Real-time sun-sensor/magnetometer calibration algorithm for micro-satellite

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Abstract: A real-time on-orbit attitude-independent calibration algorithm for sun-sensor/magnetometer is proposed. In the existing calibration algorithm, only the norm of the geomagnetic field is used as the measurement. In this paper the dot production between the magnetic vector and the sun vector is introduced as another measurement, so that the system observability is reinforced, and it also enables the real-time calibration of the sun-sensor. Although extended Kalman filter (EKF) is widely used, its linearization process introduces some errors into the system. Unscented Kalmam filter (UKF) is a non-linear filter which needn't the linearization process. Calibration algorithm using EKF and UKF are researched in this paper. Simulation results show that the proposed algorithm is effective. For example, in the magnetometer bias calibration, the accuracy of UKF is 26% higher than that of EKF.

Author Keywords: Attitude determination; Calibration; Kalman filter; Micro-satellite; Unscented transform

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