

Control Over Graphs, Limited Bandwidth, and Switched Systems

Geir E. Dullerud
University of Illinois

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The future of embedded and robotic systems, as currently envisioned, involves light weight systems that have the ability to talk, negotiate, adapt, and physically interact with other systems in real time over either wireline or wireless communication channels. We present recent developments on systematic analysis tools for computer control of distributed robotic systems. New results and current work are presented on the control of distributed systems formed from the interconnection of multiple heterogeneous input-output subsystems. In particular we will discuss progress on two specific problems. The first problem is that of designing systems where information is received with varying latency and resolution; our approach is by means of our recent and more general work on switched and Markovian linear systems. The second topic in the talk is control design over graph interconnections, and is aimed at addressing the need for synthesizing controllers that have a specific communication topology.



Our multi-vehicles testbed (HOTDEC) designed for extensive experimentation with the control issues arising from control over networks will also be briefly presented. It consists of autonomous hovercraft, wirelessly communicating with each other and users on the Internet.

Geir E. Dullerud is Professor of Mechanical Engineering, and Research Professor of the Coordinated Science Laboratory, at the University of Illinois at Urbana-Champaign. Prior to this he was on faculty in Applied Mathematics at the University of Waterloo 1996-1998, after being a Research Fellow at the California Institute of Technology from 1994-1995, in the Control and Dynamical Systems Department. During the academic year 2005-2006 he held a visiting faculty position in the Aeronautics and Astronautics Department at Stanford University. He has published two books: "A Course in Robust Control Theory" (with F. Paganini), Texts in Applied Mathematics, Springer, 2000, and "Control of Uncertain Sampled-data Systems", Birkhauser 1996. His areas of current research interest include networked and cooperative control, robotic vehicles, complex and hybrid dynamical systems. In 1999 he received the CAREER Award from the National Science Foundation and in 2005 the Xerox Faculty Research Award at UIUC. He is a Fellow of the IEEE.