

Exploring Social Presence Transfer in Real-Virtual Human Interaction

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ABSTRACT

We explore whether a peripheral observation of apparent mutual social presence between a real human (RH) and a virtual human (VH) can in turn increase a subject's sense of social presence with the VH. In other words, we explore whether social presence can "transfer" from one RH-VH interaction to another. Specifically, we carried out an experiment where human subjects were asked to play a game with a VH. As they entered the game room, approximately half of the subjects were exposed to a brief but apparently engaging conversation between an RH and the VH. The subjects who were exposed to the brief RH-VH interaction had significantly higher measures of both emotional connection and the attentional allocation dimension of social presence for the VH, compared to those who were not. We describe the motivation, the experiment, and the results.

Index Terms: H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems—Artificial, Augmented, and Virtual Realities; J.4 [Computer Applications]: Social and Behavioral Sciences—Psychology

1 INTRODUCTION

In general, a greater sense of presence has the potential to make training more effective, leading to the formation of teams that perform better in a real environment [1]. Blascovich et al. define *social presence* both as a "psychological state in which the individual perceives himself or herself as existing within an *interpersonal* environment" (emphasis added) and "the degree to which one believes that he or she is in the presence of, and interacting with, other veritable human beings." [2, 3]. Harms and Biocca described *co-presence* as one of several dimensions that make up social presence, and they evaluated the validity of their social presence measures by questionnaire [4]. While there is no universal agreement on the definitions of these terms, for the purpose of this paper we use *social presence* to reflect one's sense of being socially connected with the other, and *co-presence* to reflect one's sense of the other person's presence. We use *attentional presence* to reflect the attentional allocation dimension of social presence as described by Harms and Biocca [4]. While many researchers are exploring virtual humans in general, we are particularly interested in the influence of peripheral, incidental, or environmental effects on feelings about virtual humans. Here we describe a controlled human-subject experiment aimed at exploring whether social presence can effectively "transfer" from one observed interaction between a real and virtual human to a *subsequent* interaction between a *subject* and the same virtual human.

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2 METHOD

The primary task associated with our controlled experiment was to play a relatively simple guessing game with a virtual human (VH) "Katie" that we could remotely control in a "Wizard of Oz" fashion to produce realistic facial expressions, speech, and body gestures. As shown in the image above, the VH Katie was rear-projected onto a screen such that she appeared to be seated behind a desk that spanned the real-virtual space—the proximal half of the desk was in the real/physical space with the subject while the distal half was in the virtual space with the VH Katie.

24 study participants were recruited from the general university community, with approximately an equal number of males and females, and multiple ethnicities. Subjects were randomly assigned to a *Control Group* ($n = 13$) or an *Experimental Group* ($n = 11$). The overall experimental task for *all* subjects comprised four steps: preparation, transition into the game room, the interaction (game) with the VH Katie, and the transition out of the game room. The preparation, which took place outside of the game room, involved the subjects reading the informed consent, completing a demographic questionnaire, and receiving a briefing on the rules of the game. The transition into the game room involved the subjects being escorted from the preparation area into the curtained-off game room where the VH Katie was waiting. The interaction involved the subjects playing a game of "Twenty Questions" [5] with the VH Katie. The transition out involved the subjects being escorted back to the preparation area.

While all subjects followed all of the above steps, the subjects in the Experimental Group were exposed to a brief but apparently engaging conversation between a real human (RH) and the VH during the subject's preparation and transition into the game room. Specifically, during the preparation step (outside the game room) they were exposed to the sounds of a muffled conversation emanating from inside the game room. As they transitioned into the game room, they would see the RH Michael in conversation with the VH Katie—the source of the conversation sounds they might have overheard during the preparation. As the subject entered the game room, the RH Michael would look at the subject, then at the VH Katie, and say "Oh, you've got visitors. I'll leave you two to play." Michael would then depart while exchanging parting phrases with the VH Katie such as "It was nice playing with you. Thanks for your time. See you later." The subjects in the Control Group simply completed the preparation and were escorted into the game room, where the VH Katie was waiting, and would greet them to start the game.

The two remaining steps—the interaction (game of Twenty Questions) with the VH Katie and the transition out of the game room—were identical for both groups. The game was actually played twice: first the VH Katie “thought” of an object (we chose/programmed a priori) and the subject asked yes/no questions to try and guess what it was. Next the subject was asked to choose a card describing an object from a full deck of such cards, and the VH Katie would ask yes/no questions trying to “guess” that object. (The entire deck had identical cards, so we were able to control the discourse.) After that, the VH Katie finished by signaling it was the end of the game, and the subject was escorted out of the game room back into the preparation area.

