Time & Location: November 1, 2013 at 9:00 AM in Engineering 1 307C
Title: Cooperative Trajectory Planning for Networked Vehicles with Nonlinear Dynamics and State and Control Variable Constraints

With the recent trend for systems to be more and more autonomous, there is a growing need for cooperative trajectory planning. Applications that can be considered as a cooperative system such as surveying, formation flight, and traffic control need a method that can rapidly produce trajectories while considering all of the constraints on the system. Currently most of the existing methods to handle cooperative control are based around either simple dynamics or on the assumption that all vehicles have homogeneous properties. In reality, typical autonomous systems will have heterogeneous, nonlinear dynamics while also being subject to extreme constraints on certain state and control variables. In this thesis, a new approach to the cooperative control problem is presented based on the bio-inspired motion strategy known as local pursuit. In this framework, decision making about the group trajectory and formation are handled at a cooperative level while individual trajectory planning is considered in a local sense. An example is presented for a case of an autonomous farming system (e.g. scouting) utilizing nonlinear vehicles to cooperatively accomplish various farming task with minimal energy consumption or minimum time. The decision making and trajectory generation is handled very quickly while being able to consider changing environments laden with obstacles.

Major: Aerospace Engineering

Educational Career:
Bachelor's of Aerospace Engineering, BS, 2011, University of Central Florida

Committee in Charge:
Yunjun Xu, Chair, Mechanical & Aerospace Engineering
Kou-Chi Lin, Mechanical & Aerospace Engineering
Alain Kassab, Mechanical & Aerospace Engineering

Approved for distribution by Yunjun Xu, Committee Chair, on September 30, 2013.

The public is welcome to attend.