Bodily Explorations in Space: Social Experience of a Multimodal Art Installation

Giulio Jacucci[1], Anna Spagnolli[2], Alessandro Chalambalakis[2], Ann Morrison[1], Lassi Liikkanen[1], Stefano Roveda[3], and Massimo Bertoncini[4]

[1] Helsinki Institute for Information Technology HIIT,
Helsinki University of Technology HUT, P.O. Box 9800, FIN-02015 TKK, Finland
`name.surname@hiit.fi`
[2] HTLab Dept. of General Psychology, University of Padova, V. Venezia, 8, 35131 Padova I
`name.surname@unipd.it`
[3] Studio Azzurro, Via Procaccini 4 C.O. La Fabbrica del Vapore , 20154, Milano, Italia
`name.surname@studioazzurro.com`
[4] Engineering Ingegneria Informatica, R&D Lab, Via San Martino della Battaglia 56,
Roma I
`name.surname@eng.it`

Abstract. We contribute with an extensive field study of a public interactive art installation that applies multimodal interface technologies. The installation is part of a Theater production on Galileo Galilei and includes: projected galaxies that are generated and move according to motion of visitors changing colour depending on their voices; projected stars that configure themselves around shadows of visitors. In the study we employ emotion scales (PANAS), qualitative analysis of questionnaire answers and video-recordings. PANAS rates indicate dominantly positive feelings, further described in the subjective verbalizations as gravitating around interest, ludic pleasure and transport. Through the video analysis, we identified three phases in the interaction with the artwork (circumspection, testing, play) and two pervasive features of these phases (experience sharing and imitation), which were also found in the verbalizations. Both video and verbalisations suggest that visitor's experience and ludic pleasure are rooted in the embodied, performative interaction with the installation, and is negotiated with the other visitors.

Keywords: User studies, Art & entertainment, Multimodal interfaces, emotions.

1 Introduction

Installation art is a contemporary art form that loosely refers to a type of art-work in which the viewer is required to physically enter the work in order to experience it. Installation as a term emerged out of a series of art movements working away from creating object-centric or 'object in space' experiences for their audiences, and more towards creating experiences in spaces or purpose-made environments. Installation works stand in opposition to modern art works, where the audience had formerly been placed in a passive and non-participant role [2]. Often the themes explored or the work itself may not be considered as *art* per se by art critics, as well as the general public. Lately interactive art installations have begun to include sophisticated

multimodal interfaces to track bodily interactions of visitors and their utterances. We believe these are fruitful settings to investigate in the field how such interfaces feature in public settings and how they are experienced and used in social situations.

Recently evaluation of user experience of artistic or playful interactive applications has been growing as an area of interest. This interest can also be connected to a variety of movements in HCI, such as affective computing and interfaces, gaming, and pleasurable products and interfaces. In this paper, we report a field evaluation on a public interactive art production called "Galileo all'Inferno" (Galileo in Hell). This work was performed in a public theatre environment, and the installations were then made available to the audience to experience and interpret in their own way. We utilize different methods to capture visitors' experience, with particular emphasis on understanding the nature of the users' interaction with the installation, and of the emotions that accompany it. This latter approach is motivated by the recent finding that emotions are a robust predictor of the overall enjoyment of a performance or work [18], possibly opening a perspective to interactive experiences in general that goes beyond conventional functionality. The field study aims both at evaluating the users' experience and at highlighting phenomena of interest characterizing the experience and worth further investigation.

2   Related Work

Interaction Design and HCI researchers have began working in the field of evaluating experiences with interactive art [11,13]. In 2005, Hornecker and Bruns evaluated a series of interactive installation works and noted the lack of methods to evaluate such experience dimensions as "joy of use." Gaver [7] suggested the concept of ludic engagement (or playfulness) as a way to discuss interactions with the everyday recreational use of technologies. He also proposed that these terms are useful for understanding the experience in interactive art installations [7]. As Heath et al., 2002 [10] discuss, when arriving at an interactive installation, the behaviour of those already occupying the environment sets the scene and can impact considerably on how others will act and relate to aesthetic objects in the environment. "People, in interaction with each other, constitute the sense and significance of an art work."[10, p. 11] The artist's perspective and motivation in making a playful environment for others to enjoy is also considered [23]. Of course ambiguous works often provoke unexpected and unplanned interpretations [7], in a complex interplay between the artist's intent and the visitors' response. Even though interpretation is placed in the hands of the audience as readers of the work [1], it is aware of and in various ways attempts to uncover the intention within the work. From an interaction point of view, the goals and mechanisms of an installation, may be designed with a more complex experience for its users in mind, than are conventional interactive or work-based systems. [7].

