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STAR NAVIGATION BASED ATTITUDE CORRECTION ACCURACY ANALYTICAL ANALYSIS AND SIMULATION FOR SPACECRAFT

Abstract

Star sensor is a high accuracy instrument for spacecraft attitude determination by star observation. Star navigation has the advantage of high accuracy attitude and strong anti-interference, while inertial navigation is a good covert autonomous navigation method, can output high integration navigation information continually, but its error grows without bound with time. The inertial/star integrated navigation system, which is based on star sensor and inertial measurement unit (IMU), fully takes the advantages f both navigation systems. The star sensor is an important part of spacecraft's autonomous navigation equipment. In order to satisfy the demand of navigation for spacecraft, the attitude correction technology based on star navigation is researched in this paper. And the analytical model of the relationship between strapdown inertial navigation system (SINS) attitude and star sensor attitude is developed. Furthermore, attitude correction accuracy of the integrated navigation is analyzed, and the attitude correction accuracy limit is discussed. Finally simulation tests are performed, and the results demonstrate to the feasibility and effectiveness of the analytical analysis conclusions. The analytical analysis conclusions can be used as the theoretical basis and reference for the spacecraft navigation system design and optimization.