

De Humani Corporis Fabrica - Fabricating Emotions through Architecture

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This paper describes an experiment that took place as the last day of the elective course "De Humani Corporis Fabrica - Fabricating Emotions through Architecture". The goal of the Experiment was to evaluate the emotional experience of 1:1 scale architectural settings. The Experiment was part of the research for a PhD thesis which describes the relationship between architecture and the body since Vitruvius until the current theories of embodiment. The referred to thesis proposes the incorporation of the corporeal practices of performance art in the teaching of Architecture and combines these with the use of emotion measurement methodologies in order to evaluate the experience of architectural space and design objects during the design process. Psycho-physiological changes in the body's sensory perception during the performances were evaluated through the combined use of biometric technology (e-health platform), a Presence Questionnaire and a SAM chart. The course was attended by 4 students who participated as subjects in the Experiment. The Experiment had the technical support of the DFKI - Deutsches Forschungszentrum für Künstliche Intelligenz, which provided the machinery necessary to collect the biometric data during the Experiment and the knowledge needed to process them.

Keywords: Corporeal Architecture, Performance Art, Emotion Measurement, Pedagogy

INTRODUCTION

This paper describes an experiment entitled "De Humani Corporis Fabrica - Fabricating Emotions through Architecture" that took place as the last day of an elective course of the curriculum of students of Architecture. The title of the experiment is a reference to the first anatomy treatise with the same name (from Latin to English, "On the Constitution of the Human Body"), in which its author (Vesalius 1543) presents dissections of human bodies in order to explain its inner workings. This title was suitable for the experiment also because the original Latin word for fabrica can have the multiple meaning of "fabrication, constitution, or construction". It was taken as the motto of an experiment in which the subjects would design, fabricate, assemble, and perform in architectural settings, taking in consideration that the design elements in such settings would produce specific physical and emotional effects on users, or as the subtitle suggests "fabricating emotions through architecture."

The course was attended by students of Architecture and was hosted by the Digitale Werkzeuge at the Fachbereich Architektur of the TU Kaiserslautern during the Winter Semester of 2013/2014. The goal of the experiment was the evaluation of emotional reaction to changes in the sensory perception when a user is performing the same actions in settings that have the same design but significantly different dimensions. The goal of the course was to increase students' awareness of the direct effect that variation in the values of basic design parameters, such as scale and dimensions, produces on the human body, while conditioning movement.

Psycho-physiological changes in the body's sensory perception during the performances were evaluated through the combined use of biometric technology, a Presence Questionnaire (Witmer and Singer 1995) and a SAM (Bradley et al. 1994) chart. The course was attended by 4 students who participated as subjects in the Experiment. Experiment 4 took place on the last day of the course and had the technical support of the DFKI - Deutsches Forschungszen-

trum für Künstliche Intelligenz, which provided the machinery necessary to collect the biometric data during the Experiment (e-health platform) and the knowledge needed to process them.



Figure 1
Subject prepared for performance with biometric platform and neutral mask installed.

DESCRIPTION

For the final presentation, during which the Experiment would take place, students were asked to prepare a performance that explored chosen actions in settings designed and constructed at 1:1 scale. Stu-

dents also were required to wear black comfortable clothing and a neutral mask, as was the case in the previous Experiments undertaken on the course of this PhD research. (see Figure 1) Experiment 1 evaluated changes in the sensorial landscape when the body's range of motion is conditioned by the interaction with objects that work as extensions, Experiment 2 evaluated changes in sensorial landscape when the body interacts with architecture models enhances with sound and smell (immersive models) and Experiment 3 evaluated changes in sensorial landscape when the body interacts in space conditioned by body extensions and restrictions. Experiment 4 was therefore the last experiment and had the aim to extend the previous research to 1:1 scale, reason why the settings were built with real-life properties of weight, sound and texture. Experiment 4 was chosen to be described in this paper as it is also the one which is most related to the research tradition in movement and ergonomic studies in a design context.

The task that prepared Experiment 4 required students to choose an architectural setting, for example a basic unit such as a dining table and a bench, and to design at least two variations of the setting, for example one with a dining table 1 m high and the other with a dining table 0.5 m high. (see Figure 2) Students were encouraged to include movement notations in the design process in order to analyse the different stages of basic actions, such as working with a laptop (see Figure 3) or baking a cake in a kitchen. The settings were designed and produced with the combined use of analog and digital tools and were installed in a cubic space. This cubic space is intended to function as a living reference to Muybridge's work on the study of the human body in motion. The performances with the objects were documented by photography and film. Biometric and emotion measurement tools were connected to a laptop via Wi-Fi and installed on the performer's body to measure while the body was performing with the objects. Recall that the main goal of this experiment was to classify users' response to corporeal stimuli, by analysing

sensory data, having in mind that our main hypothesis was:

- H1 - a user's emotional response as "compelled or not compelled", "positive or negative", "aroused or not aroused" and "dominant or dominated" to an architectural setting can be evaluated through objective measurements of emotion using the Presence Questionnaire, the SAM chart and the e-health platform.

