UNIVERSITY of HOUSTON
CULLEN COLLEGE of ENGINEERING
Department of Electrical & Computer Engineering

MS Thesis Announcement

FEEDBACK CONTROL OF CUBESAT FOR ATTITUDE AND TRAJECTORY CORRECTIONS

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Place: ECE Small conference room

Time: 10:00 am

Committee Chair: Dr. Earl J. Charlson

Committee Members:
Dr. Robert Provence
Dr. Matthew Franchek

In order to analyze the performance of Cube Satellites with regards to orbit maintenance and attitude maneuvers, a three unit (3U) CubeSat with a mass of four kilograms in six degrees of freedom, is studied and modeled in this research. With a major constraint on their mass and volume, thrusting in small satellites is a limited operational resource. An error in the thrust vector can propagate to a large error in the attitude or trajectory over time. Six degree of freedom rigid body dynamics is implemented using unit quaternion based torque induced roll-pitch-yaw motion. A single thruster is included along the roll axis. A thrust error is simulated and its effects on the satellites trajectory and attitude are observed over one orbit. Spherical harmonic gravity is implemented to account for the gravitational disturbances in the two body model. Attitude correction is achieved using quaternion feedback control while trajectory corrections are attained using nonlinear state feedback control with backstepping technique. Stability analysis is done using Lyapunov's second method to assure global asymptotic stability. Numerical simulations are conducted to demonstrate the attitude and trajectory corrections of the CubeSat using above control strategies.