Between Real and Unreal: Investigating Presence and Task Performance
The Design of a Pilot Study

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Summary

This document describes on-going work investigating the relation of the notion of presence in virtual environments and task performance. Three initial experiments are being designed to identify significant factors which influence humans' memory related to a learning experience run under various conditions, as well as their perception of the environment. Although results from this study are not complete yet, the initial hypothesis relates to a conclusion made by Slater et al[8], which stated that there is no particular reason to expect presence to improve performance. The motivation of this study is therefore, to conduct experiments in an effort to find a possible link between these two concepts; this would be an outcome which will help define a set of design guidelines to specific applications. The task required subjects to attend a seminar, which was video recorded. The audio data from this seminar is going to be used again by two different sets of subjects, one of them attending a 3D seminar with audio and the other listening to the audio without any visual information involved. The goal of these initial experiments is to analyze data taken from the two mediated experiments associated with data gathered during the real-life seminar. The results could form a base for the design of a follow-up experiment involving a Shared Virtual Environment setting.

Introduction

With the advent of new technologies, especially networked 3D graphics and virtual reality, the concept of presence has become an active area of research between different disciplines, from computer science and engineering to psychology and philosophy. According to Lombard and Ditton[5], presence is defined as the perceptual illusion of non-mediation that occurs when a user fails to perceive or acknowledge the existence of a medium and responds as if the medium was not there. Heeter[2] distinguished three types of the subjective experience of presence in a virtual world: personal presence, social presence and environmental presence. In relation to task performance, Sheridan[7] asked if the sense of 'presence' is a concomitant benign phenomenon, or even a distraction, stating that what is important in performing a task is having enough information in the proper form.

In this preliminary pilot study we are initially trying to answer the following questions:

- Does presence, perceived as the richness of sensory information, correlate in any way with task performance in a mediated learning environment?
- Will the subjects acquire the same amount of information from the real and virtual seminar?
- Will the subjects perceive the same level of details of the environment in the real and virtual world?

Design of the experiments

The purpose of this limited pilot study is to associate data taken from subjects attending a real seminar with relevant data taken from different sets of subjects attending two mediated seminars. In addition, the authors' goal is to explore this specific experimental methodology and acquire a clearer idea about its limitations and restrictions.

The real seminar

The real seminar took place in the Department of Computer Science of the University of Bristol. There were 20 subjects attending the seminar, 8 female and 12 male, all computer science students who agreed to participate on a voluntary basis. The duration of the seminar was 15 minutes. The topic was the Boer War in South Africa which was chosen as it was unlikely that any of the audience would have prior knowledge on the matter. Just before the seminar started, the participants were asked how they would rate their knowledge of the subject on a scale from 0 to 10. Only one of the subjects reported a '1'. The seminar was video recorded using a high resolution digital camera which had a steady viewpoint. The lecturer used a standard overhead projector and 12 slides during the talk. The audience was not informed previously about the topic of the seminar nor the contents of the questionnaire that followed.

The task questionnaire

The subjects were asked to leave the seminar room after the seminar was completed to an adjacent room, where they were asked to complete a questionnaire. There was not any restriction of time for this task. The questionnaire consisted of 12 questions, each of which had four possible answers. Eight of them were asking for data recollection relevant to the theme of the seminar (the Boer War). Half of these had answers which were included on the slides projected on the wall and half were mentioned by the lecturer but not included on the slides. This means that half of the questions had correct answers mentioned through audio and visual stimuli and the other half through only audio stimuli. The remaining four were designed to test the subjects' perception of the environment. In general, every question had one possible correct answer, one similar to the latter and two totally irrelevant ones.

Figure 1: DrAlan Chalmers during the real seminar

VR seminar

The sound from the video of the seminar room was extracted and stored in a sound file. A model of the seminar room was constructed in 3D Studio MAX and converted to VRML. A slide show was implemented, incorporating the actual slides of the real talk already taken place, into the virtual room. A different set of subjects are going to be asked to listen to the sound file while at the same time they will be viewing the slide show projected on the wall of the 3D reconstruction of the seminar room, on a 21 inch monitor. They will be able to navigate (walk) in the virtual room and zoom in and out from the slides. At the end, they will fill in the same questionnaire given after the real-life seminar.

Audio seminar

Yet another set of people are going to listen to the real seminar's sound file, without any visual information involved. The subjects are going to be asked to fill in the part of the original questionnaire relevant to the content of the seminar.

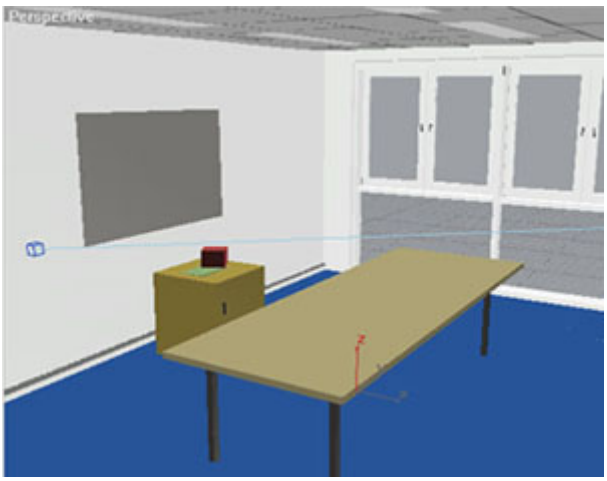

Figure 2: The 3D model of the seminar room

Discussion

While designing the pilot-study, no interactivity was allowed at this point, in an attempt to isolate the different elements of a mediated experience (sound, visual stimuli, interactivity) and get comparable results between the real and the virtual seminars.

In general, different ways of perceiving or measuring presence, relating this subjective notion with task performance, are complicated issues to address. This relation (if it is concluded that it generally exists), could be strongly task and technology-involved dependent. The experiments described here should be regarded as an attempt to draw some initial conclusions towards the design of follow-up experiments; the authors' main goal is the exploration of the basic concepts and principles towards an extended and more complete experimental design which will associate real-life situations to relevant virtual environment simulations.

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