Joint Department of
BIOMEDICAL ENGINEERING

UNC CHAPEL HILL | NC STATE UNIVERSITY

Coulter Seminar Series Presents

Rehabilitation Engineering

Promoting Patient Engagement in Upper Limb Robotic Rehabilitation

Marcia K. O'Malley (Marcie), Ph.D.

Stanley C. Moore Professor of Mechanical Engineering

Director of Graduate Studies in Mechanical Engineering

Special Advisor to the Provost on Health-Related Research and Educational Initiatives

Rice University

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 IEEE Transactions on Robotics. Additionally, she is a senior associate editor for the ACM Transactions on Human Robot Interaction.

ABSTRACT Neurological injuries including stroke and spinal cord injury are some of the leading causes of long-term disability today; therefore, many research efforts are focused on designing maximally effective and efficient treatment methods. In particular, robotic rehabilitation has received significant attention for upper-limb therapy due to its ability to provide high-intensity repetitive movement therapy with less effort than would be required for traditional methods. Recent research has focused on increasing patient engagement in therapy, which has been shown to be important for inducing neural plasticity to facilitate recovery. Robotic therapy devices enable unique methods for promoting patient engagement by providing assistance only as needed and by detecting patient movement intent to drive to the device. This talk will survey recent advances in this field, highlighting in particular efforts in the Mechatronics and Haptic Interfaces Lab at Rice University. My group has proposed and validated novel exoskeleton-type robotic devices, objective assessments, and adaptive control architectures for upper extremity rehabilitation, all with the intention of promoting patient engagement in therapy. I will discuss our recent contributions and directions for the future of the field.

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