The EMMA Project: Emotions as a Determinant of Presence

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ABSTRACT

So far, scientific literature has paid attention to the cognitive and environmental determinants of presence, trying to offer a definition and assessment measures that could seize such an elusive concept. However, the emotional determinants of presence have received less attention. Emotional responses could play a key role in generating and enhancing presence, specially for some Virtual Reality (VR) applications, such as mental health field (both for promotion and treatment goals). The main goal of EMMA project –an European Community funded research project (IST-2001-39192)- is to study the relationships between presence and emotions. In particular, after analyzing the possible emotional impact of high compelling synthetic experiences characterized by a high level of presence, the EMMA project wants to develop "mood devices" able to induce different forms of mood enhancement.

Keywords: *emotions, virtual reality, emotional response, presence, EMMA Project*

1 Introduction

Presence, the sense of "being there", is a complex experience. There is consensus that it is formed through an interplay of raw sensory data and various cognitive processes. However, there are still a number of unresolved issues such as the

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structure of presence, an accepted explanatory model of presence, measuring presence, contributions of determinants of presence, effects of presence, impact of individual differences and social consequences of presence technologies (Ijsselsteijn et al., 2001).

So far, scientific literature has paid attention to the cognitive and environmental determinants of presence, trying to offer a definition and assessment measures that could seize such an elusive concept. However, the emotional determinants of presence have received less attention. Not too much effort has been dedicated to study the relationships between emotions and presence. However, emotional responses could play a key role in generating and enhancing presence.

Emotions affect behaviours and cognitions, and they have an important impact on presence. Users "feel" presence. And as presence is unstable, emotions are also continuously changing. If we are able to understand better presence and emotional reactions to VE, we will be able to design more effective "virtual" experiences. Especially in clinical psychology field, but not only, we need to know how to generate and optimise the emotional impact that the virtual experiences have from a therapeutic point of view.

Over the last 100 years clinical psychology and psychopathology have advanced notably and different useful metaphors have been stated for the understanding of human being. These metaphors had an important heuristic value. At this moment, VR permits us to state a new metaphor. This one starts from the classic notion of "living organism that uses tools", that is, the use of tools modifies the environment, and in turn, such a modification has an effect on the human being. From this perspective, the psychological subject can be considered as a very complex open system in which not only the cognitive components are central, but also the "wise emotions" (Campbell,1978). This open system is intimately interacting with the "participative universe" (Prigogine & Stengers, 1979), and it is in a continuous process of change. This open system contributes actively to the construction of its own experience. In fact, the observer's participation produces what is called "tangible reality", the Universe (Wheeler, 1979). Tart (1990) already pointed out that our "reality" is virtual. We live inside machines which simulate the world, "our machine to know the world", using the Konrad Lorenz's terminology (Lorenz, 1977). Our perceptions are constructions, "simulations of the world processes" that allow us to do things. Moreover, VR allows a new way of interaction with the information. As it occurred with the microscope and the telescope, more information is available with this "new sense" for both researchers and users. In short, VR has a notable potential to stimulate the scientific knowledge since it

serves as a model of understanding the human mind; it may provide important keys to understand its anomalies and, from those keys, we can establish solving strategies.

At present, there are some assumptions that have a notable heuristic value, but they are quite elusive, like the conceptualization of *self* established by William James (1890). This author distinguished between *I* and *ME* as two central components of the self. *I* represents the self as "expert/knowledgeable" (the part that organizes and interprets continuously the experience) and *Me* represents the self as "known". James also pointed out the gradual transition between *Me* and *Mine* (everything the individual can consider of one's own: his/her body and ideas, his/her family, house, friends, political party,, …). This aspect allows the consideration of a basic trait of the self, its *extension*. Therefore, the *self* is not an entity blocked and closed to the world, but it is part of the environment and the environment is part of the *self* (Hermans, 1996). The aspect of *process* has to do with the historical nature of the human experience and implies to take into account space and time. The individual lives in a concrete time and space, and from them he/she can be orientated towards the past and future and towards the surrounding world. *Organizational* means that the person is not only orientated towards different parts of his/her temporal and space location, but also he/she connects or organizes those parts into a story or self-narrative. *Valuation* has to do with any unit of meaning in which the events of a self-narrative are organized.

Up to now, the different VR applications have insisted on the convenience of "simulating the reality in the most accurate way possible", but it is the moment to take a step forward and to start the design of "other realities" that represent our deepest fears, illusions, fantasies, ... New realities that user consider very "real" and they feel present in them. New realities that lead us to new processes/stages of evolutionary development. In those realities both users and "the others" could be present (or a part, sketch or trace of them). It is possible to imagine multiple dynamic positions of the *self*, along the development process. The self may move from each of those different positions and also may establish communication and interaction among them. They can be contemplated as characters that adopt an own life inside a story, the self of any position can correspond to other real or imaginary self (protecting father, imaginary friend, loving mother, etc.). From this perspective, the self is understood as a social self in the sense of Bruner (1990), that is, it is a *distributed* self. What is stated is that "I" am not only "here", but also "there" and may act as if "I" were the other.