Several frameworks that can be used for studying aesthetic experiences already exist. For instance, Presence measures [9], Flow Experience [6], Dimensional models like Pleasure Arousal Dominance model (PAD) [22], Positive Affect Negative Affect Schedule [26,27], all seem feasible frameworks for the task. They also have derivates, such as the Self-Assessment Manikin (SAM) [19] which is an instrument based on the PAD model. Previous work adopting these frameworks focused on the use of

questionnaires on involvement and presence to study experience of games [25], positive affect and flow experience in Internet use [3], and PAD approach to study interactive experiences [20]. However, these measures have not been extensively applied in real-world contexts to assess experiences with interactive art. Höök et. al [11] argue that the evaluation of artwork would be enriched by including an ethnographic perspective to better understand human action in-situ. Costello and Edmonds implement a method to collect experiential data with video-cued recall method to increase accuracy in recall for interview discussions [4]. Cultural probes and cultural commentators have been used in combination with ethnographic study as methods for evaluating interactive art [7,8,24]. Our methodological experimentation moves towards pluralistic evaluation approaches in allowing for divergent audiences responses from different perspectives [cf. 7,8,14,23].

3   Evaluating Installations of "Galileo all' Inferno"

Galileo all'Inferno is a theatre show developed by Studio Azzurro, it has been performed daily between 10th - 12th of July 2008 in the Teatro Arcimboldi of Milan, Italy. The show is composed of two parts, both different from an aesthetic and the technological-interactive point of view.

   The first part of the show is a dance performance, during which the public attends the show in a classic way, sitting in the stalls. In the second part of the show, at the end of the performance the audience can get on the stage and interact with two interactive installations, "Galassie" ('Traces of Galaxies', Figure. 1 left) and "Ombra di stelle" (Stars' shadow', Figure. 1 right), both inspired by the writings of Albert Einstein. Our study focuses on this second, interactive part of the performance.

3.1   Description of the "Galassie" and "Ombra di stelle" Installations

"Galassie". In this installation a projector throws a beam through a transparent screen positioned on the stage. It projects a geometry of a grate of coordinates, creating a visualization of stylized shapes similar to galaxies. The software is composed of two main components: the video tracking (Retina) and the generative/reactive algorithms programmed in Processing OpenGL. The video tracking defines the position and detects the outlines of the visitors with the help of an infrared lighting system. Every person who gets on the stage generates an expanding galaxy from his body. As the user moves, (s)he's followed by his own galaxy and by a grate that visualizes persons movement in a cyclic and generative way. Moreover, by using a set of directional microphones, a component analyses acoustic features of voice based on a machine learning individualizes the emotional state of those present and influences the appearance of the galaxies. Three categories of emotions, neutral, positive or negative are detected and they modify the colour of the galaxies: a scale of grey corresponds to the neutral condition, a shade of light blue corresponds to the negative condition and a shade of red corresponds to a positive condition. Thus three semantic categories are used to send status events and the galaxies will change the dominant colour. As positive event is received all the galaxies change to "warm colours" yellow orange and red. If the status event is negative the colour ramp used by the galaxies changes to
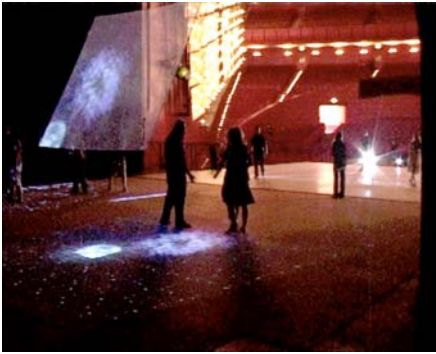
Fig. 1. Left. The art installation Galassie   **Fig. 2.** Right. The art installation "Ombra di stelle"

"cold colours" blue light blue violet. If the neutral event is received the galaxies turn to a grey scale. This effect will reinforce the emotional climate with introspective colours (blue Light blue) in a "negative" condition or joyful colours (orange red) in a "positive" emotional condition. The grey state should suggest the need for change stimulating reaction on the group.

