



**The Center for Control, Dynamical Systems, and Computation  
University of California at Santa Barbara  
Spring 2009 Seminar Series  
Presents**

**Analysis and Control Design for State and Control  
Constrained Nonlinear Systems**

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Nagaoka University of Technology**

**Friday, April 10, 2009 3:00 - 4:00pm WEBB 1100**

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**Abstract:**

Constraints on actuators and often also on the states are present inherently in all real physical systems. They can lead performance deterioration and even instability if not properly accounted for in control design stages. An invariance property of a certain subset in the state space plays fundamentally important roll in analysis and design of systems with state and control pointwise-in-time constraints. In this presentation, we consider necessary and sufficient conditions to fulfill the specified state and control constraints for nonlinear closed-loop dynamics. We investigate the concept of the maximal output admissible set, which is the largest constraint admissible invariant set, or in other word, the set of all initial conditions such that the resulting trajectories never exceed the specified constraints. We propose explicit procedures for computing the maximal output admissible sets and consider their finite characterization properties. As a last portion of the presentation, a simple application of the maximal output admissible set to reference management problems is addressed. Whenever necessary, the reference management mechanism alters original external reference signals to enforce the specified constraints.

**About the Speaker:**

Kenji Hirata is currently a visiting research scholar at the Center for Control, Dynamical Systems, and Computation at UCSB. He received a B.S. degree in control engineering from Kyusyu Institute of Technology, Kitakyusyu, Japan, in 1994, and M.S. and Ph.D. degrees in information science from the Japan Advanced Institute of Science and Technology, Hokuriku, Japan, in 1996 and 1999, respectively. In 1999, he joined with the Department of Mechanical Engineering, Osaka University, Suita, Japan, as an Assistant Professor. Since 2006, he has been with the Department of Mechanical Engineering, Nagaoka University of Technology, Nagaoka, Japan, where he is currently an Associate Professor. His research interests include the development and application of tools for controlling systems with state and control constraints.

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