

Understanding the Role of Presence in Virtual Learning Environments

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Main contributions

- Development of parameters/metrics for presence
- Empirical study
- Understanding and importance of feedback
- Audio and audio changes

Introduction

Virtual Environments open new possibilities for instructional designers to create more interactive worlds for learners. In fact a great emphasis is placed upon interactivity by a number of educational theorists. For example, Piaget (1930) stresses the role of action upon objects, whereas Bruner (1966) takes a more conceptual view and emphasises the importance of the categorisation of actions in learning environments. While Vygotsky (1962) recognises the social aspects of learning, particularly highlighting action upon others. As with all these theoretical positions it is often difficult to translate these theoretical notions into real classroom experiences and raises the question of whether the ability to interact and manipulate objects in a new software environment is going to be enough to promote conceptual learning.

Hence, what are the parameters of a Virtual Environment that will afford interaction for conceptual learning. (In this instance conceptual learning is defined as a conceptually-orientated method of learning, where specific scientific content is understood and later manipulated by the subject: as opposed to the subject gaining procedural skills from working with a training environment.) These parameters could well be different from those needed to produce a training environment which could have merited commercial success, such as pilot training (Kruegar 1982).

The parameters which Whitelock et al (1996) selected to create a model that compares salient properties of virtual systems are: representational fidelity; immediacy of control; and presence.

These parameters build upon Zeltzer's (1992) notions of autonomy, interaction and presence. Whitelock (1999 forthcoming) found that when students used two desk top virtual environments, the students learnt more in one environment than the other. The two environments were called Oak Wood and The North Atlantic Ridge. Oak Wood required the student to investigate a wooded habitat with a complex eco-system. The ground layer was occupied by a large number of diverse organisms, the oaks supported a variety of species and the dead wood contained other organisms. The expert designers rated this system with higher representational fidelity than the North Atlantic Ridge. However, Oak Wood also had a lower rating for immediacy of control, than North Atlantic Ridge. The North Atlantic Ridge environment required the student to explore, via a submarine, the bottom of the ocean. Students could explore the terrain for geological structures and biological life in seven major locations along the Ridge. This would be unfamiliar terrain to students and therefore on the scale of representational fidelity it received a low rating. This study found that students learnt more in the Oak Wood environment than with the North Atlantic Ridge. This might be attributed to the tighter task structure and more elaborate feedback, but students' perceptions of engagement and learning were higher in the North Atlantic Ridge environment. Yet, experts rated them the same. However, what was different was the students' perceptions of the degree of presence afforded by these two environments. There was a higher notion of presence in the North Atlantic Ridge experience rather than in the Oak Wood software. Why should this occur? One suggestion is that higher immediacy of control also contributes to the notion of presence (this was the case with the North Atlantic Ridge) and that the parameters of immediacy of control is a confounded variable within a cluster of attributes that define presence in virtual environments. In order to probe this latter hypothesis we have developed a further study which aimed to try and identify the parameters/metrics for presence. This would unpick more fully the parameters or metrics for presence.

Study

The research questions for this second study were:

1. What do users understand by the notion of presence?
2. What features or attributes need to be available in a Virtual Environment for the users to experience this notion of presence?
3. What previous knowledge and experience contribute to the users notion of presence?

Methodology

This was a qualitative study using a phenomenographical approach. It focuses on the key informants for interviewing. Phenomenography is associated with phenomenology, and as such is experiential and content based. A feature of phenomenography is the discovery of different conceptions of reality, and how some particular phenomena is perceived by people of different ages, cultures or subcultures (Marton 1988). The aim of phenomenography is to try and describe an aspect of the world as it appears to the individual and to clarify how people define a specific part of their world. Therefore an interview technique was used to probe participants' understanding of the notion of presence.

Procedure

Ten participants were interviewed. They were all experienced computer users, familiar with multimedia systems, although at differing levels of competence. Their employment roles varied from secretary to IT facilitator, and academic to software designer. All of the interviews were transcribed for analysis. All participants were asked the same questions which probed their notions of presence in a virtual environment, and to define the functionality of their ideal system in which they would feel truly present.

Findings

It is not surprising that both interaction and feedback were considered to be the most important parameters to experience presence. The visual updating facilitates this type of functionality, but when probed about the 'feeling of presence', it is having the evidence of self in the interaction, and not being in a solitary world that is of prime importance. It is the interaction with others, together with tangible evidence for this collaborative interaction that was emphasised by our interviewees, for example one interviewee responded:

'If we take the example about the fire station. If you could see your colleagues then you'd feel you are there just as in reality. We feel comfortable if we see people we know or whatever, so long as you're not going singly down the corridor on your own or whatever...'

More importantly, what was found was that audio feedback provides the 'feeling of presence' more than any other parameter. Subjects did mention the notion of representational fidelity as a salient variable but they did not emphasise its role in this feeling of presence. In fact we found this in our previous study with the North Atlantic Ridge environment. Here the terrain at the bottom of the ocean was a graphical fantasy constructed by a leading academic in the field and the students accepted these so-called unrealistic graphics. It is the audio feedback that provides an aid to navigation, tells the user they are in a dynamic environment and also provides an emotional response.

The subjects gave us some clues as to how to develop a cluster of metrics for the notion of presence. One could observe users in dynamic environments and record their changes in posture i.e. are they moving within the environment? The number of audio changes could also provide a clue to the degree of presence, for example is there a background noise, does this change with the user's interaction with objects in the virtual environment. The level of interactivity afforded by the system should also be measured and the degree of feedback provided to the user. Another way of measuring presence could be what one user described as the level of engagement with the system and if there are problems to be solved how long does the user persist and stay immersed in the environment. Another telling factor could well be the user's previous experience of computerised game playing activities. Therefore we propose to explore the following metrics:

Metrics

- Users posture
- Audio changes
- Level of interactivity
- Feedback
- Ease of navigation
- Persistence with program., i.e. keep working
- Correlations between previous experience and presence

Future Work

Interest in the use of audio in virtual environments has led to discussions about the type and quality of the audio feedback provided to the user. We are going to embark on a further study investigating younger students than we have used before i.e. Sixth Form students as opposed to adult learners which make up the normal student population at the Open University. We will provide users with two versions of the North Atlantic Ridge environment. One will have background audio and the other will not. We will measure student learning gains in both environments and also

probe their notions of engagement and presence and previous game playing

experience. In this way we wish to tease out the importance of presence

in the design of virtual environments. Presence is indeed a difficult concept to define and more empirical work is needed in order to understand its value and necessity for conceptual learning environments.

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