"Ombra di stele". A projector transfers the image of a stellar field to a transparent vertical screen. Once passed through the screen, the beam of light is refracted and reflected, delineating stars on the stage and some other stars on the opposite side of the entrance. When the visitor gets closer, (s)he is lighted by infrared rays, creating a shadow on the ground invisible to the visitor. This shadow is detected by a camera equipped with a IR filter. The signal is analyzed by a video-tracking algorithm that identifies the shapes of the shadows throughout a sequence of coordinates. The data are elaborated by a software that reacts in real time and generates the graphics. The image of the stellar field changes depending on the graphics and the stars concentrate around the shape of the infrared shadow based on two parameters: presence and persistence. As the visitor moves, the stars move with her/him with a certain inertia. Looking at the ground (or at the backcloth), the visitor sees a constellation of stars surrounding his/her silhouette. (see Figure 1).

3.2 Approach and Method

The goal of the present work was to understand how visitors experienced Galassie and Ombra di Stelle, and to highlight specific phenomena characterizing their experience that could be subject of future work. The approach we employed to study user experience was a triangulation of three techniques:

- Quantitative data about emotions collected by administering the Positive and Negative Affect Schedule (PANAS; [26,27]).
- Written interviews to collect descriptions about the views of visitors
- Video-recording of users interacting with the art installations

We collected data on three consecutive performance days. On each day, we video-recorded users' interactions on stage. On the first day (10th July 2008) we

administered the qualitative questionnaire. On the second day we administered the PANAS, and on the third day both the qualitative questionnaire and the PANAS in a balanced way. The qualitative and PANAS instruments also included a section inquiring peoples' demographic details.

The rationale of the evaluation was to contrast the user's self-reported experience against our expectations that Galassie and OdS triggered positive feelings connected to interaction and co-presence. In case of negative feelings, we wanted to identify their nature and the circumstances associated with them. The videoanalysis was aimed at integrating the outcomes of the other techniques, and to explore the nature of interaction and co-presence in the installation. Some recurrent phenomena emerging from the videoanalysis could be worth further investigation or could be used to inform subsequent evaluation approaches. In the rest of this section we described each of technique used.

The Positive and Negative Affect Schedule. The PANAS is a self-report measure of Positive Affect and Negative Affect developed by Watson and Tellegen [26,27]. It presents a two-dimensional model of affect including independent positive and negative affect dimensions. PANAS is composed by positive affect and negative affect subscales, each consisting of 10 terms. Respondents are asked to rate the extent to which they have experienced each emotion in a 5-point scale. [29]. Positive affect (PA) represents the extent to which a person feels enthusiastic, active and alert. A high PA score reflects the state of full concentration, high energy and pleasurable engagement, whereas low positive affect [26,27]. is characterized by sadness and lethargy. Negative affect (NA) is a dimension of subjective distress, in which high level of NA is described by subjective distress and unpleasurable engagement, with low NA a state of calmness and serenity [5,27]. The analysis of the PANAS data was carried out using SPSS Version 15.1 for Windows. (SPSS Inc., Chicago, IL).

The qualitative questionnaire. The questionnaires included a range of questions, some adapted from [11]. These questions probed which emotions were raised and what provoked those emotions. We also measured dominance-submissiveness dimension - the extent to which the visitors felt they could influence the installation. Dominance was defined as a feeling of control and influence over one's surroundings and other people, versus feeling of being controlled or influenced by the situation or other people on stage [21].

Video-recordings. The video-based observations present the ethnographic approach in our methodology. This method enables understanding more fully the types of behavior—including the physical movements and the social interactions—that can occur in a particular context. Ethnographic studies are commonly conducted with new technologies to examine how people interact and which kind of emerging collaborative practices can be found. Here, we planned to video-based interaction analysis to investigate four topics a) How users discover the way to interact with the art installations, b) How they interact, c) Which are the activities that visitors are going to perform when in the same place, and d) how people orient themselves [10]. In the installation space, cameras were positioned at the rear of the stage, 90 degrees apart, pointing at each of the 2 installations on the stage and effectively capturing the whole wide area of interaction.

