ABC Monthly Seminar

Monday October 29, 2018

Dr. Raziel Riemer

Abstract

Biomechanical energy harvesting as a base for exoskeleton: theory, design, and results

In this talk I will review the state of the art in exoskeletons technology. I will then focus on biomechanical energy harvesters which are wearable robots designed to generate electrical energy from human locomotion (e.g. walking). Thus, providing an alternative to batteries as an electrical power source for portable electronics (e.g. GPS, laptops) or enable reduction of the dependence of exoskeleton in battery power.

For an energy harvesting device to be useful, it is important that it can generate energy with minimal – or without any additional – effort of the user. Therefore, many of the current devices aim at replacing part of the muscles' work during the phases in human motion where the muscles act as brakes (i.e. negative work). This leads to regenerative breaking, which generates energy similar to a hybrid car. If performed correctly, this in theory could lead to generation of electrical energy while reducing the user's effort (i.e. metabolic power).

In this talk I will explain the theory of an energy harvesting device, discuss the criteria for evaluation of the device, demonstrate the optimization base design approach, and present preliminary results of our device which indicate that it is possible to generate electrical energy while reducing the user's effort.

Finally, I will talk about future directions for research and the implications for designing wearable robots (exoskeletons).

Short Bio

Raziel Riemer is a senior lecturer in the Industrial Engineering and Management Department of Ben-Gurion University of the Negev in Israel. He holds a B.Sc. degree in Mechanical Engineering and a M.Sc. in Industrial Engineering from the Ben-Gurion University of the Negev, and a PhD form Department of Mechanical and Industrial Engineering at the University of Illinois at Urbana-Champaign, USA. His research interests are in the areas of analysis, modeling, and simulation of human movement, as well as robotics. He integrates knowledge from biomechanics and robotics. This research has implications, biomechanical energy harvesting**,** exoskeleton, ergonomics and physiotherapy. Before joining the academic world, Raziel worked in the industry both as a mechanical engineer and as industrial engineer for 6 years, most of them at Intel**.**