The FET Proactive Initiative 2002 call on Presence Research Activities, which includes EMMA (Engaging Media for Mental Health Applications, IST-2001-39192) as one of its

projects, pretends to develop novel media that convey the sense of "being there" and expects to obtain a theory of presence thanks to interdisciplinary research.

2 Project objectives

There are two strategic objectives in the EMMA project.

The first one will be to investigate how **presence** mediates or generates **affective and emotional responses**, how emotional responses can be manipulated to control the extent and nature of presence, and how to use presence and emotions effectively in clinical settings. Emotions affect behaviors and cognitions, and they have an important impact on presence. Users "feel" presence.

The second objective will be to design, develop and test different mediated environments, from more traditional to more emerging, and new technologies that generate and enhance presence and emotions.

Regarding well-being issues, EMMA project's main goal is the investigation of the use of engaging media for the development of non-addictive, mood-stabilizing experiences. In particular, after analyzing the possible emotional impact of high compelling synthetic experiences characterized by an high level of presence, EMMA pretends to develop "mood devices" able to induce mood enhancement on both clinical and non clinical samples. The "mood devices" will provide innovative ways of coping with distressful emotions, that will be better than existing approaches, for different users:

(i)   Users who suffer from psychological problems (affective disorders, anxiety disorder, adjustment disorders).

(ii)   Users with acute restricted mobility (the emotional mediated experiences that bedridden patients could have by means of mood devices may help relieving their anxieties, reducing their pain, and encouraging them in their fight against diseases).

(iii) General population (relaxation environments through TV or VR; presence-enhanced synthetic environments for entertainment, etc.).

3 Focus on presence

EMMA pretends to achieve a more complete understanding of presence and reactions to mediated experiences. This will help us in creating more effective experiences for emotional learning, that could be useful in many different contexts.

Three distinct types of presence will be studied: You are there, the world is here, and we are together. Regarding subjective presence, some applications could need users BEING there, and BEING NOT here (in the "real" world), but in other ones users could be there and here. Equally, some applications need the virtual world being there, or it may be a mixed in between real and virtual or holographic worlds. The purpose is to create "significant life experiences" that ARE there and thus users can test that reality, and change it. It is like Alice in Wonderland: you can go through the mirror and see the other side of reality, and after that, you can come back. Specifically, EMMA will focus on narratives of abandon, loses, reject, acceptation, collaboration, minusvaloration, fear, and so on. These mediated experiences will be able to induce emotions such as sadness, anxiety, anger, joy, hope, etc., and users will learn to cope with these emotions and feelings. A goal is to create a VR laboratory where "emotionally loaded" scenarios will be designed. Related to that, one purpose is to create a "LIVING BOOK" that would constitute digital shared environments, accessible across a range of media (from fully immersive rooms or environments to textual diary entries), allowing users to build a history of their emotional experiences, but also to live present emotional experiences and even generate new future experiences. Finally, EMMA will also focus on the therapist presence. Users could be always accompanied by a person who trust on, under therapist protection. So it is easier for them to venture to change the world (and change themselves). And not only when users are "in" the virtual environment, but also when they are in the real world, even generating therapist presence using some aspects of therapist (voice, instructions, etc.).

The project is focused not only on generating and enhancing presence, but also on measuring it. The purpose is to measure the "arrival" experience (being in the VE) and the "departure" experience (not being in the physical environment). As the sense of presence is unstable (a moment-by-moment feeling), it would be necessary to design and develop new instruments to measure sense of presence.

4 Design of experiments

Presence is determined by different factors: the medium, the user and the context. Before developing the final applications for different types of users, EMMA pretends to study the potential role of each variable and to identify the factors that affect emotions

in mediated experiences. Specially, it should be determined if it is possible to maximize presence via modification of emotions, or if it is possible to maximize emotions via modification of presence.

4.1 Emotional aspects.

The role that different emotions have on presence is going to be analyzed. At least, three basic emotions are going to be compared with the neutral: joy, sadness and anxiety.

In order to generate emotions in the user, it is required to design emotionally significant environments. The environment that we are going to use is a park with different parts (summer cinema, band stand,…).

The aspect of the park will change depending on the emotion. From the technical point of view, changes in the textures will be made, but also some specific objects or avatars will appear at the park in function of the emotion.

Several mood induction procedures will be used inside the park. They will appear in different parts of the environment. For example, in the band stand, the user will have the possibility of reading and interacting with Velten sentences and images related to the content in the sentences. In the summer cinema, the user will be able to visualize fragments of films related to the emotion. Also music can have an important role.

When the user finishes his/her exposure to the environment, in the case of sad or anxious experiences, some elements of a joy experience will appear in order to recover the user from the negative experiences.

Figure 1. Band stand in the sad park.