4   Analysis and Results

4.1   Measures of Positive and Negative Affect

A total of 115 subjects (52 male, 63 female, age 11-77) filled the PANAS question-naire. In initial analysis, we inspected the responses to single items of the instrument. Mean values of Positive Affect items and Negative Affect items are show in Figure 3. Scores are derived from a scale 1 "very slightly or not at all", 2 "a little", 3 "moderately", 4 "quite a bit" and 5 "very much".
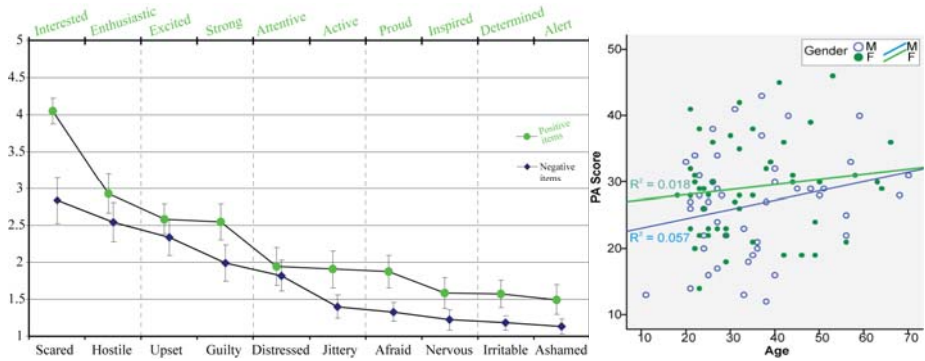

Fig. 3. Left. Means and 95 % confidence intervals for the items of positive (top) and negative (bottom) affect values. Scale 1=not at all, 5=very much.
Fig. 4. Right A scatter plot about the relation of Age and PA score. Women PA and men PA are represented by distinct markers and dedicated linear regression lines.

The majority of the items shows moderate or weak agreement, people generally agreeing more on the positive items, than the negative. From individual items we calculated the PANAS PA and NA scales and estimated their reliability. Cronbach's α was .78 for the PA scale, and .78 for the NA scale, showing that the translation of the scale into Italian language had produced a comprehensible instrument. The mean scores on the PA and NA scales were 27.90 (SD = 7.56) and 12.62 (SD = 4.14) respectively. In order to evaluate the influence of background variables on the PANAS scores, we performed two univariate analyses of variance (ANOVA). Fixed factors included gender, age and age and the interactive art installation used on the stage. Daily computer use hours and the number of interactive art installations visited in the past were used as covariates. Because of missing answers, the amount of subjects for ANOVAS was 100. ANOVA results revealed that females obtained significantly higher scores than males on the PA scale (F = 4.124, p = .045). This result is visualized in Figure 4. However, no significant gender difference was found for NA. A significant effect of age was found for PA (F = 4.028, p = .048), Figure 4 shows that increasing the age of visitors is increasing the PA score as well (regression B = .120). No significant differences were found between the two interactive art installations.

4.2 Visitors' Verbalizations

A total of 100 qualitative records were collected, 49 from users interacting with "Galassie" and 51 from users interacting with "Ombra di stelle". The data from the responses was analyzed in a bottom-up manner. The objective of this approach is to branch the descriptions of feelings in categories that result directly from the answers of the visitors. The first step was to identify terms describing a particular emotional state, following the categorization of emotional terms made by [28]. The second step was to group the descriptions in logical semantic categories. After an iterative analysis of the corpus, we identified 14 categories of feelings: interest, transport, ludic pleasure, amazement, involvement, creation, serenity, freedom, confusion, irritation, indifference, frustration, boredom, distressed. Moreover it was possible to split the 14 emotional categories in two macro-categories: Positive feelings and Negative feelings.

Table 1. Positive and negative Categories, characteristic terms and frequency in descriptions of feelings

Positive	Typical terms	Freq.
Interest	Curiosity, research, try to understand, interesting	19
Transport	In a surreal world, abducted, altered time dimension, lack of reference, sensorial isolation, "floating in a dream"	19
Ludic pleasure	Sense of play, amusing, creative game maker	11
Amazement	Astonished, surprised, amazed	5
Involvement	Participation, involvement	4
Creation	To create, to generate	4
Serenity	Peacefulness, peace, lightness	4
Freedom	Sence of freedom, "I was feeling to be on the sky, to be free"	4
Misc.	Attentive, happy	1 each
Negative	Typical terms	Freq
Confusion	Feel confused, disoriented	6
Irritation	Annoyance, irritated	4
Indifference	Not involved, not interested	4
Frustration	Frustrated, feel nitwit	3
Boredom	Feeling bug, boredom	2
Distressed	Upset	2
Misc.	Unsure, disquiet, Embarrassed, Fear, loneliness	1 each

Table 1 shows the 14 categories of feelings described by the visitors and the frequency of different terms. The semantic categories are depicted in a decreasing order of occurrence in the descriptions collected.

