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TARGETS SELECTION METHOD FOR MULTI-OBJECTIVE ASTEROIDS EXPLORATION MISSION

Abstract

As a type of important target in deep space exploration, asteroids are expected to be explored frequent in future years. To make the asteroids exploration mission more efficient, there are lots of plans to explore more than one asteroids in one mission, which is called multi-objective asteroids exploration mission. This paper proposes a method to select target asteroids for multi-objective asteroids exploration mission by searching and filtrating the database. At first, the constraints of the orbit characteristics and physical properties of asteroids are put forward considering the constraints of the exploration mission, such as the carrying capacity of the rockets and the mission period, and 34 asteroids that satisfy these constraints are selected preliminary based on the data from Minor Planet Center (MPC). Then according to the asteroids ephemeris, we found 26 groups of asteroids are acquired in which both asteroids are at perigee in a time scale of one year, in that case two asteroids in each group could be explored in one mission. Among these 26 groups of asteroids, 4 groups are finally selected which include at least one carbon type asteroid, the most valuable scientific target. The transfer orbits of the asteroids exploration missions are designed and the velocity increment of each group is optimized, indicating the rationality and correctness of the method. Then the priority of 4 groups is ranked according to total velocity increment. The results finally gave out a list of groups consist of two asteroids that can be explored in one mission. The paper also proved the feasibility of exploring two asteroids at one time, and it can provide some theoretical support and technical references for multi-objective asteroids exploration mission. Keywords: asteroids exploration; multi-objective; target selection; Lambert problem