The Effect of Interpersonal Familiarity on Cooperation in a Virtual Environment

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1 Introduction and Motivation

Immersive virtual environments (VEs) allow people to experience situations which because of danger, expense, time, or distance would not otherwise be available. Moreover, IVEs have been shown to be useful tools for learning and training. However, there are still many unanswered questions about how humans experience and interact with these environments and how this experience differs from the real world. In the experiment presented in this work, we are specifically interested in how effectively two people will collaborate within an environment given that they have never met or even seen each other prior to the experiment. We postulate that participants who never meet their partner in a collaborative environment will perform worse than those who are able to interact with their partner prior to the performance of a task. If this holds true, then it could have important implications for long distance collaboration.

2 Technical Approach

In this experiment, 26 volunteers were placed in pairs and divided into two test groups: those that would meet each other prior to the experiment and subsequently work together through the entire process, and those who would meet only as avatars within the virtual environment. Participants viewed the VE through a head-mounted display and physically walked to explore the VE. Participants were encouraged to work together in order to efficiently navigate the virtual environment and complete a search task. Each person was represented by an anthropomorphic robot avatar within the environment to provide a control for our evaluation and to prevent implicit bias of appearance.

A series of experiments by Ruddle and Reicke examining the ability for a single human to navigate around a virtual environment was crucial to this experiment, as the tasks used to test movement and interaction in their environment were the main inspiration for testing collaboration in a virtual environment [Ruddle and Warren 2009; Bernhard E. Riecke 2010]. The virtual environment consists of an open field strewn with 18 birdhouses, 9 of which contain eggs that the participants must find in a timely manner with minimal revisits. The experiment works under the assumption that the users will need to communicate with each other in order to prevent revisiting birdhouses. The primary metrics we looked at were how quickly and how easily the users were able to complete the task together. Ease was evaluated quantitatively by the number of birdhouses a pair revisits and qualitatively by a subjective questionnaire at the end of the experiment.

We found that participants felt more comfortable working with a partner whom they had met face-to-face first. Meeting in reality, however, had little to no affect on their performance. In addition, having been represented by a robot did not significantly affect the user experience; although, participants did note that the environment did not feel as realistic with a robot avatar.

Figure 1: *Observation of two participants discussing strategies.*

3 Implementation and Future Work

Our future research will examine the same conditions of collaboration in a virtual environment but will involve tasks which require more communication between the participants. Additionally, participants will be further isolated from the outside environment to enhance immersion within the virtual environment. Methods to achieve this isolation include: noise reducing headphones with white noise and disorientation of the participants by wheeling them into the testing room blindfolded. Two additional trials will be performed per experimental group. An interview will be added in order to better assess their perception of their performance. A section will be added to the post-experiment questionnaire for participants who perform the experiment without physically meeting to assess their perception of their partners physical characteristics and personality traits. We hope to extract more information about the human experience and perception of virtual reality within the realm of collaborative environments.

References

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