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MULTIOBJECTIVE TRAJECTORY OPTIMIZATION OF SOLAR SAIL SPACECRAFT

Abstract

The trajectory optimization problem of the solar sail spacecraft between coplanar orbits is considered. The optimized objective is to minimize the transfer time; meanwhile, two constraint conditions on orbital radius and radial velocity at the final time should be satisfied. In this paper, we propose a novel algorithm for solving the trajectory optimization problem of solar sail spacecraft using multiobjective evolutionary algorithm. The proposed multiobjective evolutionary algorithm is called nondominated sorting Big Bang-Big Crunch algorithm (NSBBBC). The algorithm combines the concept of nondominated sorting with the improved Big Bang-Big Crunch (BBBC) method. A threshold comparison strategy is adopted to overcome the limitations of the original BBBC. Simulation results of optimal trajectory transferring from the geosynchronous orbit to the Mars orbit show that the trajectory optimization problem of solar sail spacecraft with constraints can be solved well by NSBBBC.