香港城市大學
City University of Hong Kong
混沌及複雜網絡研究中心
Centre for Chaos and Complex Networks

THE HONG KONG
POLYTECHNIC UNIVERSITY
Department of Electronic and Information Engrg.
香港理工大學 電子及資訊工程學系

IEEE Technical Co-sponsor: IEEE Hong Kong Section
Robotics and Automation/Control Systems Joint Chapter

Jointly presents

SEMINAR SERIES ON CHAOS, CONTROL AND COMPLEX NETWORKS

Synchronised Behaviour and Flocking

Dr. Michael Z. Q. Chen
Department of Engineering
University of Leicester, UK

Date and Time: Friday, 19 December 2008, 4:30pm – 5:30pm
Venue: Room **B**6605, City University of Hong Kong
Reception starts at 4:15pm
(Language: **English**)

Abstract

An important natural phenomenon surfaces that satisfactory synchronization of self-propelled particles can be achieved via sharply reduced communication cost, especially for high-density particle groups with low external noise. Numerical evidence illustrates that a highly efficient strategy is to distribute the communication messages as evenly as possible along the whole dynamic process since it minimizes the information redundancy. Although partial communication causes fairly little loss on the synchronization performance, it can help the particles aggregate into synchronized clusters.

By introducing a predictive mechanism with small-world connections, we also propose a new motion protocol for self-driven flocks. The small-world connections are implemented by randomly adding long-range interactions from the leader to a few distant agents, namely pseudo-leaders. These pseudo-leaders are able to predict the leader's motion several steps ahead and use this information in decision making towards coherent flocking with more stable formation. It is shown that drastic improvement can be achieved in terms of both the consensus performance and the communication cost. The conclusions are valid for both the attractive/repulsive swarm model and the Vicsek model.

About the Speaker

Michael Z. Q. Chen was born in Shanghai. He graduated from Nanyang Technological University, Singapore, in 2003 with a B.Eng. degree in Electrical and Electronic Engineering, and from Cambridge University in 2007 with a Ph.D. degree in Control Engineering. He is currently a Lecturer in the Department of Engineering at the University of Leicester, England. He is a Fellow of the Cambridge Philosophical Society, a Life Fellow of the Cambridge Overseas Trust, and a member of the IEEE. Since 2008, he has been an Associate Editor of the IES Journal B--Intelligent Devices & Systems and a reviewer of the IEEE Transactions on Circuits & Systems, Automatica, the International Journal of Adaptive Control & Signal Processing, and the Journal of Sound & Vibration, amongst others. His research interests include: passive network synthesis, vehicle suspensions, complex networks, and statistical mechanics.