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RESEARCH ON AUTONOMOUS ORBIT DETERMINATION FOR BEIDOU-3 BASED ON THE
PURE INTER-SATELLITE LINK USING THE EXTENDED KALMAN FILTER AND A METHOD
FOR REDUCING CONSTELLATION ROTATION ERROR

Abstract

The BeiDou navigation satellite system (BDS) provides precise positioning services globally, this ability is based on the precise orbit determination (POD) of the constellation. The traditional POD method uses data tracked by ground stations, which is significantly affected by the atmosphere and the distribution of stations. The POD using inter-satellite link (ISL) data can avoid these shortcomings and realize autonomous orbit determination (AOD). In this paper, we use purely ISL data to realize AOD for BDS using the Extended Kalman Filter (EKF). The results show that onboard computers can efficiently maintain the relatively high-precision ephemerides of the BDS by executing the AOD procedure to process onboard data without assistance from ground facilities. In addition, the results of AOD for BDS using purely ISL data are influenced by the rotation error of the constellation significantly because of the geometric rotational symmetry, we propose a method to predict the rotational angles of the constellation and reduce position error.