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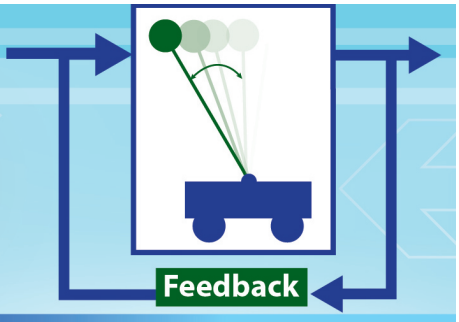
Control Seminar



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Control and Autonomy in the Age of Cyber-Physical Systems

Amit K. Sanyal

Syracuse University
Department of Mechanical and Aerospace Engineering

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3:30 – 4:30 pm • 1500 EECS

ABSTRACT: We realize that these are exciting times for cyber-physical systems, and also that there are several challenges that lie ahead. What are the biggest challenges in integrating computer algorithms with mathematical models of physical (dynamical) systems? In particular, what are the challenges in making these systems autonomous and self-reliant? Can the physics of a system, as observed through available sensor feedback, be learnt \well enough" to provide a good mathematical model to describe the physics? Assuming that the underlying physics can be learnt from the observed data, can this physics be learnt in real-time or fast enough for feedback control? When the model of the physics is already sufficiently known, it can be readily incorporated in computer algorithms to learn the part that is not known (i.e., the uncertainties). In this talk, I argue that adaptation and learning are very important challenges to be overcome for cyber-physical systems, where the cyber part needs to adapt and learn from what it observes of the physical world. But also important is acceptance of a certain amount of risk that comes with the understanding that the best mathematical or computational model is not perfect and may not be accurate enough in all situations. Inspiration and observations from nature, in particular from biological systems, may provide valuable insights into how to cope with uncertainties while still achieving a desired degree of autonomy and self-reliance in cyber-physical systems designed to carry out specific tasks.

BIO: Amit Sanyal obtained the B.Tech. degree in Aerospace Engineering from the Indian Institute of Technology, Kanpur, in 1999, the Ph.D. in Aerospace Engineering and his MS in Mathematics from the University of Michigan in 2004 and 2005 respectively. Between 2004 and 2006, he was a Post-doctoral Research Associate in the Mechanical and Aerospace Engineering department at Arizona State University. From 2007 to spring 2010, he was Assistant Professor in Mechanical Engineering at the University of Hawaii. Between fall 2010 and spring 2015, he was a faculty in Mechanical and Aerospace Engineering at New Mexico State University. He is now Associate Professor in Mechanical and Aerospace Engineering at Syracuse University. He develops and uses techniques from geometric mechanics, nonlinear and geometric control, and variational integration of Lagrangian/Hamiltonian systems, to dynamics modeling, guidance, navigation, and control of unmanned and autonomous systems. He is a senior member of AIAA and IEEE, and a member of ASME and SIAM.

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Questions? Contact: Judi Jones asap@umich.edu