



**The Center for Control, Dynamical Systems, and Computation
University of California at Santa Barbara
Spring 2008 Seminar Series
Presents**

Hybrid and Distributed Model Predictive Control over Wireless Networks

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Abstract:

Constrained large-scale and dynamically coupled systems can be controlled in a distributed way through a network of cooperative model predictive controllers (MPCs). In this talk I will cover some recent ideas on stabilizing distributed MPC and, for the frequent case of control loops closed over wireless sensors, novel energy-aware MPC techniques for reducing battery consumption of wireless nodes. To handle uncertainties due for instance to the imperfections of the communication channel, I will present an MPC approach to control stochastic hybrid systems that exhibit both continuous dynamics (difference or differential equations) and discrete dynamics (automata with both deterministic and stochastic transitions, logic conditions, etc.). The approach is based on a combination of reachability analysis and optimal control under chance constraints, solvable through standard mixed-integer programming tools. The ideas will be exemplified on a laboratory process for experiments in wireless automation.

About the Speaker:

Alberto Bemporad received the masters degree in Electrical Engineering in 1993 and the Ph.D. in Control Engineering in 1997 from the University of Florence, Italy. He spent the academic year 1996/97 at the Center for Robotics and Automation, Dept. Systems Science & Mathematics, Washington University, St. Louis, as a visiting researcher. In 1997-1999, he held a postdoctoral position at the Automatic Control Lab, ETH, Zurich, Switzerland, where he collaborated as a senior researcher in 2000-2002. Since 1999 he is with the Faculty of Engineering of the University of Siena, Italy, where he is currently an associate professor. He has published several papers in the area of hybrid systems, model predictive control, automotive control, multiparametric optimization, computational geometry, and robotics. He is coauthor of the Model Predictive Control Toolbox (The Mathworks, Inc.) and author of the Hybrid Toolbox for Matlab. He was an Associate Editor of the IEEE Transactions on Automatic Control during 2001-2004. He is Chair of the Technical Committee on Hybrid Systems of the IEEE Control Systems Society since 2002. <http://www.dii.unisi.it/~bemporad>