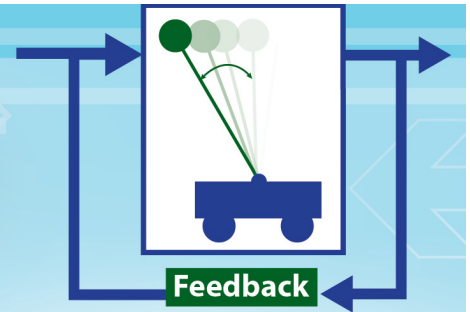


COLLEGE OF ENGINEERING

Control Seminar



Sponsored by: Bosch, Ford, and Toyota

Agile and Dynamic Bipedal Locomotion: Taking on the Wave Field



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Department of Electrical Engineering and Computer
Science

Friday, September 15, 2017

3:30 – 4:30 pm • 1500 EECS

ABSTRACT: Is it great fortune or a curse to do legged robotics on a University campus that has Maya Lin's earthen sculpture, The Wave Field? Come to the talk and find out! We will discuss our work on model-based feedback control and optimization for highly dynamic locomotion in bipedal robots. The presentation will evolve in stages. We'll start with feedback controllers that induce locally exponentially stable periodic walking gaits and illustrate a range of aperiodic behavior that can be achieved with such controllers. Then, robustness to terrain variation will be explicitly brought into the design problem, leading to gaits that can handle walking outdoors on grass, asphalt and 2 to 4 cm thick planks tossed randomly about the laboratory. Next, it is argued that under more extreme perturbations, these gaits typically fail due to ground reaction force constraint violations, and a means to address this with a library of gaits and interpolation will be discussed and illustrated. At this stage, the simpler parts of the University of Michigan's Wave Field can finally be tackled. The last part of the talk will discuss preliminary work on using Supervised Machine Learning to approximate an explicit MPC controller. When combined with robot vision, we hope this will allow the full complexity of the Wave Field to be conquered. In any case Jovanotti assures us, "Non c'è scommessa più persa di quella che non giocherò". I for one will keep trying!

BIO: Jessy W. Grizzle is a (full) Professor in the Control Systems Laboratory of the Electrical Engineering and Computer Science Department within the College of Engineering at The University of Michigan in Ann Arbor, Michigan. He is the Director of Michigan Robotics and a member of the ECE Systems Laboratory and the Robotics and Computer Vision Area. He has a courtesy appointment in Mechanical Engineering. The activity at Michigan in control systems is very interdisciplinary and moves easily across traditional departmental boundaries. We maintain a very active College of Engineering Control Seminar Series. Additional EECS Control Lab information is available here. For more fun stuff, see the EECS YouTube Home Page.