

Optimal Peer-to-Peer On-Orbit Refueling Mission Planning with Complex Constraints

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Abstract : On-Orbit Refueling is of great significance in extending space crafts' lifetime. The problem of minimum-fuel, time-fixed, Peer-to-Peer On-Orbit Refueling mission planning is addressed here with the particular aim of assigning fuel-insufficient satellites to the fuel-sufficient satellites and optimizing each rendezvous trajectory. Constraints including perturbation, communication link, sun illumination, hold points for different rendezvous phases, and sensor switching are considered. A planning model has established as well as a two-level solution method. The upper level deals with target assignment based on fuel equilibrium criterion, while the lower level solves constrained trajectory optimization using special maneuver strategies. Simulations show that the developed method could effectively resolve the Peer-to-Peer On-Orbit Refueling mission planning problem and deal with complex constraints.

Keywords : mission planning, orbital rendezvous, on-orbit refueling, space mission

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