STEVENS INSTITUTE of TECHNOLOGY
THE INNOVATION UNIVERSITY

University Seminar Series

Sponsored by Mechanical Engineering Department

Distributed Control: Robots, Networks, and Buildings

Professor John T. Wen

Director, Center for Automation Technologies & Systems
Department of Electrical, Computer, & Systems Engineering
Rensselaer Polytechnic Institute, Troy, NY

ABSTRACT

Cooperative systems with distributed decision-making arise in many nature and man-made systems. For example, flock of birds, school of fish, and hordes of ants all involve coordinated motion and manipulation. Similarly, for man-made systems, robots work together for material transport, assembly, and surveillance, users interact, albeit indirectly, in power grid, networking, and building HVAC systems. In the absence of a centralized leader, it is still possible to achieve a common group objective without explicit coordination and communication between the individual actions. Such cooperative collective behavior is made possible by indirect communications through local information feedback. In this talk, we consider the stability, performance, and robustness of several distributed control examples: formation control, collaborative load carrying by multiple robots, network flow regulation, CDMA power control, and building temperature control. The main tool that we use is the concept of passivity. Passivity is motivated by energy conservation or dissipation in physical systems and has long been used in the stability analysis and design of nonlinear feedback systems, including mechanical structures and electrical circuits. This talk will review the passivity approach and then present its applications to the distributed control of various problems. Our recent effort in developing a distributed control and communication architecture, called Robot Raconteur, will also be presented.

BIOGRAPHY

John T. Wen received his B.Eng. from McGill University in 1979, M.S. from University of Illinois in 1981, and Ph.D. from RPI in 1985, all in Electrical Engineering. From 1981-1982, he was a system engineer at Fisher Controls. From 1985-1988, he was a member of technical staff at the NASA JPL. Since 1988, he has been with RPI where he is currently a Professor in the Department of Electrical, Computer, and Systems Engineering with a joint appointment in the Department of Mechanical, Aerospace, and Nuclear Engineering. Since 2005, he has served as the Director of a New York State sponsored interdisciplinary research center, Center for Automation Technologies and Systems (CATS), with the participation of over thirty faculty from nine departments. He also served as the Interim Director of the NSF Smart Lighting Engineering Research Center from June-Dec, 2009. He is the co-inventor of the Adaptive Scanning Optical Microscope (ASOM), which was licensed to Thorlabs and developed as an award-winning product. Dr. Wen's research interest lies in the modeling and control of dynamical systems with applications to motion control, robot manipulation, opto-mechatronics, thermal management, and active flow control. He has over 200 refereed publications and six patents. Dr. Wen is a Fellow of IEEE.

EVENT DETAILS

DATE:
Wednesday October 31, 2012

TIME:
1:30 PM

LOCATION:
Carnegie, Room 315
Stevens Institute of Technology

ATTENDANCE:
This event is open to Stevens' Faculty, Students, Staff, and Invited Guests