Positive and Negative feelings. A total of 99 visitors described their feelings. Positive feelings were described 72 times and negative 26 times. 14 subjects described more than one feeling, 13 subjects reported that they were not feeling emotions.

Perception of others. A total amount of 72 visitors answered questions about feelings perceived in others. 21 respondents described more than one feeling. Positive feelings were described 72 times, negative feelings were described 11 times. We found that Interest (23 times) and Ludic pleasure (23 times) were the feelings most often described, visitors referring to Interest with terms such as "curiosity". Ludic pleasure was described with sentences such as "they were playing like children", they were playing… who was dancing, who something else". Amazement was present 13 times in the descriptions with variable terms, for instance "surprise" and "amazed". Transport was described only 2 times. The Negative feelings that were more perceived in others were Confusion (6 times) and Indifference (3 times). 11 visitors answered that they didn't know the feelings of others.

Influencing the artworks and dominance. 54 visitors (48.8 %) described that they were able to influence the artworks and 32 (37.2 %) indicated the opposite (N=44 of "Ombra di stelle", N=42 for "Galassie"). Responses were similar for both installation, With "Ombra di stelle", 26 visitors interacting indicated being in control, With "Galassie" 27 visitors responded being able to influence the stage. Less data was acquired about Dominance. A total of 44 visitors (N=59) answered that they were not controlled by the artworks. 15 visitors felt being controlled by the system and 10 visitors explained that they felt dominated in the absence of feedback from the interactive installation.

Influence of others in the same space. Near half of all visitors acknowledged other people's influence. 31 visitors (44.3 %, N=70) described having being influenced. 10 people told that they were positively influenced by others and 3 of them explicitly mentioned imitation as adding to the positive value of their experience (e.g. "yes, observing them simplified my interaction"). 10 visitors responded to be influenced in a negative way by others, four of them stated that they would prefer a private experience.

Self-reported emotion determinants. Visitors described that Interest was provoked by curiosity, by the originality and the unfamiliarity of the artwork, and the attempt to understand the functioning of the artwork. Visitors who felt Transport used different sentences to explain what provoked that feeling: "the response to the interaction with the artworks, because of introduced a dimension changing in the silence", by the context of the particular environment, "the darkness around me and the background were producing a sense of isolation from what and who were around me ", "lights and colors", "I was feeling attracted without point of reference, like floating". Visitors explained that Ludic Pleasure was provoked by the "emotion of play", by the interaction with images that were following them and by the possibility to control the projections. Visitors described that Amazement was provoked by the surprise and by the experience of trying something that they have never done before. Visitors described that confusion was provoked by not understanding the work and the surrounding darkness. Visitors reported that Irritation was provoked by the incorrect feedback from the installations, by the scanty response of the software and the presence of other people in the same space.

4.3   Phases of Exploration towards Play

The videoanalysis, as well as the other techniques deployed in this field study, focused on two aspects of the installation, namely the interactivity and the co-presence with other visitors. The interaction analysis of people exploring the installations identified three recurrent phases: Circumspection, Testing, Play. All of them are based on the exploration of the installation affordances, showing what visitors recognized as the possible way to interact with it.

Circumspection is the phase in which the visitor is entering the interactive area, observing the current setting and selecting a point to start from.

Testing is the phase in which the visitor starts to try to interact with the artwork by making a particular bodily movement such as "moving an arm" in order to find out which movements have a consequence on the configuration of the installation. In this phase, visitors usually remain within a portion of the installation, and appropriate it by exploring and testing.

Play is the phase in which the visitor interacts with the art installation in an aware, active and involved way usually after having discovered the "working of a principle" behind the installation. In this phase, they do not just to wait for the artwork reactions, but also try to provoke those reactions by using creatively the movements that were tested in the previous phase and new ones. In the following, we will highlight two characteristics of these three phases emerged from the analysis, namely sharing the art experience and relying on imitation as a guiding principle for interaction.

