

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Space-Based Navigation Systems and Services (3)

Author: Dr. SUN Shouming

State Key Laboratory of Astronautic Dynamics, China, ssming2000@163.com

Dr. Li HengNian

State Key Laboratory of Astronautic Dynamics (ADL), affiliated to Xi'an Satellite Control Center, Xi'an, China, henry_xsc@yaho.com.cn

Mr. Zhang Zhibin

State Key Laboratory of Astronautic Dynamics, Xi'an Satellite Control Center, China, pu32208@yahoo.com.cn

CONFIGURATION KEEPING OPTIMIZATION OF COMPASS CONSTELLATION IGSO
SATELLITES

Abstract

Compass regional navigation system is consist of 5 GEO satellites, 5 IGSO satellites and 4 MEO satellites. Longitude of ascending node of 3 IGSO orbital plane differ 120 degree and the ground tracks of IGSO satellites are repetitious, which is the firstly applied all over the world, so anyone fault will affect the compass constellation navigation service. The configuration keeping consumed time of IGSO satellite is not less than 12 hours usually, between the configuration keeping window and with consider of the effect of IGSO satellite configuration keeping on the user service, when the orbital control is carried out is an important problem which must be well solved. When sun and the orbital plane of IGSO satellite are coplanar, IGSO satellite turns into earth shade mode and the period of which is about 180 days. When the elevation angle of sun less than 4 degree, yaw angle of IGSO satellite is zero degree and which will last for 10 days around. In order to make the best use of thrust and avoid the attitude adjust control danger, configuration keeping of IGSO satellite is carried out during the earth shade. In this paper, between the configuration keeping window, the navigation error and navigation service availability were taken into account, compass regional navigation system performance is selected as the index function, the lowest limit navigation requirement is considered and which is modeled as constrained term, then a control time optimization method of compass constellation IGSO satellite was proposed and the effect of configuration keeping consumed time on navigation performance was analyzed. Results show that, with the increase of configuration keeping consumed time, the navigation performance of compass region navigation constellation deteriorates gradually. Contrast with the instance that satellite IGSO-03 provides navigation service, based on the new configuration keeping optimization method, CV drops 0.66% and PDOP deteriorates 0.07 with configuration keeping consumed 12 hours, so the effect of IGSO satellite configuration keeping on the user service is reduced, and the regional navigation precision of compass constellation is guaranteed. The new method is a universal means, which not only can be used in compass region navigation system but also can be applied in the global navigation system.