KEYNOTE TALK

Wednesday, October 9, 2019 at 1:30pm
(Sand Harbor II)

Perception and Affordance Research Inspired Design of Virtual Self-Representation in Near-Field Virtual Reality Interactions

Sabarish Babu
Clemson University, USA

Abstract: In this keynote, I will be highlighting a body of work that was conducted over a decade in the investigation of spatial perception and fine motor actions in near field or personal space virtual reality simulations, and its implications to the design of interaction metaphors and self-avatars. In our initial research, we studied near field distance estimation in real and virtual environments via visually guided reaching and speech based responses. We found that distances are systematically misperceived in immersive virtual environments and the real world in the near field. We then investigated how visuo-motor recalibration or adaptation can overcome depth misperceptions in near field virtual reality, via calibration to congruent and divergent visual and haptic feedback. In multiple experiments, we found evidence that congruent and divergent visuo-haptic feedback not only differentially affected distance estimation, but also affected the properties of fine motor actions such as velocity, accuracy and path length of the end effector's movements in open and closed loop experiences in VR. Building upon these findings, we investigated the effect of anthropomorphic and anthropometric fidelity of self-avatars, which are self-representations of the user in VR, on spatial perception and affordances in near field interactions. In this recent thrust, we found evidence of the presence of a malleable embodied body schema that is adaptable based on alterations to the self-avatar, and subsequently scaling our perceptions of distance and the participants' reach envelope in VR interactions. More recently, we have been investigating the effects of the presence or absence of self-avatars in contemporary VR experiences on the affordance of passability, and comparing the results to that of real world viewing situations. Our initial results seem to suggest that the difference in viewing has a larger impact on perceived affordances in the medium field, than the presence or absence of body scaled virtual embodiment. Finally, I will end my talk by highlighting our ongoing research on the effects of congruent and divergent visuo-haptic feedback on size perception and near field affordances in VR. The results of our work have profound implications to the design of VR interactions in fine motor training such as surgical simulation, mechanical skills trainers, as well as tangible devices and interaction metaphors.

Speaker Bio-Sketch: Sabarish "Sab" Babu is an Associate Professor in the Division of Human Centered Computing in the School of Computing at Clemson University in the USA. He received his BS (2000), MS (2002) and PhD (2007) degrees from the University of North Carolina at Charlotte, and completed a post-doctoral fellowship in the Department of Computer Science at the University of Iowa prior to joining Clemson University in 2010. His research interests are in the areas of virtual environments, virtual humans, applied perception, educational virtual reality, and 3D human computer interaction. He has authored or co-authored over 75 peer-reviewed publications in premiere venues in the research field. He was the General Chair of the IEEE International Conference on Virtual Reality (IEEE VR) 2016. He also served as a Program Co-Chair for IEEE VR 2017. He and his students have received Best Paper Awards in the IEEE International Conference on Virtual Reality, IEEE International Conference on 3D User Interaction, ACM Symposium on Applied Perception, and the IEEE International Conference on Healthcare Informatics. His research has been sponsored by the US National Science Foundation, US Department of Labor, St. Francis and Medline Medical Foundations.