

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
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AUTONOMOUS INTEGRATED NAVIGATION USING X-RAY PULSARS AND ASTEROIDS

Abstract

To improve the navigation performance for the spacecraft during interplanetary cruise, a novel integrated navigation system is proposed. For X-ray pulsar navigation (XNAV) is a hot and promising research subject, and the optical navigation using asteroids is practical in the space engineering, we designed an autonomous navigation system using one X-ray detector and one navigation camera. The measurement models of the XNAV based on the time difference of arrival, and the optical navigation based on the images of asteroids, are presented. To enhance practicality, the X-ray pulsars and the asteroids are observed by turns. The batch least square filter, used by Deep Space I, is adopted to estimate the system state. The numerical simulation results show that the integrated navigation is feasible on the interplanetary cruise orbit. Moreover, compared with the XNAV and the optical navigation, the integrated navigation system can provide higher navigation performance.