



SANTA CLARA UNIVERSITY

Department of Mechanical Engineering

Mechanical Engineering Seminar Series

Aircraft and Rotorcraft Flight Control Challenges: An overview of flight control research at the US Army Aviation Development Directorate at NASA Ames

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Date: Wednesday, February 15, 2017

Time: 4:00 – 5:00 pm

Location: Bannan Engineering, EC 326

Abstract

In this presentation, we will review the aeronautics and space related research projects that are currently being conducted in the Intelligent Systems Division at NASA Ames Research Center. In particular, we will highlight some of the technical challenges and present proposed solutions.

Ultra-efficient future commercial vehicles: Elastic wing shaping actuation in-flight has been proven to be effective in reducing induced drag and enhancing lift performance, and this can be achieved by actively controlling the local wing wash-out twist and wing bending. As a low drag distributed actuation concept, the design of Variable Camber Continuous Trailing Edge Flap (VCCTEF) system has been proposed, which consists of multiple aerodynamic control surfaces throughout the aeroelastic wing and provides active wing shaping control capability to gain aerodynamic efficiency. However, the actuation of VCCTEFs is constrained in both relative deflection and deflection rate.

Trajectory planning for Mars Aerocapture: One key aspect of future NASA large mass Mars mission or human Mars mission is the necessity of employing Aerocapture through deployable aerodynamic decelerator. All propulsive guided entry maneuver is not feasible, and the amount of propellant mass saved by Aerocapture can be significant, especially for landing large-scale payload on Mars. The Adaptable Deployable Entry and Placement Technology (ADEPT) is a novel planetary entry vehicle concept, which utilizes a mechanically deployable aeroshell that can be used as drag generating decelerator as well as thermal protection system. The challenge is to develop a lift-guided control system by utilizing ADEPT aeroshell as a controllable effector.

Biography

Sean Swei is a research scientist at NASA Ames Research Center (ARC). He is currently a Principal Investigator of the ARMD Convergent Aeronautics Solutions Project entitled: "Mission Adaptive Digital Composite Aerostructure Technologies (or MADCAT)." In this capacity, he has led a team of researchers to develop an advanced aerostructure system to demonstrate the feasibility of the digital wing concept. Sean has also designed the spacecraft attitude control systems for LADEE (Lunar Atmosphere and Dust Environment Explorer) and led the guidance and control concept development for the ADEPT (Adaptable Deployable Entry & Placement Technology) planetary entry vehicle. Sean had worked in both industry and academia prior to joining NASA ARC in 2000. Sean has received Ph.D. in Aeronautics & Astronautics from Purdue University. His research interests are in the general area of modeling and controls of aircraft/spacecraft systems.