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Represent-ing presence

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Abstract

The paper discusses the notion of RE:PRESENT in the light of the concept of presence. Presence is the state of being present and denotes the state of being in a determined or/and a perceived space. The research is focused on the study of interactive spaces and installations that are composed of physical and virtual artefacts, impelling the user to employ his/her body as the medium of interaction. It is proposed that space is perceived as a mixed experience of presence and it is related to the embodied cognition, meaning bodily senses, memory and kinesthesia.

The literature review performed on the notion of presence as well as on the notion of embodiment facilitated the extraction of several parameters comprising a common field for presence and embodiment, orientation of attention, nature of interaction, imagination etc. Following, several paradigms of installations in which the body is (mostly in a dynamic way) the medium of interaction are presented and analysed. The aim of this paper is to develop a taxonomy of the parameters deriving from the literature in order to identify the ones that are strongly related to the sense of mixed presence in respect to the embodied cognition. The ultimate goal is to compose a general framework for the notion of the mixed sense of presence.

Keywords: presence, embodiment, interaction, kinesthesia

Introduction

The notion of RE:PRESENT is discussed in the light of the concept of presence. Presence is the state of being present and implies the state of being in a determined and perceived space, but also is a description for a sense that is experienced in a virtual environment, and thus denotes the impression of being physically in a distant place. The paper is focused on the sense of presence in interactive spaces and hybrid installations consisted of physical and digital entities.

Many contemporary installations and spaces tend to incorporate virtual reality to the physical environment in order to enhance interactivity. Thus mixed complexes are created, that oscillate between physicality and digitality, usually impelling the user to employ his/her body as the medium of interaction. It is argued that the successfulness of such an environment, as far as lived experience is concerned, is related to the sense of a mixed experience of presence which derives from the embodied cognition, meaning bodily senses, memory and kinesthesia.

Firstly a literature review is performed on the notion of presence. The research focuses on theories that emphasize on bodily participation and interaction thus relating presence mostly to bodily parameters. Involving the body can be equally in a physical and a mental way. Therefore, theories that referred to psychological parameter are also included. Following, literature review is also performed on the notion of embodiment. Embodiment is analysed in the light of perception. Theories of Maurice Merleau-Ponty and Jacob Gibson are mostly cited, which are considered as fundamental on the analysis of the way people perceive world through their body and have affect the work of many contemporary researchers.

The third section of the paper presents the parameters that derived from the literature analysis combined in order to create a common filed for embodiment and presence. A first taxonomy is formed and is tested on the fourth section where examples of interactive spaces and installations are presented. Since the aim is to produce a general framework for the sense of mixed presence, the examples are chosen to be representative of different implementations. This analysis is the beginning of a broader research that will introduce the concept of mixed embodied presence to the design process of mixed environments. Paradigms from the technology of mixed or augmented reality are selected to be presented due to the fact that they mainly introduce the subject as the connecting link of physical and virtual parts.

Presence – embodied presence

According to Webster's Revised Unabridged Dictionary, presence is "the fact or the state of being present" and present is the state of being in a determined or/and a perceived space. The notion of presence is mainly used to describe a state in a virtual reality environment.

According to Slater (2003), presence is a user's impression that s/he can actually live, move and experience a virtual environment. Schubert and Friedman (1999, p.2-3) analyse the notion of presence through the concept of "embodied presence". Having as background Gibson's theory for the way that perception is connected to bodily movement, as well as approaches of the way users are becoming familiar with the virtual environment through the construction of mental models based on the bodily memory and function, Schubert and Friedman (1999, p.2) argue that the sense of presence on virtual space is derived from the projection of mental representations on the way that the body or parts of it are moving inside this specific environment. The more intense the generated kinaesthetic perception, the more convenient is the construction of a mental model and therefore, the sense of presence increased.

