Both events hosted a number of demos and installations, which attracted a quite heterogeneous audience. For both exhibitions, The Music Room was constantly busy from the opening to the very end: 87 and 85 couples for a total of 344 visitors of all ages tried the installation. Individual visits lasted on average 5 minutes each (from a minimum of 1 min 30 s up to a maximum of 10 min).

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**Fig 1. The Music Room as seen from the camera mounted in the ceiling with the foreground maps portrayed on the right.**

### 3. EVALUATION

In a parallel paper presented at this conference, the authors suggest a framework for classifying musical interfaces on the basis of user experience [8]. It is structured as a design process consisting of two stages: design goal and technical specifications. In this section we discuss how we evaluated The Music Room from these two perspectives. Design goal can be evaluated by observing the experience of the visitors, while the system reliability is an indicator of the quality of the technical implementation.

#### 3.1 User experience

The evaluation of the user experience is based on a triangulation of online observations, interviews, questionnaires and offline analysis of log data and videos.

##### 3.1.1 On-line observation

For both exhibitions The Music Room was constantly busy, from the opening to the very end: 87 and 85 couples for a total of 344 visitors of all ages tried the installation. At both venues the installations quickly attracted interest, as witnessed by the long queue visitors had to face. However, the smiling faces of the people living the room appeared to be an attraction to many people. Indeed, despite being a disincentive for several visitors, the long queue also caught the attention of several passers-by who eventually ended up joining the queue. During the first exhibition we were caught unprepared by such a success but a team of 11 generous and passionate colleagues and friends rescued us.

##### 3.1.2 Offline Video analysis

The video-analysis is based on two samples of videos extracted from both exhibitions in equal part (N=30). The methodology to interpret behaviour evolved with several iterations of top-down thematic video analyses supported by ELAN. Thematic analysis involves the creation and application of codes to qualitative data. Coding refers to the creation of categories in relation to data. Categories were isolated and redefined by one of the authors and two assistant researchers who independently viewed the video footage of each session several times. Themes were iteratively elaborated by two of the authors, who participated in the design and exhibition of the Music Room.

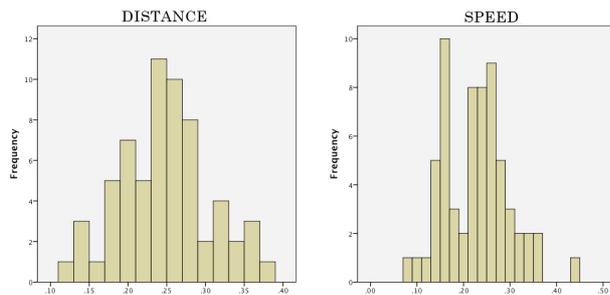
The four most common acting behaviours were *walking*, *running*, *dancing*, *standing* and *running after each other*; all of these actions had a direct effect on the music played in the room. A considerable number of participants experimented with other playing behaviour, such as *jumping*, lying on the floor (and at times spinning or rolling), twisting, bowing or stamping, or mimicking a love declaration. These behaviours did not have a direct influence on the music, but they mostly occurred at the apex of the experience, when people were deeply engaged with the private room and each other. Following the musical metaphor, we could say that *acting* inside The Music Room, visitors played the role of two players engaged in the same melody. Several people however experimented as if they were playing a duet on the same piano. Intimate behaviours ranged from a playful run and chase game, or the enactment of a fight, to more intimate experiences such as couple dancing, hugging or the more energetic pirouetting. A number of participants also lay down and crawled, as trying to tweak the system by hiding from the camera view.

##### 3.1.3 Log-data analysis

The information on couples speed and distance is computed in real-time to adapt the generated music to the movements of the visitors. This source of information can also offer valuable information for understanding user behaviours and experiences. To this end, during the event, the information on the distance and the relative speed of each couple of visitors was stored for an offline evaluation. This data can potentially disclose important information on couples behaviour. Information on couples speed and distance was plotted into several graphs and visually inspected by two researchers. We were expecting visitors to explore the space and try out the most different combinations of musical output (e.g. standing still close and far, and running) as they entered the room. In a latter stage, once they domesticated with the system, they would engage in dance, pleasurable activities, intimate behaviours or other typical behaviours of flow conditions.

