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THE STATION KEEPING DEAD-BAND BUDGETS AND ANALYSIS FOR GNSS CONSTELLATION

Abstract

Since the stability and continuity on the service performance for GNSS Constellation are affected by the configuration maintenance process, the satellites are maintained to run at the neighborhood of the nominal position and required to be controlled only when the satellites run beyond some range. Therefore, according to the specific mission requirements, it is necessary to determine the most allowable drifting range, which is also called as the station keeping dead-band of the constellation.

The station keeping dead-band is defined as the representation parameters of the allowable drift of RAAN (the right ascension of the ascending node) and argument of latitude. Main strengths are focused in this paper on Station Keeping Dead-Band Budgets and Analysis for the GNSS constellation, two methods to calculate the allowable drift for Walker- navigation constellation are proposed with taking into consideration of the coverage, navigation performance and collision relief requirements. The dead band budgets and Analysis for a typical constellation are presented to conclude the methods.

For typical constellation with configuration of Walker 24/3/1 composed of three orbital planes separated 120 degrees on RAAN, an inclination of 55 degrees, and a semi-major axis 27906km. Under the situation with the minimum coverage index of 6 and minimal elevation of 5 degrees, research results indicate that the most allowable drifts for RAAN is 3.0 degrees and the allowable displacements for argument of latitude is 5.0 degrees.

Key Words: GNSS; Constellation Stability; Configuration Maintenance; the Most Allowable Drifting Range; the Dead Band