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Editorial: Simulating virtual humans and crowds for virtual reality

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Editorial on the Research Topic

Simulating virtual humans and crowds for virtual reality

Virtual humans, both in the form of autonomous agents and human-controlled avatars, constitute a core part of immersive experiences in VR. Collaborative spaces populated with real and artificial humans have enormous potential to provide insights into human behavior/psychology and improve simulation models.

Early work on virtual humans addressed the technical issues of modeling and animating characters in real-time (Granieri & Badler, 1994) and pioneered today's characters with a rich repertoire of behaviors. Such behaviors elicit social presence, namely "the sense of being with one another" (Biocca et al., 2003), and help enhance user engagement and performance (Takács, 2005). Since then, virtual humans have started playing significant roles as therapists, interviewers, audience members or pedagogical agents to help alleviate distress or overcome phobias (Pertaub et al., 2002; Batrinca et al., 2013; Morbini et al., 2014; Kahlon et al., 2019). In addition to providing standardization, virtual humans have advantages over real humans as they can exhibit infinite patience, uphold pedagogical guidelines and provide objective and consistent feedback without being burdened by social complications (Mell & Gratch, 2015). Furthermore, people treat and communicate with virtual humans naturally as if they were real humans (Patterson et al., 2002; Nass & Reeves, 2003; de Borst & de Gelder, 2015; Slater et al., 2019).

This Research Topic brings together original research articles that explore the roles of virtual humans in various social situations and the impact of their realism on their perception and effectiveness. Multiple studies show that virtual humans can effectively use persuasion strategies similar to real people (André et al., 2011; Dai & MacDorman, 2018) and be as persuasive as real people (Bickmore et al., 2009; Dai & MacDorman, 2018). The first article on this Research Topic (Dai & MacDorman) applies this knowledge to the healthcare domain. The authors explore how virtual physicians' realism and bedside manner affect patients' adherence intention to diet and exercise, predicting behavior

change. The article presents an online virtual consultation study, where participants act as diabetic patients and interact with a virtual physician. The physician is depicted in different styles of realism and eeriness, acting with low or high warmth. The results indicate that although eeriness was conveyed as intended, it did not affect the patients' adherence intention and behavior change. On the other hand, the virtual doctor's perceived warmth was linked to increased physical activity.

The second article (Rogers et al., 2022) also investigates the effect of avatar realism on social interactions in VR. The authors classify avatars in terms of their graphical realism and interaction dynamics complexity into three categories: basic avatars, semi-realistic avatars, and realistic motion avatars. Their premise is that realistic motion avatars can help enhance presence in VR as they can capture subtle details of motion, thus communicating more information. The article presents a study comparing VR-based social interactions with realistic motion avatars to analogous face-to-face interactions to support their argument. The scenarios include a casual introductory conversation and a semi-structured interview where participants disclose negative and positive experiences. Results of the study suggest that although participants indicated a preference for face-to-face interactions, their ratings showed no significant differences between face-to-face and VR interactions. An especially important finding is that some participants preferred VR when they had to disclose negative experiences.

The third article (Glémarec et al., 2022) focuses on virtual audiences, benefiting from the controlled setting that VR provides for social skills training. The article introduces a virtual audience control system and a behavior model that uses pedagogical strategies to modulate the affective state of the speaker by controlling the virtual audience's attitudes. The system was designed in a user-centered fashion, incorporating pedagogical narratives according to expert feedback. With user studies involving undergraduate students in a scientific

presentation seminar, the authors collected data on the virtual audience believability, system usability, and acceptability. The results indicate that all the participants agreed on the environment's ecological validity and pedagogical promise.

The articles in this collection contribute to unraveling the potential that virtual humans offer in various areas, including education, healthcare, and casual conversations. We hope the collection provides a helpful reference for the state-of-the-art immersive systems involving virtual humans.

Author contributions

FD wrote the manuscript. NP and MG-F reviewed the manuscript and provided comments and suggestions. All the authors read and approved the submitted version.

Conflict of interest

MG-F was employed by Microsoft Research.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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