Subjects were video recorded from multiple angles and observed for verbal and non verbal behavior such as proper/polite closing of the conversation with VH (e.g., “good bye”). Participants were also asked to fill out a set of post-questionnaires at the end of the experiment, which include a social presence questionnaire [4], a presence questionnaire [6], and an affective attraction questionnaire [7]. The social questionnaire has six questions related to attentional presence (the attentional allocation dimension of social presence), asking about the distraction level, focus, and attention between Katie and the subject during the interaction. The Emotion Questionnaire (EQ1) asks about Katie’s mood influencing the subject, the Affective Attraction Questionnaire (AAQ1) asks the subjects to rate how cold/warm they feel about Katie (who was neutral for both conditions), and the CoPresence Questionnaire (CP1) asks if the participant felt they caught Katie’s attention.

3 PRELIMINARY ANALYSIS AND RESULTS

Subjects in the Experimental Group were more likely to have increased attentional presence with the VH. The aggregate measure of attentional presence shows that the Experimental Group that was exposed to a prior VH-RH social interaction reported a larger mean for attentional presence ($n = 11, M = 6.03, SD = 0.75$) than the Control Group ($n = 13, M = 5.27, SD = 0.76$). The independent samples t-test was associated with a statistically significant effect ($t(22) = -2.468, p = 0.011$).

Subjects in the Experimental Group felt a greater emotional connection to VH Katie. Looking at individual questions, subjects in the Experimental Group gave a higher rating for the influence of VH Katie’s mood on them (EQ1: $t(22) = -2.173, p = 0.02$), perceived VH Katie as more warm (AAQ1: $t(22) = -2.117, p = 0.023$), and perceived that they caught VH Katie’s attention more than the Control Group (CP1: $t(22) = -2.216, p = 0.019$).

Subjects in the Experimental Group are more likely to properly/politely end conversations with the VH. Videos of subjects were observed and tagged if they properly/politely ended the conversation by replying with something like “Good bye”, “See you later”, or “Thank you” at the end of the conversation or if they non-verbally acknowledged the explicit verbal closing statement from VH Katie (e.g., head nod, hand wave, direct smile). Each subject had two opportunities to reply to VH Katie when she ended the conversation, the first time at the end of the game and the second time when they were asked to go back to the room to get their picture taken. In the Control Group, out of 23 total opportunities, 15 subjects (65.2%) responded with a proper ending to the conversation, and 8 subjects (34.8%) did not respond or acknowledge the last statements initiated by VH Katie. In the Experimental Group, out of 21 total opportunities, 19 subjects (90.05%) responded with a proper ending of conversation and two subjects (9.5%) did not respond. An independent chi-square test for statistical significance was run on both groups $\chi^2(1, N = 44) = 3.988, p = 0.046$.

The open-ended comments from the participants also seemed to support the above findings. From the Experimental Group one subject commented: “Michael was a human that influenced my first expression of Katie. He set the tone that she was friendly and ap-

proachable.” Another subject said: “My interaction with Katie was the same as how I would interact with any human being. I was warm and friendly and so was she. The feeling in the air was comfortable, the same feeling I get when I talk to strangers at the grocery store.” A doctoral student in counselor education commented “I thought Katie was quite pleasant and warm...At times when I laughed or thought for long, that was when I was reminded that she was an avatar.” From the Control Group, there were more mixed comments. Relatively few participants rated VH Katie as very realistic and friendly while one subject commented that “Katie could have been nicer and more friendly.” Another subject said “Usually when I play the game with my friends, we show more emotion,” and another said “...humans usually feel closer to people who are warm and friendly. Katie could’ve been nicer and more friendly.” One subject said “...her face doesn’t show feeling...”

4 CONCLUSIONS

We explored the “transfer” of social presence to a virtual human (VH) by exposing an Experimental Group of subjects to a peripheral conversation between that VH and a real human (RH) in advance of a subsequent interaction with the VH. Preliminary results indicate that subjects in the Experimental Group were more likely to have increased attentional presence with the VH, felt a greater emotional connection to VH Katie, and were more likely to properly/politely end conversations with the VH.

The basic approach outlined here depends on the presence of an additional human—the RH in our experiments—which might not be possible or appropriate for many applications. As such we are presently experimenting with a VH in place of the RH, i.e. exploring the potential transfer from a VH-VH interaction. If a peripheral observation of a VH-VH interaction also increases social presence, it will broaden the potential applicability of the approach.

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