Two secondary hypotheses were formulated:

- H2 - the feeling of presence and emotional activation can be induced through the performance in analogical models, in this case, 1:1 scale architectural settings;
- H3 - the somatic techniques of "performance art" and "emotional design" are an effective strategy to develop corporeal awareness and stimulate the creativity of students and designers;

To verify these hypotheses, the experiment was developed considering four stages:

1. Identify the design characteristics that are more suitable to induce certain sensations in a user, such as "positive, aroused, dominant, compelled" or "negative, not aroused, dominated, not compelled";
2. Design an architectural setting so that those characteristics are the most important aspects of the design;
3. Perform experiments with users interacting with such architectural settings, while being monitored by camera and assess their emotional experience through the use of a PQ, a SAM chart, and a biometric platform;
4. Process and analyse the sensory data collected to understand if significant differences can be found in the classification and differentiation between a "compelling-positive" experience and a "not compelling-negative" one.



Figure 2
Subject performing
two variations of 1:1
scale setting "Eating
dinner".



Figure 3
Subject performing
two variations of 1:1
scale setting "Office
space".

RESULTS

Experiment 4 - De Humani Corporis Fabrica evaluated the emotional experience of 1:1 scale architectural settings by analysing changes in the sensorial perception of the user while performing a pre-set choreography of actions in settings built for the same purpose but with significantly different dimensions. The results of this experiment were the answers to the Presence Questionnaire (Witmer and Singer 1995) and the SAM chart, where recall of experience and believability of simulation are systematized. Such data depicts the subject's physiological response and emotional activation and allows for the evaluation of the setting's ability to condition the user's movements and alter his emotional state and perception.

The data is organized according to Presence Questionnaire's "Factors" and "Subscales", as well as SAM's parameters of "Valence", "Activation" and "Control".

As in the previous three experiments, the final values considered in the analysis of the PQ results were obtained by averaging the ratings assigned by the subjects to each of the questions, according to a 1-9 point scale. The final values used in the analysis of the data collected through the SAM charts were obtained following the same principle, as the three parameters of "valence", "activation" and "control" also were rated by the subjects using a similar 1-9 point scale. After making these calculations, we obtained values that qualify each subject's individual experience with the "De Humani Corporis Fabrica" settings,

regarding the parameters of "presence", "emotional response", "valence", "activation" and "control". From the data collected, we can also qualify the experience of the group of subjects as a whole, by averaging the results for the same parameters.

The average value of the answers given by the group of 4 subjects to the Presence Questionnaire (PQ) and the SAM chart shows that they have classified the experiment "De Humani Corporis Fabrica" as "compelling", "worthwhile", "moderately pleasant", "very exciting" and "dominating". These adjectives relate respectively to the parameters of "presence", "emotional response", "valence", "activation" and "control".

Out of the group of 4 subjects which participated in the experiment:

- 4 subjects classified the experience of the performance with the "De Humani Corporis Fabrica" settings as "compelling";
- 3 subjects rated the emotional experience of the performance with the "De Humani Corporis Fabrica" settings as "worthwhile" and 1 as "very worthwhile";
- 2 subjects rated the experience of the performance with the "De Humani Coporis Fabrica" settings as "very pleasant" and 2 as "pleasant";
- 2 rated the experience of the performance with the "De Humani Corporis Fabrica" settings as "very exciting" and 2 as "exciting";
- 2 rated the experience of the performance with the "De Humani Corporis Fabrica" settings as "dominating" and 1 "very dominating", while 1 rated it as "not very dominating".

Also, out of the group of 4 subjects:

- 3 could control emotional response to settings "well" and 1 "very well";
- 2 were "able" to control objects in performance and 1 "very able", while 1 was "not very able";
- 4 found the experimental setting "very stimulating" in imagining the performance to take place;

- 2 had their attention "very dedicated" during performance and 2 "dedicated";
- 3 found the performance sensually "very engaging" and 1 "engaging";
- 2 were "very involved" in the visual aspects of the performance and 1 "involved"; while 1 was "not involved";
- 2 were "involved" by the haptic aspects of the performance, 1 "very involved" and 1 "somewhat involved";
- 2 were "involved" by the auditory aspects of the performance, while 2 were "not very much";
- 3 found the performance settings "very convincing" and 1 "convincing";
- 2 were "aware" of events around, while 2 were "not very aware";
- 3 were "very aware" of the surrounding space and 1 "aware";
- 3 were "very able" to anticipate use of settings just by looking at them and 1 "able";
- 2 were "very compelled" to move in the settings and 2 "compelled";
- 3 felt that settings and objects "really stimulated" their imagination for the performance and 1 just "felt" so;
- 3 could interact with settings and objects "very well" and 1 "well";
- 3 could manipulate the surrounding environment "very well" and 1 "well";
- 4 were "very involved in the experiment";
- 2 were "very distracted" by the suit, mask, and e-health platform, 1 was "distracted" and 1 "not very much";
- 2 felt the camera didn't interfere with performance "at all", 1 "not much", while 1 thought that it "interfered".
- 2 could concentrate "very well" on the performance and not on the objects and settings and 2 just "well";
- 4 thought that they had learned new techniques which expanded their skills as designers;

- 4 found the experiment a "very good" learning experience;
- 2 "lost track of time" and 1 "almost completely", while 1 "not at all."