To verify our intuitions, we focused on the data describing the movements of each couple during the whole session. Should our suppositions prove correct, speed and distance would greatly vary in the first part of the session eventually reaching a stable condition (for instance: low distance and low speed for intimate dancing). Results showed that this was not the case. In some cases proxemic cues varied for a very limited extent, suggesting that visitors kept performing the same behaviours. In contrast, other couples continuously changed their speed and distance. These results contrasted with our predictions, as the expected pattern did not emerge. The analysis did not reveal any recurring patterns or trajectory of interaction.

The analysis on the standard deviations (STD) of distance and speed for each couple revealed a Gaussian distribution (Fig 2), thus confirming that the behaviours in the room greatly varied among couples.



**Fig 2. Distribution of the standard deviations for distance and speed.**

A low STD for both factors means that the behaviour of visitors did not change by any significant amount: rather than exploring all the interaction possibilities, they probably preferred to adopt a more passive behaviour. On the other hand, a high STD suggests that visitors spent a relevant percentage of their time experimenting with different combinations of speed and distance. Involvement can be described along a continuum ranging from a very active control over the interaction dimensions to the passive experience of being immersed in music. Another potential indicator of the presence of some particular behaviour is the convergence of the means of distance and speed. Intimate slow dancing, for instance, could be described by low means for both distance and speed, while running could be described by high means on both factors. In contrast, means describing divergent combinations of distance and speed (i.e. high-speed, low distance and vice versa) could refer to either behaviours where the couples are linked together but moving fast (pirouetting) or individual behaviours characterized by high distance and low speed.

### 3.1.4 Interviews

Feedback collected through interviews [N=140] helped understanding users' behaviour and engagement [6]. A couple of questions probed their general experience, which was described by almost all visitors with positive words (e.g. *cool, interesting, unique, intimate, pleasant* and *relaxing* [6]). The only two people who did not like the experience complained about a lack of interactivity as if they were expecting a more direct manipulation of the artistic artefact. The only important complaint addressed a delay between people's movement and the reaction of the system, which was solved in the second installation.

The last question investigated people's perception of their control over the music. This question highlighted the important dichotomy reported above. Some of the interviewed noted that they first spent some time controlling the music and then they simply forgot about the instructions and followed the music. Others claimed that they first tried to control the music but, as the music was not promptly changing in consequence of their movements, they ended up just following the music.

In the second exhibition we were mostly interested in understanding whether the ambivalence between controlling vs. following the music had been reduced by the technical intervention on Robin. Results show that this was just partially the case, as 58% of the interviewees reported that they were controlling the music; 15% claimed that they felt like they were following the music, while 27% experienced both feelings.

### 3.1.5 Questionnaires

For the second event we collected 57 questionnaires from 32 female and 25 male respondents, 26% of whom described being able to play an instrument. To gain a general understanding of user appreciation, a pleasure index was computed combining four questionnaire items. These items related to hedonic

experience (i.e. *"I enjoyed the installation"*, *"I did not like the music inside the room"*) and creative qualities of the installation (i.e. *"It was a stimulating creative experience"*) as well as participants' recommendation intention (*"I will recommend this installation to my friends"*).

The answers to the questionnaire revealed that people enjoyed the installation (pleasure index = 4.04). The music was generally appreciated (3.93) though some of them would have preferred other musical genres. The most negative response referred to number of available movements used to influence the music (2.77). The pleasure index was entered as a dependent variable into an ANOVA with 2 (gender: male, female) X 3 (level of acquaintance: friend, partner, stranger) X 2 (musical knowledge: play instrument, does not play instrument) as between-subjects factors. Results indicated a significant effect of musical knowledge ( $F(1,48) = 6.56, p < .1, \eta^2 = .12$ ). This effect was due to participants who did not play an instrument, who scored higher in the pleasure index. No other significant effects were found.

