IAF SPACE OPERATIONS SYMPOSIUM (B6)
New Space Operations Concepts and Advanced Systems (2)

Author: Dr. Biao Xu
Nanjing University of Aeronautics and Astronautics, China, bxu@nuaa.edu.cn

MISSION SCHEDULING FOR MULTIPLE SPACECRAFT REFUELING BASED ON SPACE FUEL STATIONS

Abstract

With the rapid development of space technology, the demand for space transportation system becomes larger and more various. Refueling on-orbit has been a new and independent developing topic in order to reduce the launch costs, mitigate space debris and improve the payload of launch vehicle. In this paper, the proposed approach focuses on generating optimal trajectories and schedules for refueling constellations of refueling spacecraft. An on orbit reusable refueling policy and its mission scheduling for multiple spacecraft in circular through a space fuel station is presented. In order to establish the scheduling model for the on-orbit refueling of multiple circular spacecraft orbit through a space fuel station, the relationship between the velocity change and orbital elements for transferring of service spacecraft is firstly obtained based on the analysis of the problem of two impulses orbital maneuver. A multi-objective optimization model for mission scheduling of on-orbit refueling for multiple spacecraft in circular orbits is developed to optimize both the sequence and time distribution of the refueling mission, and a specifically design algorithm is employed to search the solutions to the multi-objective optimization problem. Numerical simulations of scheduling a mission of on-orbit refueling in circular orbits are performed to verify the effectiveness of the proposed approach.