Witmer and Singer (1998, p.225) argue that presence is nothing else but "a normal awareness phenomenon". It is related to user's attention, while it is based on the interaction of various sensory stimulations, environmental factors that encourage user's involvement and enable immersion, as well as internal tendencies to become involved. In relation to Minsky's definition for telepresence, Lombard and Ditton (2000) record six different conceptualizations of presence; the social richness, realism, transportation, immersion, social actor within medium and medium as social actor. Realism is about the medium and how successful is the representation that is produced in comparison to the "real thing", while "social actor within medium" is about the phenomenon where the medium (due to its nature) is ignored, giving to user the impression of direct communication with the "media personality" or entity in general.

Lee (2004a, p.27) defines presence as "a psychological state in which virtual objects are experienced as actual in either sensory or non-sensory ways". The "objects" in this case is a broader category, including physical objects as well as virtual representations of the self. Sas and O'Hare (2003, p.525) conceive presence as a "psychological phenomenon" in which the procedures of obtaining knowledge as well as the attention of the user shift toward "another world" to such an extent that s/he experience the sense of being present there. The means for this transition is the application of technological artifacts or the imaginary ability. For Hendrix and Barfield (cited in Balakrishnan et al, 2007) the notion of presence should denote a remote, distant but also physical environment, rather than a completely digital environment, while Gerrig (1993) suggests in an implicit way that presence is the sense of transition to a narrative environment, derived from the medium of interaction. However, Lee (2004b)

supports that it is essential to develop a mechanism, which could re-present the way that the experience of presence is formed. This mechanism, as Balakrishnan et al (2007, p.121) argued, could be the background for the “development of 3-D visualization tools and techniques that focus on capturing the architectural experience”.

A different approach is formulated by Prothero (1998, p.4), who argues that presence is “a common property of virtual interfaces”. As a result, whatever tries to explain the psychology of an interface should also explain the sense of presence. However, this does not imply that the sense of presence is related in a direct way to the efficiency of an interface. An interface can reflect a variety of issues that are related to presence though, and there are several factors which can contribute to make an interface more intuitive such as” the pictorial realism, the addition of tactile cues, the spatialized sound, and the degree to which the content is engaging”. As for the design process of interactive systems, a major parameter that is mentioned by Fogtmann et al (2008) is kinesthesia. They believe that the installations should encourage the kinetic learning and impel user to applying his/her innate bodily skills/capabilities. Likewise, another researcher, Larssen (cited in Fogtmann et al 2008, p.90), studies the role that kinesthesia, proprioception, haptic sense, and sensorimotor skills have when a “tool” is incorporated on the body that participates on an interaction. Concluding, figure 1 is a synopsis of all the above mentioned theories.