Figure 2. Swings in the sad park

Figure 3. Band stand and summer cinema in the sad park.

4.2 Technical aspects.

The role of technical aspects on presence is also going to be analyzed: configurations with different levels of immersion, different devices for interaction and navigation…

Several configurations for visualization will be studied. A stereo projection system will be tried, projecting the environment in a frontal projection screen of big dimensions. This immersive configuration will be compared with other configurations such as a computer with a head mounted display, or a computer with a monitor of at least 17''.

The goal is to analyse the role that immersion has over the level of presence achieved in a virtual environment.

We also pretend to compare the levels of presence achieved in the different immersive technological systems with those achieved in the real world. We will use procedures such as Velten sentences, movies, images in the real world, without the mediation of the virtual environment.

Regarding navigation/interaction we are going to analyse the role of different devices and different paradigms, from more traditional ones (such as mouse or joystick) to more innovative, such as gestual interfaces or wireless devices.

Finally, there are some technological tools that will be addressed due to their possibilities for generating emotional responses. For example, we will use virtual agents, preparing the software developments required to allow the incorporation, in a simple and fast way, of virtual agents in software applications for different hardware platforms. Those virtual agents will be able to talk and gesticulate according to the user's interaction with them in order to generate several emotional responses.

Other tools that will be analyzed will be handheld devices. We pretend to develop software solutions on new mobile computing platforms with wireless capabilities in order to facilitate access for everyone in everywhere situation. The hardware platforms will be centered in PDA, 3G cellular phones and tablet PC using new outstanding natural interfaces like handwriting capabilities, `digital ink`, speech recognition and calligraphic interfaces.

5 Innovation

The result of the EMMA project will allow innovative advances in central aspects for mental health field: new theoretical developments, new research paradigms, and new treatment strategies.

a) Theoretical advances: Although the effectiveness and the utility of the VR (Virtual Reality) applications for the health field have been demonstrated, it is still needed an appropriate theoretical framework that guides the research and allows a larger progress in the future. EMMA project will help us to undertake that framework.

EMMA also will allow to seize the process of extension of the self, and the "narrative" and "dialogal" conception of the self, defined by Hermans as an *organized process of valuation*.

b) A new research framework: EMMA aims at carrying out basic scientific research on presence and reality judgments. Researching on presence and reality judgments may shed some light to discover how we attach reality to our perceptions, cognitions, interactions etc., and especially what go astray in the same metacognitive processes of psychotic individuals. This may allow us to distinguish between psychosis and neurosis, or in a more traditional way, between "craziness" and "normality". Being able to count in psychopathology with a normative theory about reality judgment would help us identify which are the specific execution deficits that have those who suffer from certain problems. For example, it could help us understand basic psychopathological processes as delusions and hallucinations: How does a person with a delusion collect and interpret the information and how does he or she use the evidence to support or disregard his or her believes? How are irrational believes created in sane human beings? On the other hand, from a practical point of view, the understanding of what aspects are altered, and in which way they are altered, could suggest innovative interventions to be used in therapy.

Another innovation is to use VR as a "new realistic laboratory" (Baños, Botella & Perpiña, 1999) where to study behaviors, emotions, thoughts, basic psychopathological processes, individual differences etc.. and emotions. This "realistic lab" will allow to do research with a high degree of validity. It is classic the dilemma between the different types of validity. It seems that we usually sacrifice something regarding the internal or external validity: As a greater control is needed, it seems necessary to turn to the "artificiality" and/or "simplicity" of the lab. The "virtual laboratory" could help overcoming this dilemma creating significant contexts, with high external and ecologic validity, in which certain questions can be tested with a high degree of control and accuracy.

c) New treatment strategies: The purpose of EMMA project is to design and test VR strategies that structure effectively the treatment procedures stated by these theoretical approaches. If the narratives are the essential processes of the construction of meaning, it is possible to make hypothesis about the different idiosyncratic ways to construct the meaning corresponding to different prototypic narratives. In other words, as EMMA project proposes, by means of "mood devices" it will be possible to construct "new vital narratives" with high emotional impact which provide concrete central meanings. This prototypic experiences can be used to activate, correct, structure, and restructure previous life experiences that serve as structural frameworks from which it could be possible the categorization of cognitive processes for future experiences. It is

not only to change the observable behavior, nor change the central cognitive contents that influence the individual functioning, but going beyond, trying to open the door that allows to modify cognitive processes and structures, and activate and modify basic emotional patterns.

6 Conclusions

With the EMMA project, it is expected to achieve a better understanding of presence construct, paying special attention to the study of the relationships between emotions and presence, by means of an interdisciplinary approach.

At the end of the project, it will be possible to understand better the development of some psychopathological phenomena and to develop "new correcting experiences and learning" to cope those psychopathological experiences, with tools that offer richer sense of presence. Since mood disorders are the most common psychological problem in the general population, it will be possible to reach a higher number of persons suffering from psychological problems.

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