COLLEGE OF ENGINEERING

Control Seminar

Sponsored by: Bosch, Ford, and Toyota

Achieving High-Level Control Goals with Model Predictive Control

James B. Rawlings

University of Wisconsin at Madison
Department of Chemical and Biological Engineering

Friday, March 10, 2017

3:30 – 4:30 pm • 1500 EECS

ABSTRACT: Model predictive control has become a pervasive advance control technology in which optimal control of a multivariable system with input and state constraints is combined with a moving horizon to produce a feedback controller. In applications, model predictive control is often used to solve constrained tracking problems. The tracking problem arises in some settings as the basic goal of the control system, and the constraint handling capabilities of MPC are what make it attractive. In other applications, however, there may be a higher-level goal, such as economic optimization of a process, and this goal is first translated into a steady-state tracking problem. Since MPC enables the designer to choose the objective function that is optimized online, it offers the potential to treat the higher-level control goal directly within the MPC controller bypassing this translation into a steady-state setpoint and tracking problem. In this talk we explore the possibilities enabled by MPC to address these types of high-level goals. We also outline some of the open research challenges presented by this approach; these include modeling, optimization, and controller design challenges. The talk concludes with a brief presentation of a recently deployed economic optimization technology developed by Johnson Controls to control the campus energy system at Stanford University.

BIO: James B. Rawlings is currently Professor of Chemical and Biological Engineering at the University of Wisconsin. He received the B.S. from the University of Texas in 1979 and the Ph.D. from the University of Wisconsin in 1985, both in Chemical Engineering. He spent one year at the University of Stuttgart as a NATO postdoctoral fellow and then joined the faculty at the University of Texas. He moved to the University of Wisconsin in 1995 and is currently the Paul A. Elfers Professor of Chemical and Biological Engineering and the co-director of the Texas-Wisconsin-California Control Consortium (TWCCC). Professor Rawlings's research interests are in the areas of chemical process modeling, monitoring and control, nonlinear model predictive control, moving horizon state estimation, and molecular-scale chemical reaction engineering.

ELECTRICAL & COMPUTER ENGINEERING
UNIVERSITY OF MICHIGAN

Questions? Contact: Judi Jones asap@umich.edu