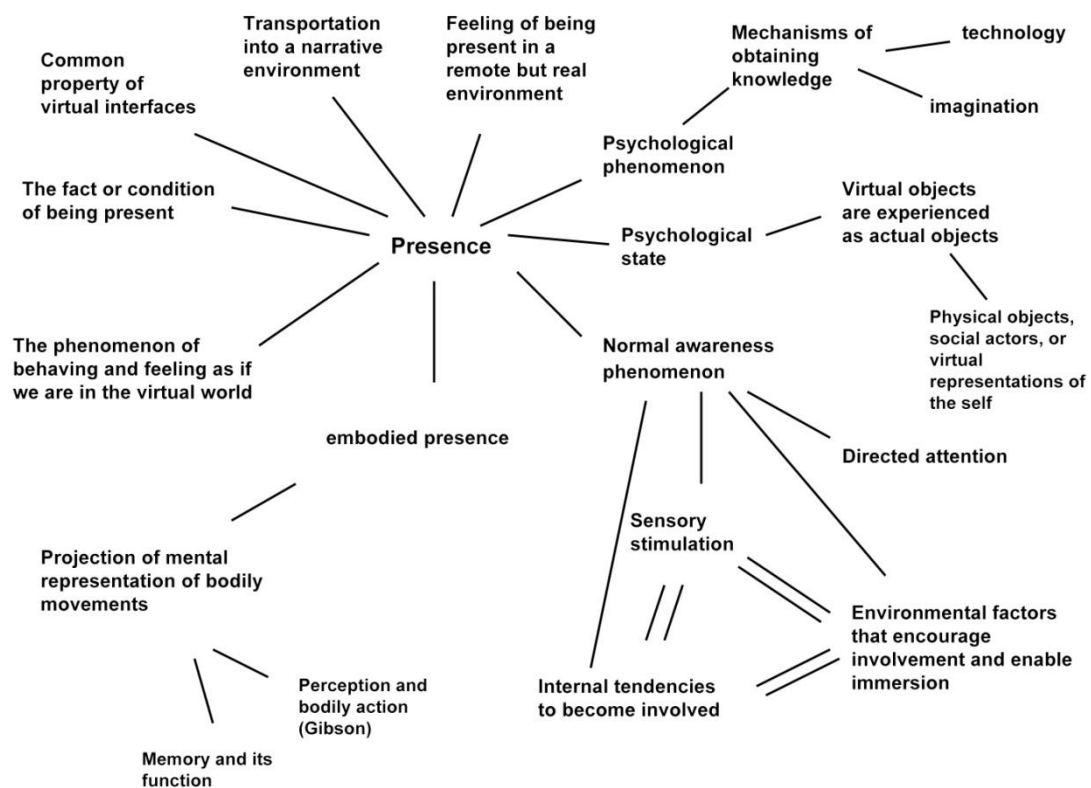


Figure 1: diagram analysing presence related theories.

Summarizing, one of the primary factors that is related to presence is kinaesthetic perception, namely the awareness of bodily position and movement in space. Moreover, a major precondition is the formation of the so called embodied cognition framework which derives from bodily memory as well as the stimulation from the type of information, the sensory centres that are activated and the way that user's attention is oriented in an environment. Additional, technological artefacts and imaginary ability can activate the mechanisms of obtaining knowledge to such extend that a subject can feel the sense of presence in a distant environment. Finally, the relation of presence to the nature of an interface has been emphasized suggesting the study of different interfaces that can be located in environments of mixed reality, in order to be analysed the nature of interaction. As interface, is perceived every medium that supports bodily involvement in a (more or less) dynamic way. Thus a variety of interfaces are chosen that range from theoretical approaches or graphical interfaces to tangible and/or interactive spaces.

