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

Real-time Predictive Control for Hybrid Systems

Francesco Borrelli
UC Berkeley

Friday, October 10, 2008 4:00-5:00pm Webb 1100

Abstract:
Hybrid systems are heterogeneous systems that exhibit both continuous and discrete dynamics. Conventional control design tools are used to develop controllers for the continuous modes at the lower level, and then a set of switching rules takes care of the discrete modes at the higher level. Unfortunately, the system behavior is all too often governed by the discrete modes so that a lengthy and expensive trial and error procedure is necessary to achieve satisfactory performance characteristics.
Over the last eight years we have focused on the development of systematic, real-time, predictive controller synthesis techniques for hybrid systems with constraints. In this talk I will first summarize our theoretical efforts. In particular I will briefly discuss the synthesis of real-time controllers for hybrid systems with linear constraints on states and inputs. The second part of the talk presents a wide range of applications where the proposed techniques were used with great benefit. Three real-time applications will be highlighted: vehicle dynamic controller design, robotic-head visual tracking and two stages manufacturing plants.

About the Speaker:
Francesco Borrelli received the `Laurea' degree in computer science engineering in 1998 from the University of Naples `Federico II', Italy. In 2002 he received the PhD from the Automatic Control Laboratory at ETH-Zurich, Switzerland. He has been a contract Assistant Professor at the Aerospace and Mechanics Department at the University of Minnesota, USA and an Assistant Professor at the `Universita' del Sannio', Benevento, Italy. He is currently an Assistant Professor at the Department of Mechanical Engineering of the University of California at Berkeley, USA. He is author of the book Constrained Optimal Control of Linear and Hybrid Systems published by Springer Verlag and the winner of the `Innovation Prize 2004' from the ElectroSwiss Foundation. His research interests include constrained optimal control, model predictive control, robust control, parametric programming and automotive applications of automatic control.