Co-testing and Co-playing. The social component of the art experience is apparent from episodes that we called co-testing and co-playing. When visitors came on the stage with friends or family, they experienced the artworks by taking into account both the installation and the other people accompanying them. Entrance in the installation space, testing the artwork possibilities and finally playing with it developed as a common activity, where the users oriented both to the artwork and to their accompanying people. People in these groups tended to focus on a same portion of the installation, and to take turns into testing or playing with the artwork.

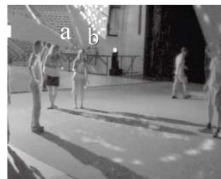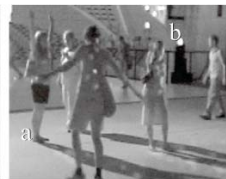Figure 5. Circumspection   Figure 6. Circumspection 2   Figure 7. Testing 1   Figure 8. Testing 2

Figure 9. Co-testing   Figure 10. Play   Figure 11. Co-play

We provide an example of an interaction episode in Figures 5-11. Two girls are entering the interactive area of Ombra di stelle, while others visitors are already present. Girl A is walking on the stage focusing on the transparent wall where the stars are projected, and Girl B follows her (see Figure 5). Girls A and girls B are still in the circumspection phase, moving in front of the interactive installation art and focusing on the interactive environment (Figure. 6). The circumspection phase of Girl B ends when she starts interacting by raising her arm and waiting for the response from the transparent wall (Figure 7). Girl A starts her testing phase by following the movement of the Girl B (Figure 8). Afterwards, the two girls remain positioned side by side, make joint actions or taking turns at interaction attempts (Figure 9). Girl A turns her body and raises her arms, Girl B brings down her body and moves her arms (see Figure 10). Figure 11 depicts Girl A and Girl B joining their hands, as they start interacting in an involved, creative way together, or co-playing.

Imitation. To follow other people's behaviour is a way to discover the actions that are possible in the installation and that have a consequence there. "The conduct of others within the same space can feature in how people orient, what people choose to look at and how they experience particular objects, artefacts and events" ([10], p. 23). We found that imitation was a very common strategy, especially since the installation was a little enigmatic, so that, after a while, a certain movement was adopted contagiously in different locations by people already in the installation space, and was inherited by people just entering the space, as a legitimate way to act in that context. An episode of imitation, where visitors learn how to interact with an artwork by observing others, is apparent in the interaction fragment represented by Figures 12-21.

Figure 12. Circumspection 1 (on the right) Figure 13. Circumspection 2 Figure 14. Subject stamps the floor, girl observes Figure 15. Girl imitation Figure 16. Subject claps, girl and boy observe

Figure 17. Boy imitation Figure 18. Girl testing moving her leg Figure 19. Girl play 1, spinning Figure 20. Girl play 4, spinning Figure 21. Girl play 4, dancing

A young couple, a women W and a man M, enters the installation space and witnesses a girl clapping her hands, and a circle of light moving in her direction after that. This 'input' gesture is immediately adopted by the man M, and soon afterwards by the woman W, but without success. Then, they try with some feet movements, and stick to them (Figures 14-20), testing several variants and treating the floor as main interface between them and the installation.

Feet-sliding is also tried but is also soon abandoned, whereas feet-hitting-the-floor becomes the favourite movement, experimented in several variants during the play phase. The light circles projected on the floor are constantly looked for and oriented

to as the active part of the environment, the one responding to their movements and validating them. Sometimes visitors acted like spectators, namely they observed other people and their behaviours without engaging in any interaction themselves.

5   Discussion and Conclusions

In this paper we presented a field study with two interactive art installations that utilise multimodal interface technologies. Using different techniques allowed to explore several different but interconnected aspects that are considered as crucial in the aesthetic experience of an interactive art installation in its emotional, physical and social aspects [13, 15, 16, 17]. The emotional dimension was considered a core part of the aesthetic experience [18], and was captured by two different techniques returning complementary and congruent outcomes. The core aspects around which the study gravitates are the visitors' interaction with the installation and with other visitors. The emotional connotations of these aspects constituted the basis for the evaluation of the experience, while the analysis of the specific actions performed with the installation and with the other visitors represented an additional resource for the evaluation and a means to explore some characteristics of the users' experience worth further investigation.