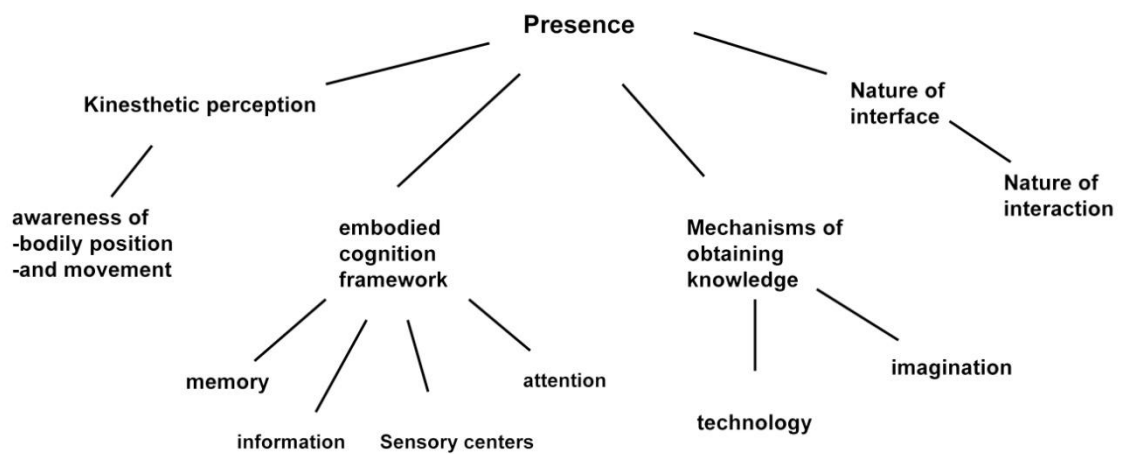


Figure 2: parameters related to presence

Embodiment

The notion of embodiment stems from the philosophical problem of mind-body and has been developed over the last years as the antithesis to the theory of dualism. According to dualism, the mind and the body are two different entities, where the body works as a vessel for the mind (Lakoff and Johnson, 1999, p. 391). On the contrary, embodiment is about a body that cannot be divided from mind. The two of them, together, are forming the "mechanism" with which every human being can perceive the space that lives in (Lakoff and Johnson, 1999, p. 38). Embodiment is strongly related and based on the notion of perception. One of the philosophers who tried to bring body on the foreground of philosophical arguments by analysing the way people perceive space was Merleau-Ponty (2003, pp.51-64). According to him people perceive and experience their environment through the bodily awareness and the sensory interaction. One of the basic ideas that he highlighted was that the experience of being present in a surrounding space leads to the awareness of bodily and mental existence in that space, and thus to the unification of ego.

The parameter of "awareness" is also referred in an indirect way in Gibson's (1979, p.200) theory. It is linked to visual perception and especially to the adoption of another person's viewpoint when two (or more) share the same space. What Gibson implied is that a person is able to perceive surfaces which are not included in his/her view but they do in the view of a co-present person, by relating each body position in respect to the surrounding space. Both of them perceive the same world but the presence of the one is the causation of defining the perceptual boundaries of the other.

a) information

Perception is linked to the formation of experience - how people realize the environments where they exist and move. Therefore, experience is shaped through the way that the world is perceived. Thiel (1997, p.117) defines experience as "the combination of continuous, concurrent, interrelated and parallel sequences of actions, feelings and thoughts". He argues that it is a "dynamic process" which is shaped as a collection of a number of data in specific intervals, and thus needs the direct or indirect participation. These data are actually information embedded on the environments and are collected by the cooperation of senses and the involvement of the body to the surrounding space.

The same is also noted from Gibson (1979, p.62), who believed that information is a factor that works as stimuli for the perceptual system. The general concept, he argues, comes from the experience of shared communication (with other people) and thus is consisted of messages, signals and signs. He also suggested that information is related to the way that people are oriented in an environment and mostly somewhere where the information is cited as fixed points. In this case, the user can use the "stored" bodily memory of the lived experience in order to orient easier the next time that s/he will be in the same space.

Information is also the cause of movement. According to Merleau-Ponty (2003, p.127) movement is the aftereffect of a kinetic question that is posed from the environment. The body, in a more or less conscious way, receives from its environment several "perceptual signals". To respond, it has to turn to its own kinetic skills which derive from "kinetic memories" and "routine gestures" (cited in Fogtman et al 2008, p.91). The decision of the kinetic answer will be determined from the kinetic skills that will be activated from the environmental stimuli, which will specify and also adjust human's behaviour.

b) bodily behaviours

The adjustment of behaviour in relation to perception is a topic that is analysed by Thiel (1997, pp.184-187), where he notes that adjustments are actually activities perceived as bodily behaviours. Bodily behaviours can be classified in a variety of ways. One of them was suggested by psychologist Maslow (cited in Thiel, 1997, p.182) , who discerned the "expressive" and "copying" behaviour, which are used to reflect human's (or in Maslow's words "former") personality and mood respectively. Another theory comes from anthropologist Birdwhistell (cited in Thiel, 1992, pp.182-184), who categorized behaviour in "instrumental", "demonstrative" and "Interactional", relating respectively to orientation, gesture and communication, as well as to spatially arrangements and bodily interactions. Thus, bodily behaviours are recognized as ways of interaction and communication with other bodies and are related to the formed bodily experience. Merleau-Ponty (2003, p.215) referred as well to this kind of interaction in the context of mutual confirmation between a person and him/herself and/or between other persons. He argued that gestures function as a mutual behaviour of communication among people, revealing purposes and parts of ones perceived world to another. However this type of communication is not necessarily a conscious action and thus simultaneous presence is not mandatory. Merleau-Ponty (2003, p.215) believed that the "experience of another bodily presence" even in an abstract way, is enough for someone to identify "through exploration movements" his/her surroundings and his/her own presence on this space.

c) senses

One of the senses that is primarily activated in the procedure of perceiving space is vision. It is one of the basic parameters in Gibson's (1979) theories, while it comprised the foundation of the theories for bodily kinaesthetic skills. For Gibson (1979, p.183), vision is, in a way, the cause of movement as it composes the information that body needs in respect to its environment and to itself in order to move. In this way it is not considered as a sense that is just used for the communication of the body with the external space but also with its own self.

