

TRACK 2: UAV / AERODYNAMICS
“VISION-BASED UAV FORMATION CONTROL”

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ABSTRACT

Conventional Unmanned Aerial Vehicle (UAV) formation requires radio communication between the UAVs and the ground control station. However, noise and interruption in the communication links may result in severe consequences. In this paper, vision-based formation control is introduced to eliminate the problems mentioned earlier. Individual UAV with a camera on-board can detect its neighbouring UAVs by implementing the concept of the Histogram of Oriented Gradients (HOG) descriptors and cascade classifiers. Image processing such as removal of shadow is applied to improve the detection rates. Upon successful detection, the Leader-Follower formation theory is applied to allow the follower UAV to distinguish and follow the path of the leader UAV. Lastly, to control the movement of the UAVs, a flight controller is designed and implemented on Simulink, based on the formation control requirements.

BIOGRAPHY OF SPEAKER


Dr Sutthiphong Srigrarom “Spot” is currently working at University of Glasgow Singapore in partnership with Singapore Institute of Technology, as an associate professor in Aerospace Systems. Prior to this, he worked for the Boeing commercial airplane company in Seattle during his graduate study. Before joining UGS-SIT, Dr Spot was at Nanyang Technological University (NTU) and SIM University. He was a visiting professor at MIT, University of Toronto, National Cheng Kung University, Konkuk University and Kasetsart University. He is an associate editor of Journal of Unmanned Systems Technology. He has published approximately 40 journal and 30 conference papers (as of 2012). His research areas include: (1) Unsteady Aerodynamics, Flapping Wing MAV, (2) Bio-inspired Fluid Mechanics Flying/ Swimming studies, (3) Unmanned Aerial Vehicle/Micro Aerial Vehicle, (4) Vision-based Navigation, Swarming of UAVs (5) Rotary Wing Aerodynamics, Blade designs, (6) Wind/tidal turbine designs for renewable energy, (7) Fluid-Structure Interaction,

Aero-/Hydro-elasticity (8) Computational Fluid Dynamics and Finite Element Analyses applications for industrial/practical problems.