

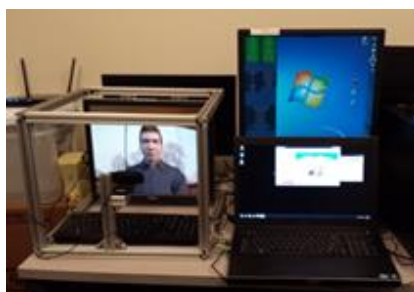
“Hi, It’s Me Again!” Virtual Coaches over Mobile Video

David M. Krum Sin-Hwa Kang Thai Phan Mark Bolas

USC ICT

ABSTRACT

We believe that virtual humans presented over video chat services, such as Skype via smartphones, can be an effective way to deliver innovative applications where social interactions are important, such as counseling and coaching. We hypothesize that the context of a smartphone communication channel, i.e. how a virtual human is presented within a smartphone app, and indeed, the nature of that app, can profoundly affect how a real human perceives the virtual human. We have built an apparatus that allows virtual humans to initiate, receive, and interact over video calls over Skype or any similar service. With this platform, we are examining effective designs and social implications of virtual humans that interact over mobile video. The current study examines a relationship involving repeated counseling style interactions with a virtual human, leveraging the virtual human’s ability to call and interact with a real human on multiple occasions over a period of time. The results and implications of this preliminary study suggest that repeated interactions may improve perceived social characteristics of the virtual human.



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Author Keywords

virtual human coaches; smartphones; virtual counselors; video chat services; reciprocity; self- disclosure

ACM Classification Keywords

J.4 Computer Applications: Social and Behavioral Sciences---Psychology.

INTRODUCTION

Virtual humans are beginning to show promise in applications such as entertainment, therapy, education, and training. In large part, this is due to their ability to evoke social responses in real humans. With the ubiquity of smartphones, the obvious next step for virtual humans is

integration into various mobile apps. We believe that virtual humans, presented over video chat services (such as Skype) and delivered using mobile phones, can be an effective way to deliver counseling and coaching applications. However, we believe that this mobile video platform is very different than previously researched web-based and PC-based virtual human platforms. New research is needed to understand how to effectively present virtual characters on a mobile video platform. We hypothesize that virtual humans who communicate over videoconference services like Skype and Apple’s FaceTime have unique advantages over other forms of presentation, including characters in native smartphone apps. They may appear to be more realistic since they can communicate using video conferencing, much like real humans. Furthermore, video and audio artifacts inherent in Internet based video conferencing may also lower the realism requirement for virtual humans. We have also identified additional design questions involved in developing mobile virtual human experiences. What behaviors, visuals, and utterances might make characters more relatable and increase rapport? Can reciprocity and other concepts from Social Exchange Theory encourage repeated interactions with the virtual character?

In this research, our goal is to develop design guidelines for the deployment of virtual humans on smartphones, with a specific focus on mental wellbeing applications, such as coaching and counseling. To achieve this end, we have developed an apparatus that allow virtual humans to initiate and interact over Skype calls. Our initial study explores how these virtual characters can establish and maintain longer term relationships, leveraging ideas from Social Exchange Theory [4]. The theory postulates that the exchange of gifts and rewards can allow people maintain their social relationships. Our study focuses on tasks and interactions pertaining to virtual humans acting as counseling coaches.

RELATED WORK

Previous studies have employed virtual humans in coaching and behavior modification applications. Human-computer interaction studies [7] suggest that people like to engage with an anthropomorphic agent in counseling interview interactions. This is also supported by Tourangeau et al. who noted that the presence of an interviewer could help retain users’ motivation [13].

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Rizzo and colleagues developed a coaching counselor, called *SimCoach*, to provide information about Post Traumatic Stress Disorder (PTSD) in an online, anonymous manner since many individuals are reluctant to get help from health care providers regarding psychological issues [10]. *SimCoach* users anonymously log in to a website and talk with a virtual human coach anytime when they are available. The virtual coach can provide web links pertaining to their diagnosis, contact numbers for real human counselors, and information regarding the symptoms of their mental illness. In the current version of *SimCoach*, once clients log out, there is no way for them to get further help from the virtual coach or for the coach to follow up until they log in again. Furthermore, access is limited to laptop or desktop web browsers, creating another gap if clients need help when they are traveling or otherwise away from a computer. However, these issues could be alleviated if clients could call or be called by a virtual coach through a smartphone.

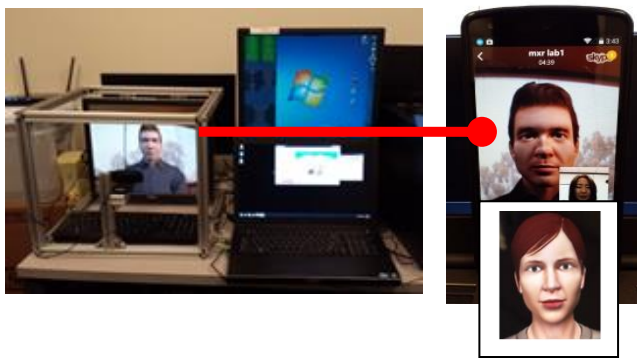


Figure 1. The apparatus at the left uses a web camera to present imagery of a virtual human in Skype. A male or female version of the virtual human can be selected. The character can initiate a Skype call and communicate to the user over a smartphone (right).

