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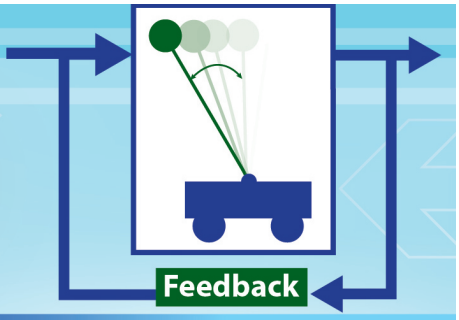
Control Seminar



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Control Synthesis for Large Collections of Dynamical Systems with Counting Constraints

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Department of Electrical Engineering and Computer Science

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3:30 – 4:30 pm • 1500 EECS

ABSTRACT: Can we control a swarm of systems and give guarantees on their collective behavior? In this talk I will discuss an instance of this problem: given a large homogeneous collection of dynamical systems and a novel class of safety constraints, called counting constraints, how to synthesize a controller that guarantees the satisfaction of these constraints. Counting constraints impose restrictions on the number of systems that are in a particular mode or in a given region of the state-space over time. I will present an approach for synthesizing correct-by-construction controllers to enforce such constraints. Our approach exploits the structure of the problem, the permutation invariance of dynamics due to homogeneity and the permutation invariance of counting constraints, to achieve massive scalability. I will discuss several potential applications of this approach and illustrate it on the problem of coordinating a large collection of thermostatically controlled loads while ensuring a bound on the number of loads that are extracting power from the electricity grid at any given time.

BIO: Necmiye Ozay received the B.S. degree from Bogazici University, Istanbul in 2004, the M.S. degree from the Pennsylvania State University, University Park in 2006 and the Ph.D. degree from Northeastern University, Boston in 2010, all in electrical engineering. She was a postdoctoral scholar at California Institute of Technology, Pasadena between 2010 and 2013. She is currently an assistant professor of Electrical Engineering and Computer Science, at the University of Michigan, Ann Arbor. Her research interests include dynamical systems, control, optimization, formal methods with applications in cyber-physical systems, system identification, verification and validation, and autonomy and vision. Dr. Ozay is the recipient of a DARPA Young Faculty Award in 2014 and an NSF CAREER Award, a NASA Early Career Faculty Award and a DARPA Director's Fellowship in 2016.