A General Theory on Presence

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Experimental Evaluation of Social Virtual Presence in a Decision Making Task

Abstract

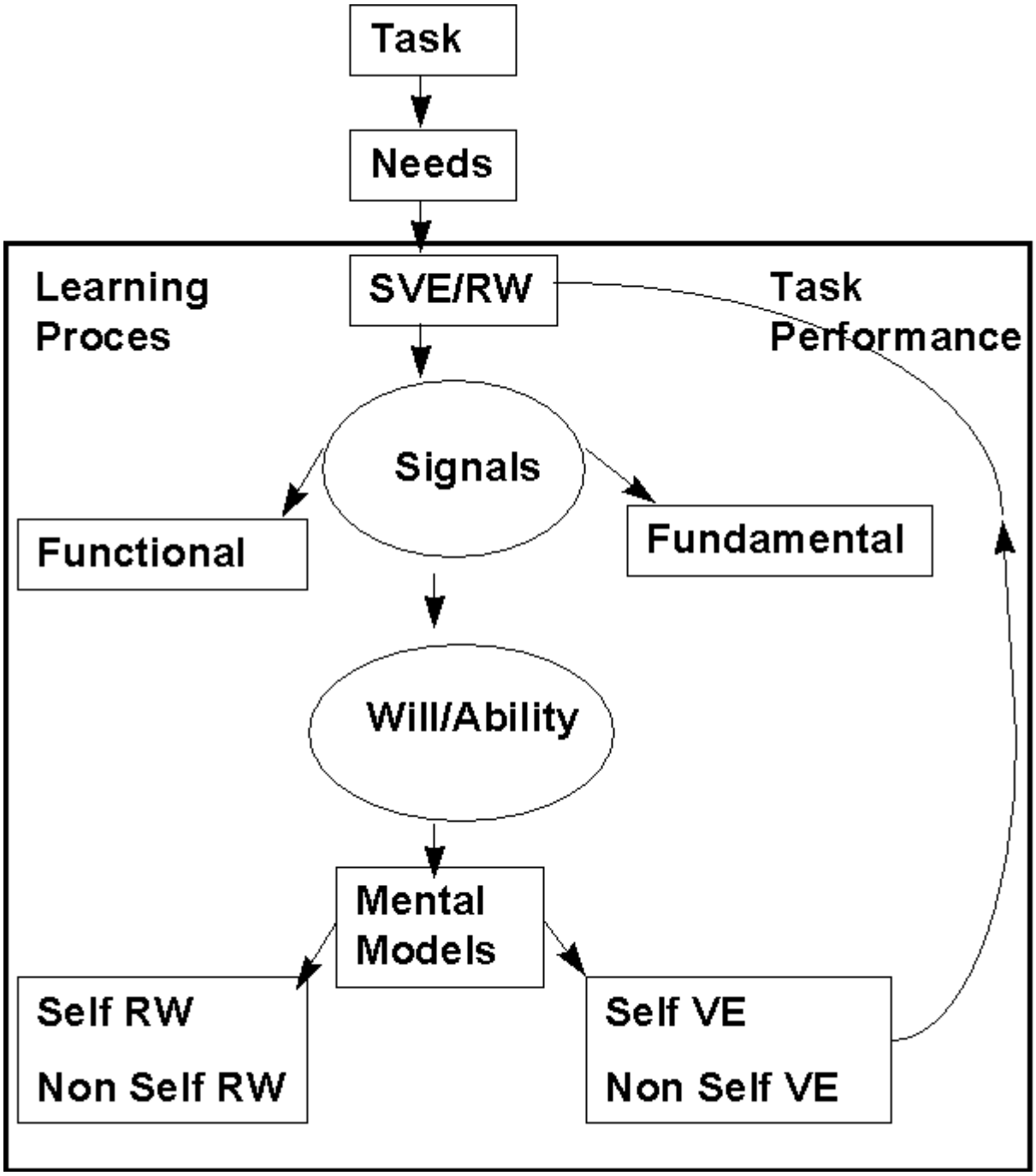
Many points of departure have been chosen in research on presence. In this paper a new, experimental testable overall theory on presence is proposed and a first attempt to test this theory is made. Also a comparison is made with earlier presence research done regarding presence measurements.

In the overall theory, the degree of (virtual) presence is related to the task people accomplish in a Shared Virtual Environment. In the case of a decision making task the main hypothesis is that presence will be higher if social presence cues will be maximized.

This hypothesis was tested in an experimental setting were 48 subjects, in groups of three, were asked to complete decision making tasks in a Shared Virtual Environment (3D). Social Virtual Presence has been made operational by manipulating Social Presence Cues.

Four ways to measure virtual presence were used, namely: a virtual presence questionnaire, a social virtual presence questionnaire, the extremity of the decision and the comeback rate.

The main conclusion of this research is that there is significant evidence that the relationship proposed in this theory between virtual presence and social virtual presence exists. Furthermore, the presence theory can explain the non significant findings e.g. the influence of the world models on virtual presence due to technical complications. This research should have a follow up in a Collaborative Virtual Environment with other in- and output devices, such as a CAVE.



