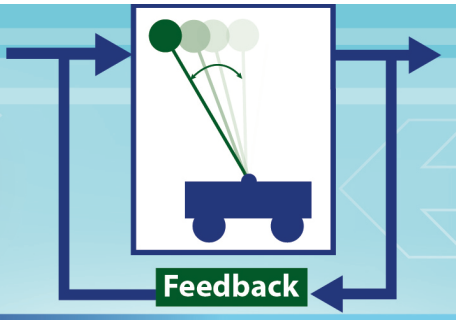
COLLEGE OF ENGINEERING

# Control Seminar

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# Will Geometric Mechanics Revolutionize Multi-legged Locomotion?


## Shai Revzen

**University of Michigan**
**Department of Electrical Engineering and Computer Science**


## Friday, April 6, 2018

**3:30 – 4:30 pm • 1500 EECS**


**ABSTRACT:** Modeling and control of legged locomotion is hard. Conventional wisdom has it that the complexity of the models will increase with the number of legs and the number of contacts. In this talk I will show how insights from the theory of geometric mechanics, a theory developed about 20-30 years ago Marsden, Ostrowski and Michigan's very own Tony Bloch, might turn that notion on its head. I will motivate the claim that when enough legs contact the ground, the complexity associated with momentum is gone, to be replaced by the problem of slipping contact. In this regime, equations of motion are replaced by a "connection" which is both simple to estimate in a data driven form, and easy to simulate by adopting some non-conventional friction models. The talk will contain a brief intro to geometric mechanics, and consist mostly of new results from the BIRDS lab showing that connection type models are more general than may seem at first, that they can be used for very rapid hardware in the loop gait optimization of both simple and complex robots, and that they motivate a simple motion model that fits experimental results remarkably well. If successful, this research agenda could improve motion planning speeds for multi-contact robotic systems by several orders of magnitude.


**BIO:** Shai Revzen is an Assistant Professor of Electrical Engineering and Computer Science in the College of Engineering, and holds a courtesy faculty appointment in the Department of Ecology and Evolutionary Biology in the College of Literature, Science and the Arts. He received his PhD in Integrative Biology doing research in thePolyPEDAL Lab at the University of California at Berkeley, and did his postdoctoral work in the GRASP Laboratory of the University of Pennsylvania. Prior to his academic work, Shai was Chief Architect R&D of the convergent systems division of Harmonic Lightwaves (HLIT), and a co-founder of Bio-Systems Analysis, a biomedical technology start-up. As principal investigator of the Biologically Inspired Robotics and Dynamical Systems (BIRDS) lab, Shai sets the research agenda and innovative tone of the lab. He believes in the intrinsic value of fundamental science, and of its transformative potential for robotics and future technology. Under his supervision, the lab combines work in three disciplines: robotics, mathematics, and biology.