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ASTRODYNAMICS SYMPOSIUM (C1)
Attitude Dynamics - Part 1 (5)

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SWITCHED ATTITUDE CONTROL OF AN UNDERACTUATED RIGID SATELLITE

Abstract

When a three- axis stabilized rigid satellite loses one of its three principal control torque inputs due to hardware failure, the underactuated satellite has stability and controllability constraints. This phenomenon occurs when there are limited resources (cost, power, mass and size) to accommodate redundant units during the integration of the satellite. The satellite attitude is represented using quaternion parameters to allow for easy on-board computation. We present a comparison of attitude control performance between a time varying control law and a discontinuous control law using two control torques from reaction wheels, following an actuator failure. The control law is based on the concept of angular velocity tracking of a desired angular velocity. A new controller is then proposed and combines ideas of discontinuous and time varying control. In this paper, Lyapunov analysis is used to prove asymptotic stability and numerical simulations are used to demonstrate three- axis stabilization capability with good performance.