Bickmore and his colleagues developed the *Relational Agent*, a virtual human designed to build long-term, socio-emotional bonds and provide advice on a user's workout behavior [1,2,3]. The agent's daily interactions with a user occurred over a long period (e.g. a month). Most of these studies explored the agents for use on mobile devices. The results of the studies indicated the *Relational Agent* to be an effective human-agent interface with regard to health education and behavior changes. However, Bickmore and colleagues posit that if a mobile agent has the potential to be with a user for extended periods of time or even constantly, very close relationships with the user become possible [1]. Our approach is designed to give users the impression that the agent lives in the real world, like a real human, and has the interest and agency to reach out and contact the user. Another differentiator is that Bickmore's virtual human plays the role of a workout coach, while our agent will ultimately play the role of a coaching counselor working with individuals suffering from mental illness.

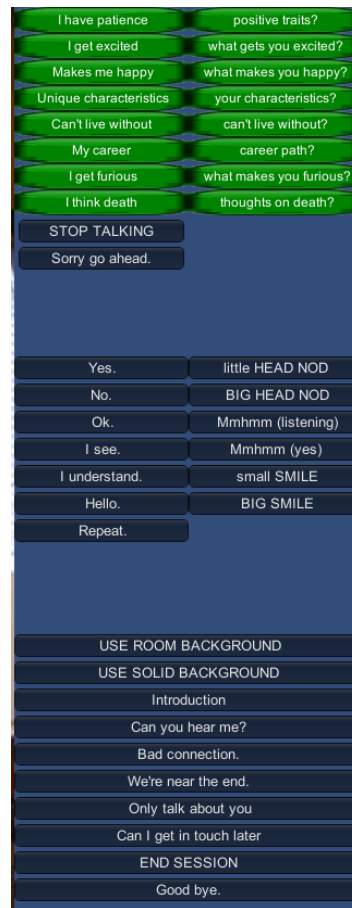


Figure 2. A Wizard of Oz control panel allowed a hidden experimenter to guide the virtual human by selecting questions to ask and choosing responses to the participants' actions.

APPROACH AND EVALUATION

Our approach to mobile counseling is focused on bringing virtual human coaches to smartphones through videoconference services like Skype. This approach could utilize the accessibility of the smartphone and the ability to call users thus allowing exploration of longer relationships consisting of repeated interactions and follow-up interventions between users and virtual coaches.

Experimental Design

The current study is a within-subject design that investigates user perceptions of and reactions to a virtual human displayed on a smartphone over multiple interactions with the virtual human. In the study, participants were asked to schedule times to receive 3 calls from a virtual human coach over the course of 3 consecutive days. We created both a male and a female virtual human (Caucasians, 35 years of age; see Figure 1) and matched gender with the human users to control for gender effects. The virtual human had the ability to display various non-verbal actions, such as two types of nod: a small or a large nod, and two types of smile: a small or a large smile. The virtual human was further able to deliver several variations of verbal empathetic feedback: "OK," "I see," etc. Unbeknownst to the participants, an experimenter remotely controlled the virtual human displayed on the user's smartphone using a Wizard of Oz (WOZ) method

(see Figure 2). The WOZ was performed by calling user's Skype ID while transmitting video of a virtual human created within a Unity game engine application on a desktop computer in our lab. The experimenter triggered variations of a virtual human's verbal (i.e. questions, intimate back stories, and empathetic feedback) and nonverbal behavior (i.e. smiles and nods).

Participants and Procedure

Participants were requested to answer a total of 24 questions over the 3 call sessions in the form of a counseling interview. The virtual human asked 8 questions during each call and shared some personal information before asking each question. The virtual human's verbal questions and responses were pre-scripted using a structure and context adapted from a previous study [7]. During the interaction, users were asked questions of increasing intimacy by the virtual human (e.g. "How old are you?"). The virtual human prefaced questions with its own intimate anecdotes to reciprocate self-disclosure and advance the conversation (e.g. "I am 35 years old.").

Participants were asked to fill out a pre-questionnaire to gather demographic information prior to starting the 1st call session. They were also asked to fill out a post-questionnaire after both the 1st and 3rd call sessions to assess any changes in user responses between the 1st and the 3rd interactions with the virtual human coach. The post-questionnaire included measures to evaluate user rapport with the virtual character (e.g. "I felt I had a connection with my partner."), social attraction toward the virtual character (e.g. "A virtual character would be pleasant to be with."), partner perception (e.g. "compassionate"), and other social perception variables. Participants responded to each question on scales using a Likert-type metric. All scales displayed good reliability [7].

Participants were also asked by the virtual human to prepare answers for interview questions given in the next session and promised that the virtual human coach would also prepare answers for the same upcoming questions. We expected this could encourage users to feel reciprocity with their virtual human partner, based on Social Exchange Theory. According to the theory, we would be able to determine whether users' preparation for their answers might have enhanced the user's feeling of rapport with their partner through the repeated interactions in this study. Such a study to explore repeated interactions, over multiple days, with a virtual character, involving smartphone video chats has been rarely, if ever been performed, due to logistical and technical complexity required.

