

Chapter 4

Unified Approach to Augmented Reality: Taking Into Account Technological, Psychological, and Ecological Approaches

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ABSTRACT

The authors present a new and holistic conceptualization on the feeling of presence. This consists of several components. The first two propose a new definition of presence and the identification of a fourth component of presence called presence of action. The third component consists of a unified approach to presence taking into account technological, psychological, and ecological considerations. They have developed a model that identifies the processes leading to the feeling of presence. According to the model, two unconscious phases of judgment condition the emergence of presence. The first judgment concerns the credibility of the environment, which depends on the satisfaction of the user's intellectual and perceptual expectations.

INTRODUCTION

Virtual reality needs a strong basis to distinguish itself from other media. This is why we define it as a mediated experience that immerses one or more users into an artificial environment in which the user can feel and interact in real-time via sensory-motor interfaces. The user deems the experience credible, agrees to take part in the game, and in response feels a sense of presence. We can note that this definition combines technological and cognitive considerations and does not forget to point to the experience aspect. We, therefore, do not reduce virtual reality to a set of technologies but consider it as the medium of a type of experience that leads to the feeling of presence. We want to express through this definition a strong relationship between virtual reality, presence, and user. Through this definition, we wish to emphasize the idea of focusing on the user's and sensory and cognitive capacities. In virtual reality,

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more than in any other computerized activity, we think it crucial to adopt a human-centered approach, for the effectiveness of the experience but also to achieve the feeling of presence. We, therefore, associate virtual reality and a feeling of presence.

The latter is a multidimensional and multifactorial umbrella concept that is often the subject of quarrels in scientific areas. Is it the result of the technology implemented? Is immersion born from the emotions brought about by experience? If the feeling of presence is an object that is difficult to identify, it is even more difficult to reach it. Given this objective, it is important to have solid theoretical foundations. It is then necessary to understand the underlying processes leading to presence.

This chapter proposes to answer these multiple needs and questions and to specify the path which makes it possible to understand the feeling of presence. The identification of a complete and unified model of presence will serve as a theoretical and technical framework for the design of devices and applications in virtual reality. After describing three existing approaches including technological, psychological, and ecological, we present a new balanced approach between these three visions and then identify a fourth component of presence. We then propose a framework dedicated to the design of virtual reality applications. Finally, we present a complete and unified model of presence.

Evaluation Phase to Verify the Relevance of our Theoretical Choices

For this phase we have developed a questionnaire comprising sixty-four questions, a third of which was created for the occasion, the others come from questionnaires present in the literature (Lessiter, 2001; Schubert 2001; Slater, 1994). The context of the evaluation is a three-dimensional video game. The participants tested this game on two different visual rendering devices, a large, polarized screen offering stereoscopic vision and an autostereoscopic screen. A large part of the questions aimed to validate some of the hypotheses put forward when designing our model of presence. The limited number of pages in this article does not allow us to present the quantified results of this evaluation, so we will content ourselves with communicating the analyzes. However, the interested reader can read the details of these results (Bouvier, 2009).

It was in 1980 that Minsky (1980) introduced the concept of telepresence. It then referred to the feeling that an operator can feel during a remote operation. The operator's body is then projected onto the machine's workplace, the operator's cameras become his eyes, and the operator can therefore at that moment feel like being (tele) present in this other place. Slater (1993) proposed a definition on the concept of being elsewhere, telepresence, as (a) the user is elsewhere than where he is physically; and (b) the "elsewhere" is formed by the images, sounds, and physical sensations supplied to the senses of the user by the system generating the virtual environment. The concept of being elsewhere or of being there is essentially associated with sensory perception: the user feels there because his senses perceive stimuli describing the virtual environment and then he builds a mental representation of the environment around him. This definition of presence by the concept of being there is very common. However, this definition is exclusively dependent on stimulating the senses of the user and does not consider the role of action, and denies the psychological and human aspect.

Following different definitions of presence, Lombard and Ditton (1997) managed to isolate the following central idea. Presence is a perceptive illusion of non-mediation. This definition indicates that presence appears when the user is no longer aware of the existence and role of interfaces. This second definition has also become a classic. It reminds us that presence is an illusion and indicates that the interfaces must be erased in order not to hinder the illusion. This definition is therefore appreciable

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