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HUMAN EXPLORATION OF THE SOLAR SYSTEM SYMPOSIUM (A5)
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MULTI-OBJECTIVE DETECTION TRAJECTORY OPTIMIZATION DESIGN IN SOLAR SYSTEM

Abstract

In order to fully understand the solar system, the eight planets including MarsJupiter and Jupiter's satellite system in solar system are selected as the primal scientific mission goals, while the asteroids and comets are selected as secondary scientific mission goals. In this paper, combine the low trust propulsion and gravity assist technique to design the multi-objective detection trajectory in solar system. In order to solve the difficulty of initial guesses in low trust trajectory design problem, the whole process is divided into three steps: First of all, the multi-objective detection trajectory design problem is considered as the MGA-1DSM trajectory design problem; then the analysis model of the low trust trajectory combined the gravity assist maneuvering is established, the solution of the MGA-1DSM problem used as the initial guess for the analysis model of the low trust trajectory combined the gravity assist maneuvering; Last of all, use the solution of the analysis model as the initial value for the numerical method to solve the low trust trajectory optimization problem. Taking the multi-objective detection in 2020-2025 year as an example, get the results of the multi-objective detection trajectory detecting several giant planets, Jupiter's satellite system and asteroids in solar system. For the case of giant planets and Jupiter's satellite, the detection mode includes two ways: rendezvous and flyby, while the asteriods' detection mode only including close flyby. Numerical simulation results show that this algorithm has good versatility and application reference value for the multi-objective detection trajectory optimization design in solar system.