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DESIGN AND OPTIMIZATION OF LARGE-SCALE MANEUVER FLIGHT MISSION PROFILE ON THE LUNAR SURFACE

Abstract

Aiming at the future manned exploration mission of large-scale maneuvering on the moon, a mission mode of 1000 km round-trip flight is presented in this paper. The flight path profile is designed. Based on the Ziolkovsky Rocket Formula, the equation of motion of the spacecraft flying in large range and low altitude is established, considering the mass, thrust and overload limits of the spacecraft. Through the design of computer simulation target practice of different thrust, horizontal flight speed and required propellant quality, the best combination of thrust and horizontal flight speed under the minimum propellant consumption is obtained. Using iSIGHT software and Adaptive Simulated Annealing (ASA) algorithm,the global optimal solution of minimum propellant consumption under the same conditions is obtained too.The results show that the optimal solution of the target practice are consistent with the solution of the optimization algorithm. The error is only 0.058%, which verifies the accuracy of the results.This paper obtains the design data of large-scale maneuvering mission profile in the range of 1000 km on the lunar surface.