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ATTITUDE CONTROL AND DETERMINATION ACCURACY STUDY OF SMALL SATELLITE
WITH LIMITED SET OF SENSORS

Abstract

The problem of a small satellite Attitude Determination and Control System development is considered. The first task of the system is the attitude determination. Decent attitude estimation accuracy is required although only magnetometer and angular velocity sensor are available. Both sensors have high values of noise and changing bias. The extended Kalman Filter is utilized to estimate both the satellite attitude motion and sensors biases. The dynamical noises matrix should be estimated prior to the filter implementation. This is performed with the numerical simulations including disturbance source unaccounted for in the filter satellite motion model.

The problem of active attitude control achieving both inertial and orbital frames stabilization is considered. Magnetorquers and reaction wheels are used to implement the Lyapunov feedback control. The results of the study for specific satellite parameters are presented in the paper.