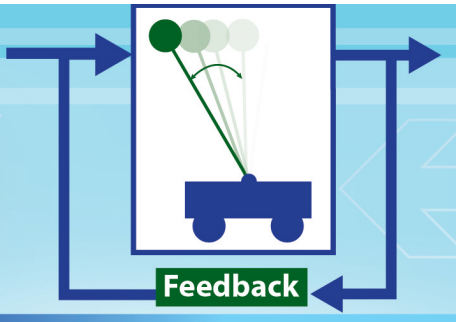
COLLEGE OF ENGINEERING

Control Seminar



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Control of Multilegged Locomotion: what hybrid oscillators, rapid manufacturing, and slippage can teach us

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Department of Electrical Engineering and Computer Science

Friday, September 30, 2016

3:30 – 4:30 pm • 1500 EECS

ABSTRACT: Most terrestrial animals massing several grams or more use more than two legs to move. Despite injury, aging, and disease; in the face of unknown and unstable substrates -- animals often achieve their locomotion objectives. We seek a theory of animal motion that would allow us to design such robust locomotion into robotic systems. One candidate is oscillator theory. Viewed from its lens, rapid legged locomotion can be seen as a hybrid oscillator, or a collection of phase locked hybrid oscillators. Our recent theoretical advances allow us to analyze the stability of a large class of such hybrid oscillators, and demonstrate that by exploiting the hybrid structure they obtain robustness, and allow for modularity by requiring low communication complexity. Our new construction methods, based on modular robotics, have allowed us to rapidly build, test and evolve robot designs. Our quantitative analysis of the robot motions teaches us that we require better models for multi-contact slippage if the motions of our hexapedal robots are to be understood.

BIO: Dr. Shai Revzen joined the University of Michigan's EECS department in 2012. In addition to his work in EECS, he has been an active contributor to the CoE's new Robotics PhD program, and to the Ecology and Evolutionary Biology department. For the past 10 years his research has focused on understanding legged locomotion from the perspective of oscillator theory. His activities span the gamut between biomechanical experiments on animals, the construction of robots, and the development of mathematical theory that allows legged systems to be better understood. At the University of Michigan's EECS department Dr. Revzen founded the Bio-Inspired Robotics and Dynamical Systems (BIRDS) lab, and developed the "Hands On Robotics" course -- an active learning, project based class in the fundamentals of robot design. Through the EEB department he developed a seminar in Comparative Biomechanics which covers topics in the intersection engineering and biology. He holds a PhD in Integrative Biology from the University of California at Berkeley, an MSc in Computer Science from Hebrew University in Jerusalem, and several patents acquired in a previous life in the tech industry.

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