The same is valid for the rest of senses, since they are used by human's perceptual system. Visual and bodily movement can be combined as actions, however, as Gibson (1979, p.236) mentioned, the information that cause movement and the control of a movement are different conjunctures. "Visual kinesthesia" is important for the control of the movement from a place to another, as the body needs a (self) reference point in order to choose its next move. Following it, is concluded that the awareness of presence on a space is the factor that lead to the control of the movement and, as an extension, to the decision of body's next move.

Kinesthesia is not related only to vision. According to physiology is "the awareness of body's position and movement in space" (cited in Fogtman et al 2008, p.91) while Merleau-Ponty (2003, p.102) noted that, our experience on the world is based on the movement of our body. In the world of motion and movable objects, the way daily activities-actions are founded, is described by kinesthesia and kinaesthetic experience. Kinesthesia is part of the bodily as well as sensory system, and thus it is related to conscious bodily perception. Therefore, kinesthesia is related to all the senses, including proprioception (Gibson, 1979, p. 201; Merleau-Ponty, 2003, pp.107-114) and empathy. It is also one of the basic perceptual "organs" and thus considered as a significant parameter in the study of bodily and spatially experience. Diller and Scofidio (1996, p.11) also note the significance of kinesthesia on bodily and spatially perception by citing three categories which referred to physiology on the topic of bodily perceptual and kinaesthetic skills. First category is for the "sensitivity on the external stimuli", involving all the senses that cited on the external surfaces of the body and consisting the interface that interacts with the environment. The second one is proprioception which is about the body, the relation to itself as well as the position and the relation to its surroundings. The third is about the senses of inner organs and the internal stimuli that the body receives from itself.

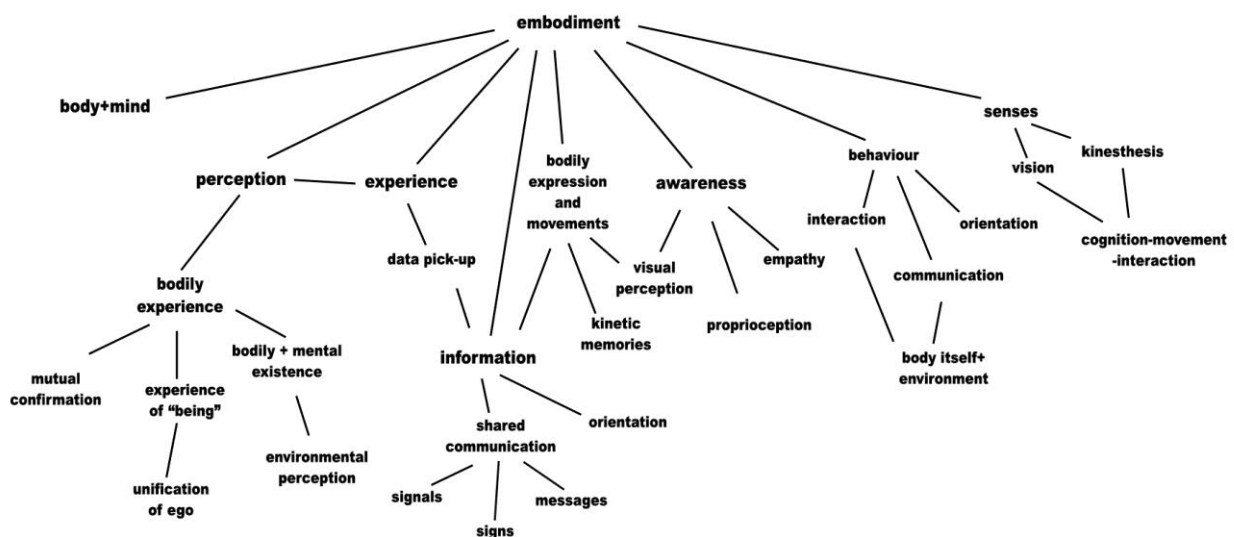


Figure 3: parameters related to embodiment.

