Joint Department of

BIOMEDICAL ENGINEERING

UNC CHAPEL HILL   NC STATE UNIVERSITY

Coulter Seminar Series Presents

Rehabilitation Engineering

Development and Translation of Bionic Limb Technology

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Levi J. Hargrove, PhD, P.Eng, earned his MScE and PhD in Electrical Engineering from the University of New Brunswick in 2005 and 2008, respectively. He is currently the Director and Scientific Chair of the Center for Bionic Medicine at the Shirley Ryan AbilityLab and an Associate Professor in the Departments of Physical Medicine & Rehabilitation and the McCormick School of Engineering at Northwestern University.

As a leading figure in the prosthetics industry, Dr. Hargrove oversees a research portfolio which encompasses cutting-edge projects aimed at developing clinically-realizable myoelectric control systems for individuals with limb loss. Dr. Hargrove's key projects include developing advanced and adaptive control systems for bionic legs, improving the control of robotic hand prostheses, and evaluating intramuscular EMG signals collected using biocompatible implants. In 2012, he co-founded Coapt, a company that translates machine-learning-based prosthetic limb controllers. The company has sold over a thousand systems to amputees worldwide, helping them regain their independence and improve their quality of life.

ABSTRACT

Amputation is a leading cause of disability, and prosthetic devices are commonly accepted treatment options to restore functional capabilities. However, current prosthetic devices still cannot fully match the functionality of their natural counterparts. This talk focuses on the progress made in the development and control of bionic limbs for individuals with limb loss. The first portion of the talk provides an overview of the development, testing and commercialization of pattern recognition control systems for prosthetic arms, including their operation with advanced surgical techniques, such as targeted muscle reinnervation. A significant emphasis of this work has been on evaluation based on real user feedback, ensuring that the developed technologies meet the actual needs and preferences of end users. The second portion focuses on the application of these approaches (i.e. statistical pattern recognition and finite state-machines) to controlling powered leg prostheses. Finally, I will discuss our recent work in using deep-learning coupled with benchmark datasets to remove the reliance of finite-state machines from our overall control approach.

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