



**The Center for Control, Dynamical Systems, and Computation
University of California at Santa Barbara
Presents**

Feedback Control of Robot Running

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Thursday, April 9, 2009 9:30 am HFH 4164

Abstract:

As an alternative to traditional wheeled and tracked ground vehicles, biologically-inspired legged systems are becoming increasingly common. On a macroscopic level, locomotion on land can be understood based on a few principles, including mechanisms of energy exchange, stability and maneuverability. Central to this macroscopic view is the introduction of archetypal reductive models, capable of capturing the primary characteristics of the task-level behavior, e.g., walking or running. Unfortunately, these reductive models provide no information on the control mechanisms governing the coordination of the multiple joints and limbs of the high-degree-of-freedom-plant in order to produce the observed behavior. The coordinated recruitment of the plant into a low-degree-of-freedom target model constitutes the central problem addressed in this work, which aims at offering a mathematically precise feedback control solution to this problem for the particular setting of monopodal robot running. In this talk, the robotic monopod Thumper, recently constructed in a collaborative effort between the University of Michigan and Carnegie Mellon University, will be introduced. The control law proposed for Thumper grows out of rigorous nonlinear controller synthesis ideas, and was originally developed based on an approximation of Thumper's dynamics, termed the Asymmetric Spring Loaded Inverted Pendulum (ASLIP). The control design procedure is systematic, rendering this framework an attractive alternative to traditional heuristic approaches for controlling legged robots by avoiding laborious trial-and-error procedures during experimental implementation.

About the Speaker:

Ioannis Poulakakis is a postdoctoral associate in the Department of Mechanical and Aerospace Engineering at Princeton University. He received his Ph.D. in Electrical Engineering (Systems) and his M.S. in Applied Mathematics, both from the University of Michigan, Ann Arbor, in 2008. He obtained his M.Eng. from McGill University, Montreal, Canada, and his Diploma from the National Technical University of Athens, Greece, both in Mechanical Engineering. His current research interests are in the application of nonlinear control theory in robotic legged locomotion.