Summarizing (Figure 3), one of the parameters related to embodiment is perception and the way that is formed. Perception is based on bodily awareness, movement and sensory interaction. The parameter of bodily awareness is related to the senses of vision, proprioception and empathy and also to the feeling of "shared awareness" that can be created by the presence of another person in a shared space. Another factor is information embedded on the environment and functioning as stimuli and as the medium for experiencing a space by creating a sense of shared communication, while related to bodily movement and sense of orientation. Bodily behaviours are also major parameters since they related to the way a person is communicating and interacting with him/herself, others, and his/her surroundings. Finally, the bodily senses and especially vision and kinesthesia, were highlighted. They are related to cognition, while motivating the body to move and interact with its environment.

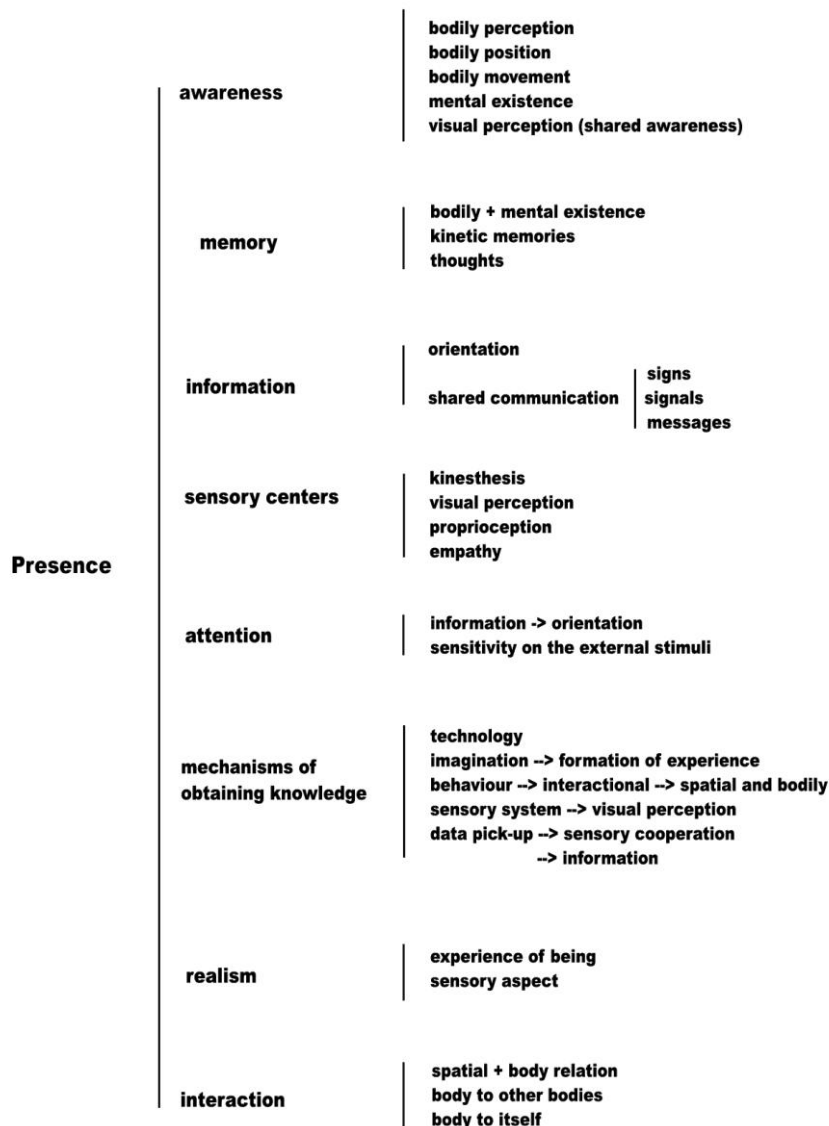


Figure 4: Taxonomy of embodiment parameters relating to presence

Parameters

The theoretical analysis can lead to a first taxonomy of the parameters of embodiment that are related to the sense of presence shown in Figure 4. The column on the left includes the parameters that are related in a direct way to the notion of presence. The one on the right consists of several factors deriving from the performance of literature review on the notion of embodiment and is suggested that are able to describe and define in a direct or indirect way the notion of presence. Firstly is highlighted awareness which is related to bodily perception, mental existence, as well as to bodily movement and motion and in the sense of shared experience to visual perception. Memory is also a common factor for presence and embodiment in respect to bodily and mental existence, kinetic skills, as well as on the way of thinking. Another parameter is information which is connected to orientation and the sense of shared communication -which can be expressed as signs, signals and messages. The mechanisms of obtaining knowledge are another major factor. These mechanisms are related to technology, imagination, interactional bodily behaviour, as well as visual perception and data pick-up through the sensory cooperation. Realism is also perceived as an important parameter since is related to the way that body can feel its presence even in an abstract way since the represented spatial entity is close to physicality. The last factor stressed is interaction which is divided to three categories, the relation of the body to itself, to another person and to its environment.