The participants were recruited online, via Qualtrics. The qualified participants were over 18 years old and able to communicate comfortably in spoken and written English. We recruited a total of 19 participants (47% men, 53% women; average 32 years old) in the study. The participants were given \$50.40 compensation when they completed the study. Participation in the study required access to a smartphone running the Skype app and Wi-Fi or 3G/4G

Internet access. The participants scheduled their interaction times with a virtual human for 3 sessions over 3 consecutive days. Each session took about 10 – 15 minutes to complete, including a post-questionnaire for the first and last sessions. Questionnaire data was collected through online surveys and user behavior was recorded using Ever Skype Video Recorder, an application for real time audio and video capture of Skype sessions.

PRELIMINARY RESULTS AND DISCUSSION

To detect significant effects within the interaction data, we used a Paired-samples T-test, an analysis used when the same subjects participated in all conditions (two different occasions) of an experiment [12].

The preliminary results demonstrated that users felt a virtual human as a compassionate partner when they communicated with the virtual human several times [($M=5.42$, $SD=1.50$), $t(18)=-2.35$, $p=.031$], rather than just once ($M=5.05$, $SD=1.31$) (see Figure 3). The results also showed a trend of users feeling greater rapport with a virtual human after experiencing all three calls ($M=5.80$, $SD=1.41$), rather to one call ($M=5.62$, $SD=1.24$) although it does not reach statistical significance. Compassion and rapport are of particular interest in counseling applications. Shallcross noted that compassion is one of the qualifications of a great counselor [11]. Joe et al. also emphasized the importance of rapport between a counselor and a client in psychotherapeutic interactions [6].

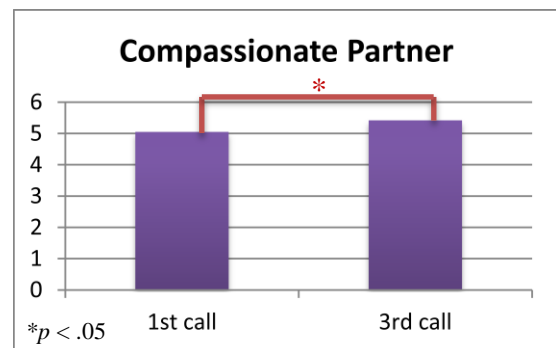


Figure 3. The result of a Paired-samples T-test for users' partner perception between the 1st call and the 3rd call.

We additionally ran a Pearson Correlation Analysis to explore associations among the variables [12]. We found that users felt greater rapport with [$r=.566$, $p=.012$] and were socially attracted more [$r=.525$, $p=.021$] to a virtual human when they perceived the virtual human's movement was natural during the 3rd call. This was not found during the 1st call. This implies that an evolution of the users' relationship and feelings towards the virtual human. Perhaps the participants began to accept the virtual human as a conversational partner over the course of interactions and began to care more about the virtual human's behavior like they would with a real human partner.

Therefore, our preliminary results indicate there is a potential for the use of a virtual human coach on a

smartphone for longer term counseling interactions, specifically when users receive multiple calls initiated by the agent. This is coupled with other technical advantages of this form of interaction. Since the virtual human can “call” the user, it may grant the virtual human an appearance of greater agency. The common conception of Skype as a communications channel connecting one real world locale to another could also reinforce the belief that the character has a real presence somewhere in the world. The further analysis of additional data, including detailed analysis of the participants’ verbal feedback, is currently in progress.

FUTURE WORK AND IMPLICATIONS

Users reported that some of the pre-scripted empathetic feedback (e.g., “Cool!”) was unnatural when repeated without variation during an interaction session. The lack of feedback variability may be responsible for some reduced rapport and the absence of statistically significant differences in some measures of this study. To explore this possibility we are currently upgrading our virtual human coach with the capability of generating empathetic feedback using a greater variety of verbal and nonverbal behavior, such as facial expressions, head gestures, etc. We are also designing additional experiments that might explore longitudinal interactions with virtual human coaches on mobile devices with additional measures and more sophisticated experimental designs.

We are particularly interested in how to present virtual characters as counseling coaches to users over repeated interactions and longer-term relationships. Current web based virtual human coaches such as [10] can engage with users and present support and expert resources relating to mental illness such as PTSD. However, such applications have been limited to web browsers and technologies such as Adobe Flash, which is incompatible with most mobile devices. Of continued interest are design questions of how best to shape and manage a virtual character’s behavior and manner for virtual coach applications over smartphones.

By utilizing Skype as a communications channel we connected the virtual human and the user from different locales, which may create or amplify the notion that the character has a plausibly real presence somewhere in the world. We are continuing to explore how to leverage the context of Skype. We are examining how Skype provides a different context than other apps and how that context affects rapport between real humans and virtual humans. We are running studies that manipulate the context of the communications channel. We plan to begin constructing a theory that captures the significant elements (technical, social, geographical, etc.) that provide context and subtext for human to virtual human interactions mediated by smartphones.

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