The last investigation concerned the extent to which visitors experienced creativity with respect to their musical expertise. This issue was of particular interest for us, as providing non-musicians with a novel creative experience was one of the most crucial success criterion. The question on creativity was entered as a dependent variable into an ANOVA with musical knowledge as between-subject factor. Results disclosed that non-musicians had a more creative experience compared to musicians ( $F(1,54) = 5.142, p < .1, \eta^2 = .09$ ).

## 3.2 System quality and reliability

Information on the quality of the system is provided by the accuracy of the response of the system to the movements of the users. In particular, we investigated how precisely the system detected the position of the people in the room and how fast the musical engine adapted the musical output to the information coming from the visual tracking module. In order to obtain this information, during both events, two researchers sat behind the control desk observing the reaction of the system to the movements of the users. The visual tracking algorithm responded to user movements fairly accurately. When the users were standing close, the system sometimes lost track of one of them. However, in most of the cases the system was capable of recovering from this lock very quickly. Only in very few occasions we were forced to perform a hard reset of the system, that resulted in a lost of track of the position of the couples for approximately 5 seconds.

Concerning the musical engine, interviews revealed that most visitors were impressed by the quality of the music, which was often described as barely distinguishable from that produced by a human musician. However, during the first exhibition a small latency between user movements and the generated music was reported. This latency however was the result of a precise design choice: we intentionally decided to avoid sudden changes in music in order to preserve the phraseological structure of music even in case of a sudden change in the emotional input. Several visitors, however, commented that this latency was a bit annoying as they were expecting the music to change instantaneously in response to their movements. In order to fulfil this request, for the second edition of The Music Room we edited the algorithm in order to reduce the maximum latency from 2 seconds to 0.75 seconds.

## 4. CONCLUSION

Interactive musical systems have the potential of empowering non-experts to experience musical creativity. Methods for behaviour understanding can be used as mediators of human intentions and emotions, thus reproducing the distinctive sensibility of talented artists. Computer scientists and

psychologists jointly address automatic analysis of human behaviour by using recent advances in pattern recognition and computer vision [1]. Techniques for behaviour understanding can also address the issues related to the evaluation of user experience in context of interactive art. Interestingly, only a few studies investigate how people experience interactive art [4, 5]. [3] clearly formulated this issue by stating: “HCI still needs to develop to provide meaningful answers as to what makes an engaging and meaningful art experience”.

In this paper we presented a case study focused on understanding user experience in context of interactive musical systems. This study offered reflections on the potential and the difficulties of analysing human behaviours in the chaotic context of a life-exhibition. In particular, given the difficulties of gathering comments in this context, running adequate interviews is problematic. Readers interested in the design of artistic/entertaining experiences may benefit of our holistic evaluation approach to weight costs/benefits of different data gathering techniques.

The evaluation focused on (i) understanding the experience of the visitors and (ii) testing the quality of the system. For doing so, a triangulation of four different techniques was adopted. Results confirm that The Music Room met visitors’ interest to a large extent: they overall enjoyed the installation and the quality of the music was positively rated. Interestingly, performing a qualitative analysis on user behaviours helped us framing the nature of the system: our initial intention was to provide everybody with an experience of music composition, but several people subverted it into an engaging, intimate and playful experience.

This evidence offers reflections on how to design for creative interaction and for appropriation. Our users were able to appropriate possibly because they were not required to follow specific tasks. Indeed, as the outcome of the interaction was not formally assessed, the *worry of failure* was missing. [2] states that appropriation happens when “people do not ‘play to the

rules’: they adapt and adopt the technology around them in ways the designers never envisaged”. This supposition is confirmed by the observation of user behaviours in The Music Room. However, our observations also suggest that exceeding what a designer envisions does not necessarily represents creativity: the designer may or may not have been particularly creative in envisioning what might be possible with their system. We do not have any evidence to claim that people really experienced the flow of music creativity, but all sources of our investigations demonstrated that they enjoyed this brief but often intense immersion in classical piano music.

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