Seminar 1: UAV Research at NUS

Prof. Ben M. Chen
Professor and director of Control Intelligent Systems & Robotics Area
Department of Electrical and Computer Engineering
National University of Singapore (NUS), Singapore

Date: February 24, 2014 (Monday)
Time: 10:00am – 11:00am (Tea Reception at 9:45am)
Venue: Room B5-122, 5/F, AC1

Seminar 2: Network Topology and Communication Data Rate for Multi-agent Consensus

Prof. Lihua Xie
Professor and Head of Control and Instrumentation Division
School of Electrical and Electronic Engineering
Nanyang Technological University, Singapore

Date: February 24, 2014 (Monday)
Time: 11:00am – 12:00noon
Venue: Room B5-122, 5/F, AC1

Abstract (Seminar 1)

Unmanned autonomous systems have gained much attention in recent years in the academic and military communities worldwide. Objects like unmanned aircraft, underwater exploiters, satellites
and intelligent robotics are widely investigated as they have potential applications in the military and civilian domains. They are developed to be capable of working autonomously without human pilot. Challenge is that they need to deal with various situations arisen in much complicated and uncertain environment, such as unexpected obstacles, enemies attacking, device failures and lack of GPS measurement in urban and indoor environments. Control systems for the unmanned vehicles are required to integrate not only basic input-output control laws, but also high-level functionalities for decision making and task scheduling. Software systems for unmanned vehicles are required to perform tasks from hardware driving to the management of device operation, and from traditional input-output control law implementation to task scheduling and event disposal.

In this talk, we aim to highlight some recent research activities related to unmanned systems conducted by the National University of Singapore UAV Research Group. Emphases will be made on the development of micro aerial vehicles and unconventional aircraft, and the development of both indoor and outdoor unmanned aerial vehicles as well as their utilization for flight missions such as ground target tracking, and vision-based transportation.

About the Speaker (Seminar 1)

Ben M. Chen is a professor and director of Control, Intelligent Systems & Robotics Area, Department of Electrical and Computer Engineering, National University of Singapore (NUS), and the head of Control Science Group, NUS Temasek Laboratories. His current research interests are in systems and control, unmanned aerial systems, and financial market modeling. Dr. Chen is an IEEE Fellow. He is the author/co-author of 10 research monographs including Loop Transfer Recovery (Springer, 1993), H2 Optimal Control (Prentice Hall, 1995), Robust and H∞ Control (Springer, 2000), Hard Disk Drive Servo Systems (Springer, 1st Edition, 2002; 2nd Edition, 2006), Linear Systems Theory (Birkhäuser, 2004),
Abstract (Seminar 2)

Multi-agent cooperation involves a collection of decision-making components with limited processing, limited sensing and limited communications capabilities, all seeking to achieve a collective objective. Well known examples include mobile sensor networks for environment monitoring and surveillance and multi-UAV (unmanned aerial vehicle) formation flight. The distributed nature of information processing, sensing and actuation makes these applications a significant departure from the traditional centralized control system paradigm. In this lecture, we shall discuss the joint effects of agent dynamic, network topology and communication data rate on the consensusability of linear discrete-time multi-agent systems. Neglecting the finite data rate constraint, a necessary and sufficient condition for consensusability under a set of distributed control protocols is given which explicitly reveals how the intrinsic entropy rate of the agent dynamic and the communication graph affect consensusability. The result is established by solving a discrete-time simultaneous stabilization problem. Next, the consensus problem under a finite communication data rate is investigated. We shall present a systematic approach to the design of encoder, decoder and control protocol to achieve the exact consensus. Explicit data rates for exact consensus for some classes of multi-agent systems with output feedback are derived. The consensus convergence rate in relation to the bit rate, network synchronizability and the size of the network is established. We shall also present some demo on multi-UAV formation flight.
About the Speaker (Seminar 2)

Lihua Xie is a Professor and Head of Control and Instrumentation Division at the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore. His current research interests include networked control, multi-agent systems, sensor networks, distributed control and optimization with application to indoor positioning and localization, unmanned aerial vehicles, and energy efficient buildings. He is an editor of IET Book Series on Control, Editor-in-chief of Unmanned Systems, and an associate editor of IEEE Transactions on Control Systems Technology. He served as an associate editor of IEEE Transactions on Automatic Control, Automatica, IEEE Transactions on Circuit and Systems-II, etc, and a member of Board of Governors, IEEE Control Systems Society. He is a Fellow of IEEE, Fellow of IFAC and IEEE Distinguished Lecturer.

All are welcome!
Enquiry: 3442 8420