COLLEGE OF ENGINEERING

Control Seminar

Sponsored by: Bosch, Ford, and Toyota

Online Adaptation for Supervisory Control of Powered Legs

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3:30 – 4:30 pm 1500 EECS

ABSTRACT: Powered assistive robots enable disabled individuals to complete a variety of different ambulation activities. However, proper control of these devices requires that they identify and respond to user intent. Here we present one such device, a powered lower limb prosthesis, which was configured to acquire and respond to the user's neural information (acquired via electromyography). We accomplished this with an adaptive intent recognition algorithm that continuously learns to incorporate the user's neural information as they ambulate with the prosthesis. We evaluated our algorithm with eight transfemoral amputees and verified that it continuously updated the user's model of neural data and accurately and consistently identified the user's intent over multiple days, despite changing neural signals. More recently, we have investigated how a similar control approach can be used to create control systems that generalize across different users which reduces the amount of calibration data required from each user.

BIO: Levi J. Hargrove, PhD, P.Eng, received his MScE and PhD in Electrical Engineering from the University of New Brunswick (2005, 2008). He is currently the Director of Center for Bionic Medicine at the Shirley Ryan AbilityLab, formerly the Rehabilitation Institute of Chicago (RIC), and an Associate Professor in the Departments of Physical Medicine & Rehabilitation and the McCormick School of Engineering at Northwestern University. His research interests include signal processing, pattern recognition, and myoelectric control of powered prostheses. A major goal of his research is to develop clinically realizable myoelectric control systems that can be made available to persons with limb loss in the near future. In 2012, Dr. Hargrove co-founded Coapt, a company to commercialize control algorithms for prosthetics and orthotics. His research addresses all levels of amputation and has been published in the *Journal of the American Medical Association* and the *New England Journal of Medicine* and has resulted in multiple patents. Key projects include the development of advanced and adaptive control systems for prosthetic legs, improving control of robotic hand prostheses, and intramuscular EMG signal processing.

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