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Author: Ms. Jiaqi Liu
Beihang University (BUAA), China

Prof. Xiucong Sun
Beihang University, China
Mr. Yang Li
Beihang University, China
Prof. Ming Xu
School of Astronautics, Beihang University, China

# PERFORMANCE ASSESSMENT FOR AUTONOMOUS ORBIT DETERMINATION OF GEO SPACECRAFT USING INTERSATELLITE MEASUREMENTS

**Abstract**

This paper uses relative position vector measurements to study the autonomous navigation method of satellites in the Geostationary Earth Orbit (GEO). Commonly employed navigation methods face limitations when applied to GEO satellites, primarily due to the sparse and weak nature of Global Positioning System (GPS) signals. The navigation method described in the paper achieves high-precision autonomous orbit determination without ground support. Autonomous crosslink radiometric navigation has emerged as a prominent method, owing to its simplicity and the maturity of existing technology. In this study, two satellites in GEO are utilized for relative position vector measurements using the Cubature Kalman Filter (CKF) navigation algorithm, allowing autonomous determination of the orbit of two satellites simultaneously. A detailed analysis of measurement errors was conducted, and the measurement errors were fused. Additionally, an evaluation of the observability of the navigation system was performed. The simulation compared the relative position vector measurements method with the relative Line of Sight (LOS) measurements only and the combination of relative position vector measurements with Global Navigation Satellite System (GNSS) navigation and studied the impact of the orbital configuration of the two satellites on navigation accuracy. Lastly, the algorithm's performance is assessed using the Root Mean Square Error (RMSE) index, the results indicate that the absolute positions of the satellites can be estimated with an accuracy on the order of hundreds of meters.