

UNSCENTED KALMAN FILTER BASED ATTITUDE ESTIMATION USING MAGNETOMETER AND SUN SENSOR AIDED MEMS GYROS

Jiljo K. Moncy
Scientist/Engineer
Vikram Sarabhai Space Center (VSSC)
Indian Space Research Organisation (ISRO)
Thiruvananthapuram-695 022, India
Email : jiljo@vssc.gov.in

Kesavabrahmaji Karuturi
Scientist/Engineer
ISRO Inertial Systems Unit
Vikram Sarabhai Space Center (VSSC)
Thiruvananthapuram-695 013, India
Email : kesavabrahmaji@vssc.gov.in

Abstract

The estimation of attitude of small spacecraft, limited by space and power, is achieved by using rate class MEMS gyros. Considerable drift in these sensors limits the use of inertial algorithms. Secondary sensors need to be used for the real time estimation of the drift. This paper proposes an algorithm based on Unscented Kalman Filter (UKF) which utilizes three axis magnetometer and sun sensor as secondary sensors and performs data fusion on to the gyro measurements. A 7-state UKF is used for the purpose. The paper discusses the detailed derivation of the algorithm, and the sensor models. Reference models for magnetometer and sun sensor is also included. Ability of the algorithm to cater to the effects of solar eclipse and sensor data loss for short duration are also studied.