Perception of Augmented Reality Agents in Healthcare

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Abstract

- Most Intelligent Virtual Agents (IVAs) can't provide non-verbal cues that aid social interaction.
- Using Augmented Reality (AR), non-verbal cues can be shown using a visual embodiment of the IVA.
- In this study we investigate how gender (female, male, gender-neutral), influences the perception of an AR-embodied IVA.
- Using Internet of Things (IoT) devices, the IVA can interact with their physical environment.
- We hypothesize that a user's confidence in an IVA performing tasks differs between different gender appearances and behaviors of IVAs.
- We present a human-subject study design to evaluate the hypothesis and compare three different forms of IVAs with different body shapes, facial features, and voice in an interactive AR healthcare scenario.

Material

In this experiment, three forms of IVAs will be implemented, which differ only in gender appearance and voice:

- Characters will be designed in Adobe Fuse, then uploaded to Mixamo to be rigged and animated.
- Experiment will take place in a hospital-type experimental space.
- Participants will be seated in a hospital bed and wear a Meta2 head-mounted display (see Figure 1).
- The IVAs will be designed to interact with IoT devices, as a virtual healthcare assistant in a hospital environment would.

Figure 1: Meta2 head-mounted display (HMD), worn by participants during experiment

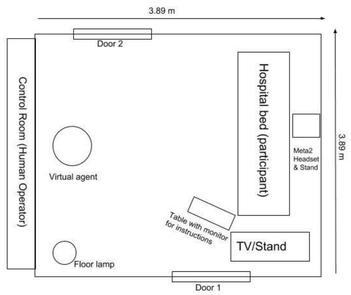


Figure 2: Layout of experimental space, designed to look like a patient room in a hospital

Methods

- After giving their informed consent and filling out a demographics questionnaire, participants will be guided into the experimental room (see Figure 3) and instructed to lie down on the bed.
- Then they will put on the Meta2 HMD, the experimenter will leave the room, and the session will start.
- Each participant will complete three sessions, where they interact with three different virtual agents (see below).
- The virtual agents will be introduced as "healthcare assistants" which could interact with IoT devices (such as a smart lightbulb, a TV, and IoT-connected outlets) throughout the room.
- During the session, participants will ask the agent to complete different tasks within the environment (see below)

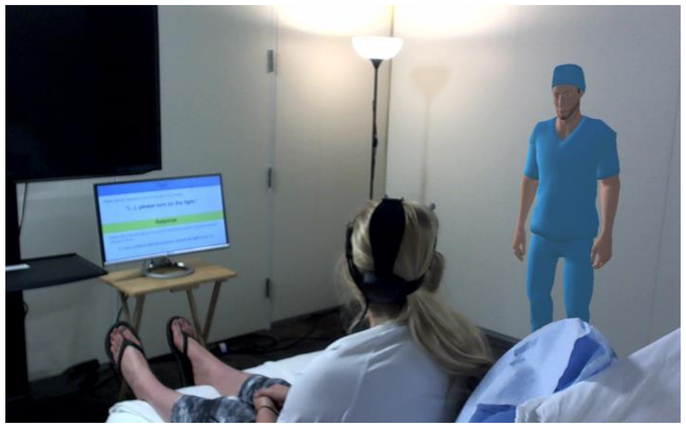
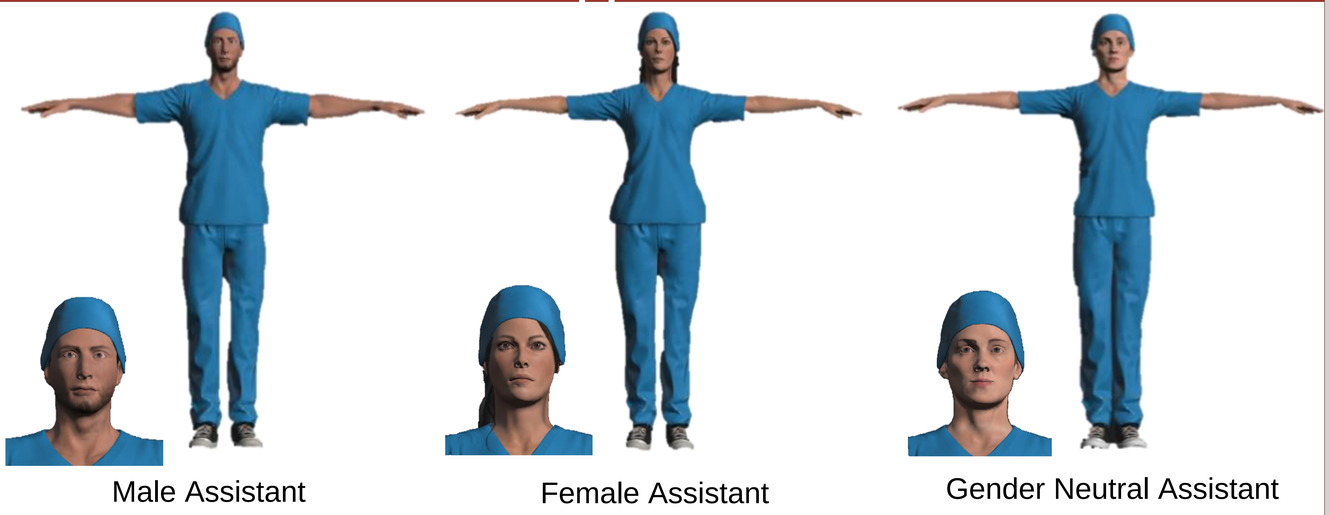


