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Wearable haptic devices and novel rendering paradigms for enabling touch-based interactions with virtual objects



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ABSTRACT:

Recent advances in extended reality (XR) technologies make seeing and hearing virtual objects commonplace, yet strategies for synthesizing haptic interactions with virtual objects continue to be limited. Two design principles govern the rendering of believable and intuitive haptic feedback: movement through open space must feel “free” while contact with virtual objects must feel stiff. This talk presents a novel multisensory approach that conveys proprioception through illusory visual feedback and tactile feedback through referred stimuli to the wrist via a bracelet interface. I'll present Tasbi, a wearable multi-sensory haptic device that conveys squeeze and vibration. In addition, I'll discuss our multi-sensory pseudo-haptic rendering paradigm, and present recent findings that demonstrate that users reliably discriminate the stiffness of virtual buttons when provided with multisensory pseudohaptic feedback. This multisensory approach, which leaves users' hands unencumbered, provides a flexible framework for synthesizing a wide array of touch-enabled interactions in XR, with great potential for enhancing user experiences. I'll conclude with some thoughts on future directions for this research.

BIOGRAPHY:

Marcia O'Malley is the Thomas Michael Panos Family Professor in Mechanical Engineering, Computer Science, Electrical and Computer Engineering, and Bioengineering, and Chair of the Department of Mechanical Engineering at Rice University. Her research addresses issues that arise when humans physically interact with robotic systems, with a focus on wearable robotics and haptics for training and rehabilitation in virtual environments. She has twice received the George R. Brown Award for Superior Teaching at Rice University. O'Malley was a recipient of both the ONR Young Investigator award and the NSF CAREER Award. She is a Fellow of the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, and the American Institute for Medical and Biological Engineering. At Rice, she has been recognized with Rice's Presidential Award for Mentoring, the Graduate Student Association Faculty Teaching and Mentoring Award, and the Rice University Faculty Award for Excellence in Research, Teaching, and Service.