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SPACE DEBRIS OBSERVATION PERFORMANCE RESEARCH OF OPTICAL SATELLITE
CONSTELLATION

Abstract

The number of space debris is increasing rapidly, posing a major threat to human space activities and the safety of space assets. Efficient observation and orbital cataloging of space debris is a necessary prerequisite for space collision avoidance and is particularly important for maintaining the safety of space assets. We established a design model of space debris observation satellite constellation, designed an optimization algorithm of satellite constellation configuration, and optimized the best constellation configuration suitable for LEO space debris observation. And designed the space-based optical satellite constellation tracking observation optimization scheduling algorithm, which can realize the optimization scheduling of single satellite and multiple satellite tracking observation. Realize multi-satellite coordination and cooperation, avoid inefficient repeated observations, make full use of observation equipment resources, maximize the coverage of observation targets, increase the number of observation targets and observation frequency, obtain high-precision orbit data of space debris, improve orbit data accuracy and orbit data update frequency, Realize the orbital cataloging of space debris. Through the design and optimization, the optical satellite constellation composed of more than 20 satellites is obtained. Under the optimized observation strategy scheduling, more than 93% of the cataloged LEO space debris can be tracked and observed every 24 hours, and the high-precision orbit data of space debris can be obtained, so as to realize the orbit cataloging of most LEO targets. In addition, it can realize the pre perception of dangerous collision, carry out emergency response for high-risk collision, timely adjust the observation strategy, conduct multi satellites relay tracking observation for high-risk targets, greatly reduce the collision false alarm rate, provide observation data support for space collision avoidance and obtain more satellite operation time.