Figure 3: Setup of experiment with participant seated in bed

IVA Appearance



Male Assistant | Female Assistant | Gender Neutral Assistant

Sample Interaction

Participant: *"Please tell my doctor that I have an irregular elevated heart rate."*
Assistant: *"Will do."* (assistant walks out of room, pauses for 7 seconds, then walks back into room.)
Assistant: "Done. I told the doctor."

Hypotheses

- **H1**: Social connection and social presence will be higher with the male and female assistants more than with the gender neutral assistant (M, F > N).
- **H2**: Trust will be higher with more feminine appearance and behaviors when conducting care-related tasks (F > N > M).
- **H3:** Confidence will be higher with more male appearance and behaviors when asked to complete more demanding tasks (M > N > F).
- **H4:** Trust and confidence will be higher with assistants that match the participant's gender identity.

Related Work

- **Appearance:** Many studies have focused on virtual agents in VR, but there hasn't been much focus on virtual agent appearance in AR.
- **Social Presence:** Kim et al [1] found that a virtual agent that showed awareness of physical objects in the room was rated with more social presence.
- **Gender:** A large body of literature [2][3] focuses on gender biases in the real world and AR/VR environments, showing same-sex and opposite-sex preferences depending on context and user characteristics.
- This study was based off of Kim et al's [4] study on the visual embodiment of IVAs.

References

[1] K. Kim, D. Maloney, G. Bruder, J. N. Bailenson, and G. F. Welch. The effects of virtual human's spatial and behavioral coherence with physical objects on social presence in AR. Comput Animat Virt W, 28(e1771), 2017
[2] J. Payne, A. Szymkowiak, P. Robertson, and G. Johnson. Gendering the machine: Preferred virtual assistant gender and realism in self-service. In International Conference on Intelligent Virtual Agents, pages 106–115, 2013
[3] E.-J. Lee. The effects of "gender" of the computer on informational social influence: The moderating role of task type. Int. J. Hum.-Comp. Stud., 58:347–362, 2003
[4] K. Kim, L. Boelling, S. Haesler, J. N. Bailenson, G. Bruder, and G. F. Welch. Does a Digital Assistant Need a Body? The Influence of Visual Embodiment and Social Behavior on the Perception of Intelligent Virtual Agents in AR, 2017

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