

Mechanical Engineering Department Seminar

3:35pm May 2, 2018

1130 Mechanical Engineering

111 Church Street SE, Minneapolis, MN 55455

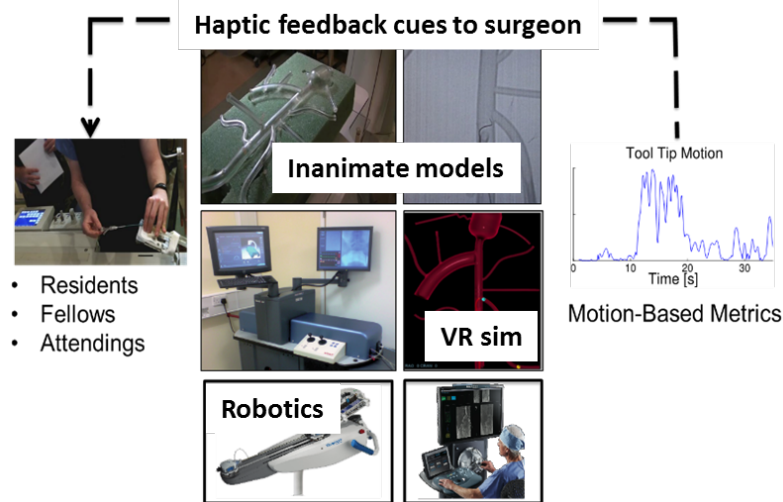
Guiding with Touch: Objective Assessment And Haptic Cueing to Improve Surgical Performance on Virtual and Robotic Platforms

Marcia O'Malley



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Recent advances in simulation and robotic surgery have changed the way surgeons are trained in terms of their ability to gain experience without risk to patients. However, the feedback surgical trainees receive is still delayed, subjective, and qualitative, which does not provide the maximum support for rapid acquisition of motor skill. In this talk, I will describe our research on identifying objective and quantitative metrics that capture surgical skill in the endovascular domain. Specifically, we have shown that low-level properties of movements (e.g., smoothness) made in the performance of several motor tasks—including surgery in both virtual and robotic environments—are highly correlated with high-level performance outcomes, such as expert evaluations in surgical environments. I will also describe our progress in transforming these performance metrics to haptic representations to a trainee. We hypothesize that it may be possible to enhance surgical performance and training by providing performance feedback based on these same motion-based metrics that quantify movement quality and strategies rather than task outcomes. This approach will allow trainees to receive feedback that is immediate and quantitative, which should amplify human capabilities and result in improved performance in difficult-to-train motor domains such as surgery.



Bio: Marcia O'Malley received the B.S. degree in mechanical engineering from Purdue University in 1996, and the M.S. and Ph.D. degrees in mechanical engineering from Vanderbilt University in 1999 and 2001, respectively. She is currently the Stanley C. Moore Professor of Mechanical Engineering, of Computer Science, and of Electrical and Computer Engineering at Rice University and directs the Mechatronics and Haptic Interfaces Lab. She is an Adjunct Associate Professor in the Departments of Physical Medicine and Rehabilitation at both Baylor College of Medicine and the University of Texas Medical School at Houston. Additionally, she is the Director of Rehabilitation Engineering at TIRR-Memorial Hermann Hospital, and is a co-founder of Houston Medical Robotics, Inc. Her research addresses issues that arise when humans physically interact with robotic systems, with a focus on training and rehabilitation in virtual environments. She has twice received the George R. Brown Award for Superior Teaching at Rice University. O'Malley received the ONR Young Investigator award and was also a recipient of the NSF CAREER Award. She is a Fellow of the American Society of Mechanical Engineers. She currently serves as an associate editor for the ASME Journal of Mechanisms and Robotics and the IEEE Transactions on Robotics. Additionally, she is a senior associate editor for the ACM Transactions on Human Robot Interaction.