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HUMAN SPACEFLIGHT SYMPOSIUM (B3)
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MISSION PLANNING WITH MULTIPLE CONSTRAINTS FOR OPTICAL MODULE SPACECRAFT OF CHINA SPACE STATION PROJECT

Abstract

China' optical module spacecraft is scheduled to be launched into orbit in 2022 or so. As a part of the China's space station project, the optical module spacecraft will co-orbit fly with the space station. When the optical module spacecraft need to be refuelled, repaired, or upgraded, it can rendezvous docking with the space station. The optical module spacecraft can fly on oribt for 10 years.

The payloads of optical module spacecraft comprise of a 2m-diameter main optical system, multiple rear-end functional modules, as well as the relevant on-orbit testing support and ground application system. It is expected to carry out astronomical observations in respect of large sky area, high-resolution, multicolor imaging and seamless spectrum-depth space touring, meanwhile also has function of conducting new experiments of earth remote sensing technology.

As the optical payloads are very sensitive, many constraints have to be consided when the astronomical observations and earth observations are performed. There are totally 19 constraints for earth observations recognized now, where 13 constraints belong to the numerial ones while 6 constraints belong to Boolean ones. A extendable general numerial constraints computing methed is proposed to solve the mission planning problem of earth observations with multiple numerial contraints. Using this general method, the 13 numerial constraints are consided when mission planning is conducted for optical module spacecraft of earth observation, such as distance between the spacecraft and the ground station, altitude of the spacecraft, angel between the payload boresight and sun, and so on. Also, the method is extendable to adapt to the future new numerial constraints which are not recognized now. Furthermore, the multiple boolean constraints must be considered for the mission planning as well as the numerial constraints, such as South Atlantic Anomaly (SAA) constraint, planet constraint, earth shadom constraint, and so on. With the multiple numerial constraints as well as multiple boolean constraints considered, the mission planning for optical module spacecraft can be conducted correctly and the observation time windows and object areas can be determined in advance.