Introduction

We started our research with the idea that when people chat on the internet in a three dimensional Shared Virtual Environment (SVE), people perform a so called decision making *task (*McGrath, 1984). In order for a person to accomplish this task, certain *needs* have to be filled. These needs can be filled by the *Shared Virtual Environment* (Hollan & Stornetta, 1992).

Specifying the task in this way makes it also possible to compare presence research in a meaningful way.

This decision making task in the experiment has a meassure of correctness. A method for measuring task performance is useful in order to test the hypothesis that task performance increases when people are experiencing a stronger amount of Presence.

Theory on Presence

We asked ourselves what kind of interface an SVE should have in order to maximize performance on a decision task. We hypothesized that if people felt as if they 'were in the virtual environment' that performance would be best. According to Steurer (1992) presence means: "The feeling of 'being in an environment'." This feeling can vary between detachment and immersion. In the case of detachment, presence is weak and in the case of immersion, presence is strong. In our research the environment is one that is made possible by a computer, it is a: 'Computer generated graphical three dimensional (3D) environment, in which one can navigate and communicate with other people.' The presence that a person feels in this virtual environment we call: *virtual presence*.

Loomis (1992) considers presence to be a feeling resulting from a learning process. This learning takes place in the human brain. It is based on the in- and output signals a person receives respectively generates. This learning process results in mental models. The shape of these mental models sculpture the feeling of presence as well as virtual presence. So the interface should maximize the feeling of virtual presence in order to maximize decision task performance.

Susceptibility for Virtual Presence

A person receives and sends signals from and to the virtual environment. In this interaction is it thought that the way in which a person perceives (virtual) presence depends on the susceptibility of that person for virtual presence. The susceptibility for virtual presence contains of two main aspects:

The first aspect is the conscious '*will*' to accept the signals from the virtual environment.

The second aspect is the subconscious '*ability*' of the persons brain to register signals from the virtual environment and rule out other signals, a biological based trait. This relates to an extensive amount of research that takes place on signal processing.

It is thought that there is an interaction between these two personal characteristics, an interaction between the conscious 'will' and the subconscious signal processing. In research on virtual presence this relationship should be taken into account. Improving these personal traits, if possible, or the presumed relationship, should increase virtual presence.

Mental models

When a person interacts with SVE two mental models will be activated and shaped: The model of the Real World (RW), responsible for presence and the model of the Virtual World (VW), responsible for virtual presence. Based on several results from presence research in literature we distinguish two main sub models within the model of the RW and the model of the VW: The first

mental sub model is called the model of the 'non-self. The non-self is the mental model of the environment as an individual experiences it.

The second mental model is called the 'self'. The self is the mental model that a human develops of him or herself. The mental models of the self in the RW causes Personal Presence and it causes Personal Virtual Presence in the VW. The mental models of the non-self can be divided in a social model and an environmental model, in the real world causing social presence and environmental presence. In the virtual world causing social virtual presence and environmental virtual presence. We assume there could be an important interference between these models.

Social Virtual Presence

In order to get a grip on the users needs in this task, several fields of research have been addressed. The result of this research is that Social (Virtual) Presence is thought to be the most important communication need for this type of task.

Social Virtual Presence is understood to mean the feeling that there are other people present in the SVE. This mental sub model, Social Virtual Presence, is a part of the virtual non-self model. Social Virtual Presence has been found to hold concepts that other fields of research bring forward as being of great importance in a decision making task. Literature on Grounding (Clarc en Brennan, 1991) as well as literature on (informal) communication (Short, William & Christie, 1976 and Kraut, Fish, Root, & Chalfonte, 1990) support these findings.

This sub presence concept is also mentioned by Heeter (1992). Heeter distinguished three types of (virtual) subpresence within the presence concept: Personal Presence, Social Presence and Environmental Presence.

A third argument for the importance of social virtual presence is the fact that even in the first developments of the telecommunication technologies, social scientists have distinguished such a concept. Those scientists saw Social Presence as a measurement of quality of a means of communication (Short, Williams & Christie, 1976).

The last argument for the fact that social virtual presence is the focus of our attention in specifying the communication needs of the user (and testing if it is possible to improve virtual presence in a decision task) is the popularity of multi-user games (e.g.; Quake). This is because it seems that the success of games depends on the possibility to play with or against other ‘real live’ persons

Social Presence Cues show an evident overlap with Social Context Cues as being described in the deïndividualisation theory in media communication. (Zimbardo & Diender in Forsyth, 1990). The signals that make a person aware of the presence of other people are imbedded in the so-called Social Presence Cues. Social Presence Cues can take many forms e.g. non-verbal cues, cues related to concepts like proximity and orientation, cues related to physical appearance or eye contact.

The social presence cues can be seen as the operationalisation of all the signals that can originate from other people in the SVE and can improve the sub mental model (social virtual presence) of the non-self and by doing so, can improve virtual presence as a whole.

After considering these parts of the virtual presence theory the following can be summarized. In order to increase virtual presence, the learning process regarding the mental model of the virtual world has to go smoothly. Furthermore, increasing virtual presence is task dependent. In case of this decision making task, manipulating social virtual presence is considered most important in trying to increase virtual presence as a whole. Also, if we want to maximize the experience of virtual presence, interference with feelings of RW presence should be kept to a minimum.