DISCUSSION AND CONCLUSIONS

Experiment 4 - De Humani Corporis Fabrica evaluated the emotional experience of 1:1 scale architectural settings by analysing changes in the sensorial perception of the user while performing a pre-set choreography of actions in settings built for the same purpose but with significantly different dimensions. The experimental results support the main research Hypothesis H1 - a user's emotional response to design objects as "compelled or not compelled", "positive or negative", "aroused or not aroused" and "dominant or dominated" can be evaluated through objective measurements of emotion. The results collected through the Presence Questionnaire and the SAM charts show that the majority of subjects experienced a high level of "Presence", "Pleasure" and "Arousal". Most subjects describe their emotional response to the performance with the objects as "positive". Results reveal that most subjects could control the emotional response to the setting and objects during the performance, but they experienced a low level of control of the performance itself. This indicates that the subjects probably didn't feel confident with the stability of their designs or perhaps their motor-skills got in the way and so they couldn't perform at ease. Still, results show that the majority of subjects didn't feel the camera interfered in the performance and felt able to anticipate the use of the experimental settings just by looking at them, as well as compelled to move in them, and found them convincing and very stimulating in imagining the performance before it took place.

Most subjects reported to be very involved in the experiment, found the performance sensually very engaging, were very involved by visual aspects and involved by haptic and auditory aspects, while remaining aware of events around and the surrounding space. This suggests that subjects were focused on

the most important aspect of the experiment which had to do with the movement of the body while performing with the objects, the kinaesthetic sense. It also suggests that they were involved by the sense of vision and hearing. This confirms a high-level of engagement and suggests that the experience was immersive, although other results show that subjects were somewhat distracted by the suit, mask, and e-health platform. Therefore, results support Hypothesis H2, which suggests that the feeling of "presence" and emotional activation can be intentionally induced through the performance with analogical models, in this case, architectural settings.

Results also show that most subjects were involved in experiment and lost track of time during the performance. This suggests that the feeling of "presence" and arousal situations can be intentionally induced in real-space, but further research is necessary to understand which specific design elements are responsible for this. All subjects rated the experiment as a very good learning experience and found that performance art techniques enhanced their creativity and capacity to design. Therefore, results also support hypothesis H3 which suggests that the somatic techniques of "performance art" and "emotional design" are an effective strategy to develop corporeal awareness and stimulate the creativity of students and designers.

The amount of participants in the experiment was only four which according to the quantitative research tradition could not be understood and treated as quantitative material. Although a qualitative research approach would be possible to use in such a context and eventually providing interesting results, the same methods used in the experiment can be applied to a larger experimental context. Also, the used approach can be understood as part of the educational content of the course and as training of research methods which incorporate innovative methodologies in the teaching of design and sensitize the students to the emotional impact of design objects in the human body. The results can be seen, for that reason as suggestive, as this experiment was

a pilot for future experiments which will involve more subjects and means. For the same reason, the results are presented in this paper as a list and not as graphics since there would be one graphic per item addressed, which would mean 28 graphics to describe each of the parameters taken in consideration. As the participants in the experiment were only four, and the results therefore do not represent a statistical importance, the authors decided to present them in the form of a list. The experiment described in this paper shows that PQ, SAM, and biometric technology can be used to objectively discriminate arousal responses related to "positive" or "negative" emotions, from the neutral condition, when users experience 1:1 architecture settings. On-going research in the fields of IT, psychology and marketing uses an established range of values that also were used in experiment. Results confirm that it was useful to include biometric machinery in the experiment, to observe how user emotions are triggered while experiencing design objects, as the participants in the experiment, in this case students of architecture, could see in the computer screen the live feedback of the physical experience of performing in the design settings. This feedback came directly from the analysis of changes in skin conductance and cardiac accelerations which are strongly correlated with emotional arousal. Still, the machinery used posed problems, namely of stability while collecting the results, therefore the data collected in the experiment is not presented in this paper. The aim in the experiment was to observe peak and limit reactions that would provide for a wide scale of physiological measures. Nevertheless, more work is necessary to establish solid conclusions. In future experiments, it is planned to integrate the use of EEG and to add to the experimental setting eye-tracking sensing technology to record the position of the user and where s/he is looking at.

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