COLLEGE OF ENGINEERING
MECHANICAL ENGINEERING
UNIVERSITY OF MICHIGAN

Mechanical Engineering Seminar Series

Challenges in Prosthetic Limbs: design, control, use and utility

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2147 GG Brown

Abstract

Artificial limbs offer an opportunity to improve movement through biomimetic devices. One approach is to directly replace joint function, but achieving humanlike performance is challenging for design, control, cost and longevity of the systems. An alternative approach is to exploit biomechanical workarounds for lost function rather than directly replacing it. This presentation will describe several such "semi-active" prostheses – low-power systems that modulate their mechanical properties but cannot power body movement – that aim to add adaptability and versatility with minimal addition of weight, height, complexity, power demand and cost.

Another challenge in rehabilitation and assistive technology is determining which among several interventions is most beneficial to everyday movement. "Real-world" assessment using wearable sensors is a popular approach, but current analysis techniques struggle to reduce days-long data sets to generalizable knowledge. The second part of this presentation will describe this challenge and a novel approach to data reduction aimed at enabling lab-like scientific findings from long-term wearable data sets, with upcoming application to prosthetic ankle-foot systems.

Bio

Dr. Peter Adamczyk earned degrees in Mechanical Engineering from Case Western Reserve University (B.S.) and the University of Michigan (M.S. and Ph.D) in the areas of Robotics and Biomechanics. He spent several years running a startup company dedicated to advancing the science and technology of lower-limb prosthetics and real-world motion assessment. He is now an Assistant Professor at the University of Wisconsin–Madison where he directs the Biomechatronics, Assistive Devices, Gait Engineering and Rehabilitation Laboratory (UW BADGER Lab, http://uwbadgerlab.engr.wisc.edu).

Dr. Adamczyk's research aims to enhance physical and functional recovery from impairments affecting walking, running, and standing. Core foci include the design of semi-active foot prostheses for gait restoration after amputation; wearable sensors for movement assessment during real-life activities; and rehabilitation robotics to explore motor learning and neural adaptation.

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