Next a variety of installations, mostly from the technological section of augmented or mixed reality technology, are briefly presented. The aim is to test if all the above parameters are related to the sense of mixed presence and create a new taxonomy. Unlike other technological implementations that usually merge to the structure of the building information technologies, in augmented or mixed reality environments the presence and participation of the user are vital in order to merge the digital content to the physical environment. Even though, some of the paradigms are relatively old applications, their presentation is significant due to the fact that their construction principles have influenced contemporary implementations.

Installations/ environments

a) Cybrid

The concept of cybrid is based on research made by Anders (1999, p.193) on finding a way to link cyberspace to the physical environment, and especially architecture. Cybrids are hybrid objects or environments that include the abilities of virtual objects in sensory actual ones, allowing in that way the embodiment of virtual and physical qualities in the same entity. Their purpose is to enable a constant (meaning without technical breaks) interaction between virtual and materialistic parts, giving to user the impression of a coherent and natural experience like one that would have in an homogenous and physical environment. The concept of cybrids is referred, in an implicit or explicit way, to the sense of multi-presence.

b) Planetary Collegium

In the light of the concept of cybrid, Anders (2003) started a project aiming to create an alternate form of "learning institution" emphasizing on the notion of public presence. The Collegium is a fragmented entity which is located in cyberspace and consisted of multiple distributed nodes, but it can be perceived as a whole due to the fact that each node enables the simultaneous presence, in an abstract way, to all nodes. The nodes host a number of activities, which were recorded and categorized in a scale extended from concrete to abstract, as well as artefacts that range from sketches or notes to digital images, creating a "mnemonic structure" for the user. The purpose of this project is to enhance the creation of an "on-line community" through a sense of shared awareness.

c) Ambiviewer

Ambiviewer was created from Anders and Lonsing (2005) and is a tool/system which makes use of a digital video, a model and coordinates that enable the unification of physical and simulated entities on the screen. In that way, an interactive model is formed that allows the creation and manipulation of virtual objects in real time. Moreover, it is designed to function as a tool for architects, especially for 3d modelling and the production of full scale stereoscopic compositions. The model is placed on a physical environment and thus the user is able to explore and transform the new mixed entity that is produced by adding or removing objects, as well as having access on past actions and the potential of undone them, by marking the time. The effectiveness of such an environment is based on the degree that the user is enabled to interact, the nature of interface and interaction, to what extent the user is engaged to the content and the number of senses that participate to the interaction.

