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ORBIT SIMULATION AND TRAJECTORY OPTIMIZATION OF IMPULSE THRUST SPACECRAFT AND NEAR-EARTH ASTEROID RENDEZVOUS

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Among the near-Earth objects (NEOs) that have been discovered so far, most of them are near-Earth asteroids, with more than 20,000. Because the small near-Earth asteroids are close to the earth, even with the protection of the moon, the earth may still be collided. At present, one of the simplest methods to deal with the possible future asteroid impact crisis is to use a projectile (spacecraft) to strike. This method can theoretically deflect the asteroid and make it yaw. It needs to detect the crisis in the shortest time and respond effectively. Therefore, it is necessary to directly launch the spacecraft into space and rendezvous with the asteroid by means of impulse thrust. Relieving the threat of asteroids by impact requires making the impactor as large as possible and the speed as fast as possible. That is, the dry weight of the spacecraft to be launched is required to be large, and the rendezvous speed is large. Assuming that the impact position has been calculated in advance, the impact direction is selected as the velocity direction of the spacecraft. In this paper, we will select the known near-Earth asteroids for orbit rendezvous, and optimize the trajectory of spacecraft by multi-objective trajectory optimization method. The optimization targets are selected as the maximum dry weight of the spacecraft and the maximum rendezvous speed. The optimization method is proposed to use the NSGA-II algorithm.