

TRACK 3: UAV / NETWORK CENTRIC SYSTEM

“DESIGN AND EXPERIMENTS OF AUTONOMOUS FORMATION FLIGHT OF MULTIPLE UAVs”

BY

DR FANG LIAO, XIANGXU DONG, FENG LIN AND RODNEY TEO
TEMASEK LABORATORIES, NATIONAL UNIVERSITY OF SINGAPORE

ABSTRACT

In this paper, a unified feedback control strategy with inter-vehicle collision avoidance is proposed for formation and reconfiguration control of a team of UAVs with dynamic constraints. This strategy consists of distributed cascade feedback control of a team of UAVs and applies consensus concept to form and reconfigure formation flying. In the outer-loop of the cascade control, a potential-field based approach is used to generate a desired velocity for each UAV which makes sure that the team of UAVs can perform formation flying and reconfiguration as well as avoid inter-vehicle collision. In the inner-loop of the cascade control, the velocity of each UAV is designed to track its desired velocity generated by the outer-loop based on a common velocity platform subject to dynamic constraints. The proposed feedback control is robust against disturbances due to dynamic constraints and measurement noise. Formation simulation of fixed-wing UAVs and formation flight test of VTOL UAVs demonstrates the effectiveness and practicability of the proposed approach.

BIOGRAPHY OF SPEAKER



Dr Fang Liao received her B.Eng and M.Eng degree in Control and Navigation, both from Beijing University of Aeronautics and Astronautics, China, in 1992 and 1995, respectively, and Ph.D. degree from Nanyang Technological University, Singapore, in 2003. During 1995 to 1999, she was an Engineer in the Research Institute of Unmanned Air Vehicles at Beijing University of Aeronautics and Astronautics. From 2002 to 2004, she was a Research Associate and then Research Fellow in the School of Electrical and Electronic Engineering at Nanyang Technological University. Since 2004, she has been a Research Scientist in Temasek Laboratories at National University of Singapore. Her research interests include robust and adaptive control theories and application, fault tolerant control, cooperative control, multi-agent systems, constrained optimization methods.