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THE USE OF STELLAR ABERRATION EFFECT FOR AIDING NAVIGATION OF SATELLITES IN
CONSTELLATIONS

Abstract

Stellar aberration, which causes the change of the apparent direction to a star, has been studied in great detail, both observationally and theoretically. In the paper, with the high-precision optical sensor, an autonomous navigation technique based on stellar aberration effect is studied. A new method based on pseudo-range observations from inter-satellite links together with the direction of observed stars is proposed to determine satellite orbits in the constellation. With the help of the balanced extended Kalman filter (BEKF), the position and velocity vectors of satellites can be estimated according to the measurements and orbit perturbation equations. A high performance of the method is illustrated through Monte-Carlo simulations in comparison with the traditional method based on pseudo-range observations. Final simulation results show that the navigation precision is better than 100m.