5.1   Visitors' Evaluations

The key finding of the different emotional probes is a strong tendency to experience, or at least report, positive feelings. The results of the PANAS show that the art installations evoked more positively feelings than negative ones. Interestingly, PANAS scores are not affected by the kind of art installation used, by the number of hours spent at the computer or by the experience with other artworks. It is influenced instead by age and gender.

The qualitative analysis of the questionnaires showed that a Positive interactive experience was mainly characterized by Interest, Transport and Ludic pleasure. Asking visitors to describe the feelings that they perceived in other visitors confirmed the relevance of the categories of Interest and Ludic pleasure. Visitors described to be interested, curious, involved in a creative game and to have felt Transport. When negative feelings were reported, the verbalizations suggest that they were motivated by frustration when the interaction did not develop smoothly, again showing the deep connection between aesthetic experience emotions and interaction. Merging the results of qualitative analysis and the interaction analysis we can argue that the bodily interaction with art installations has had a central role in the users experience but also in what people perceived in others who were in the same space. Visitors reporting what they perceived in others used expressions such as "they were playing like children, it is a wonderful thing", "they were playing, everyone showing his proper art, who was dancing, who something else", "they feel play".

Considering the evidence from the qualitative analysis, it seems that Ludic pleasure is related to visible, activities such as spinning, jumping and dancing, which are also able to capture the interest of others. This would also explain why the 'Ludic pleasure' category obtained higher frequency in the perception of feelings of others. What

remains difficult to investigate with video observations are feelings that we summarized in the category of Transport, which seems to be a deep, subjective and interior experience. Only the qualitative questionnaire was able to shed light into this aspect of the experience. The category of Transport had frequency 19 when users were describing their emotions, but obtained only frequency 2 in the feeling perceived in others. This category seems to reflect a personal, private, and subjective experience.

Asking what provoked feelings during the interaction revealed the influence of the context and underline the important of the feedback/response of the systems, it is important to consider that not all the visitors were explaining the reason why they were feeling certain emotions/sensations in an understandable way, (Interest was provoked by "the sensation of enlarged space"). Here it did not seem reasonable to try to understand emotion in a cause-effect way. We can conclude that most of all the visitors enjoyed the experience on the stage and that they were engaged with the art installations.

5.2 Phenomena Highlighted in the Visitor's Interaction

The video-based interaction analysis allowed to explore the unfolding of the interaction with the installation and the other visitors. This more exploratory part of the field study returned some interesting insights that – besides adding some clarifications to the outcomes from the PANAS and questionnaire– represent phenomena worth been included in further studies with interactive installations.

The analysis of the video-recordings showed the existence of three main phases of interaction: circumspection, testing and play. These results are aligned with the visitors themselves describing the experience as being 'Ludic', referring to the amusing sense of play, to the emotion of play, and to the interaction with the system that was able to give them feedback. These phases show that the discovery of the action possibilities is at the core of the experience [15,16,17]. It is here we see that the participant who having learnt what the environment does, need no longer be concerned if their reading of the intention of the work is correct or not. At this stage, as well as being comfortable with responding to others in this social and performative setting, participants are free to enjoy the designed enhanced ambience and interactivity of the installation in its full force. Imitation also shows that this sequence is influenced by co-present people: users do not just study the physical environment, but the social environment as well in order to find out what action is possible. Co-testing and co-playing show that people organize their experience by including other people in the dialogue between them and the installation. Echoing the observations of a previous study [10], the social dimension revealed to be constitutive of the visitors' experience, even if the installation was not expressively meant to be experienced collectively. The presence of others was both a resource and a constraint: a resource because it helped creating a practical meaning for the space; a constraint because the space had to be conquered, configuring/marking a personal area on the floor to experience the installation.

5.3 Future Work

The results of the evaluation suggest that interaction and co-presence were the reasons at the bases of both positive feelings and negative feelings reported by visitors. The

field study also allows to highlight some phenomena that can be included in future studies on interactive installations. Future evaluations could include the circumstances under which visitors give up and leave the installation, to understand what hampers the fruition of the art, or what defines the experience as completed. The equilibrium between engagement and disengagement with others in the public spaces of the exhibitions could also represent a way to evaluate the experience. Finally, other installations could be studied to check whether the same progression over three phases emerges and to go more deeply inside the practices that create a subjective meaningful place out of a spatial installation.

Acknowledgements

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