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DESIGN OF RETROGRADE ASTEROID IMPACT ORBIT BY MULTIPLE GRAVITY ASSIST MANEUVERS

Abstract

The deflection of potentially dangerous asteroids has garnered significant attentions. Among all kinds of deflection technologies, the kinetic impact technology has emerged as the most feasible option at present. A retrograde kinetic impact strategy is proposed in this study due to its advantage of providing a greater relative impact velocity. Multiple gravity assist maneuvers are applied to shorten the transfer time. Firstly, Ra-Rp diagram is used to obtain the preset the gravity assist sequence, and the retrograde impact orbit is constructed by increasing the orbital inclination of the spacecraft through Jupiter gravity assist and Earth resonance gravity assist. To increase the efficiency of travel to Jupiter during the Earth escape phase, the spacecraft utilizes the lunar gravity assist to increase the payload mass into the target orbit. Finally, the genetic algorithm is applied to optimize the overall trajectory. Numerical simulations verify the efficacy of the proposed method.