d) Ambient displays

The third example is ambient displays by Wisneski et al (1998). These implementations belongs to the general category of "tangible bits" which are based on the idea of developing and designing an environment where the haptic system of the participant will be the centre of sensory attention and thus users will be able to grasp and manipulate the digital information. Their concept is partly based on the need for communication that people have, as well as on the need of transferring multiple information. A paradigm of such an installation is AmbientRoom (Wisneski et al, 1998, p.25). It is a small room, the size of an office, where the user is surrounded by an augmented environment. He/she is provided with a framework of actions which are taking place in distinct augmented environments. This platform was developed in order to support the expression of the online digital information with environmental elements such as light, sound, airflow and movement that are used as peripheral displays and appearing on the background of user's attention. By transferring information from ones environment to other, this project aim to create to users the sense of community through "shared awareness".

e) VR-Cave as interface of network space

This paradigm is about a virtual reality environment and specifically VR-Cave. The project that was lead by Yu-Lu (2006) is about the re-design of the interface of network space. The physical elements of VR-Cave are used to produce an alternative digital interface for network space which will change users' perception for the internet. The aim of this installation is to be attributed, as physical as it is possible, the "spatial feeling". Thus the research focused on the parameters of speed, distance, scale and movement. After running an experiment, Yu-Lu noted that the creation of such an environment give users the opportunity to experience in a better way network space since they can move, sense and thus relate internet to their bodily position and perception.

f) Mobile phone Communication

The last example concerns a research on the relation of mobile phone with the notions of presence and embodiment. Even though this project (Rettie, 2005) is mostly theoretical, however it is related to a device that every person interacts with, in a daily frequency. Mobile phone communication is analysed through the aspects of time, space, potentiality of simultaneous interactions, as well as of Gibson's theory for affordances ("the perceived potential for action"). Also it is compared to the experience of presence in virtual reality. It is argued that mobile phone communication is realized in two places concurrently, namely the real space where the body physically exists and the "virtual space of communication". As a result a sense of "absent presence" is created as well as a sense of shared awareness through

the feeling of co-presence. Moreover it is argued that mobile phone communication forms abstract patterns of possible inter-actions thus creating "a sense of presence and embodiment" in a common space.

The intention of all the above mentioned installations is to merge virtual parameters to physical entities in a way that the new mixed entity will be perceived as a coherent experience. In a direct or in an indirect way the implementations try to enhance the sense of presence by creating facilities that address to certain bodily skills and senses. This mixed sense of presence is primarily based on the nature of interaction which is also related to the nature of interface. The nature of interaction determines the bodily skills that need to be applied in each case. It is noted that some of the displays emphasize on the kinaesthetic skills (Ambiviewer, VR-Cave) while other are mostly based on the stimulation of senses (Ambient displays) in order to draw user's attention. Reality is also a matter of consideration but mostly in an implicit way and in the aspect of creating a feeling of physicality. A major parameter is the presence of other users in a physical or abstract way (especially on mobile phone paradigm). Thus the occurrence of an on-line community which leads to the feeling of shared awareness is a factor that increases the sense of user's presence, in a social point of view at least.

Discussion

The aim of this research was to create a general framework for the notion of mixed sense of presence in a combined environment of physical and virtual entities. Presence was analysed in the light of embodiment cognition. After the extraction of parameters that are related to presence like bodily awareness, memory, information, attention and interaction; and to embodiment such as perception, kinesthesia, sensory system, a taxonomy was created shaping the basic guidelines for the test of primary hypothesis in materialised paradigms of mixed or augmented reality.

The examples were selected on the grounds of analysing installations that address activities related to the daily life. It is noted that the formation of a framework for a mixed sense of presence, on the aspect of embodiment is possible and that the parameters deriving from the literature review can be assigned to mixed environments. In detail, the nature of interface and thus the nature of interaction is the primary parameter that should be studied. Next, the number of senses that are stimulated and the way they cooperate and combine must be

considered. A major aspect is the presence of other persons in an implicit or explicit way that can lead to the feeling of shared awareness. Realism is a subsidiary parameter as it is related in an indirect way to presence and mostly in the aspect of creating a feeling of physicality.

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