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NON-COPLANAR LEO-LEO AEROCRUISE ORBITAL TRANSFER TRAJECTORY OPTIMIZATION

Abstract

For orbital change modes on space, the use of atmospheric forces to produce an orbital plane change requires less energy than a pure exoatmospheric propulsion maneuver. Aeroassisted orbit transfer mainly includes three typical modes: aeroglide, aerocruise and aerobang. The aerocruise maneuver is commonly thought to be the fuel-optimal solution to a maneuver flown at a constant heating rate. It is a complicated multi-phase trajectory optimization problem for designing non-coplanar aerocruise orbital transfer trajectory. An improved direct collocation numerical optimization method is studied in this paper. The numerical optimization precision is enhanced by introducing a gridding auto-subdivision algorithm. Non-coplanar LEO-LEO aerocruise orbital transfer trajectory optimization is solving using this improved direct collocation method. The smooth flight trajectory satisfying heating rate constraints and overload constraints is obtained and analyzed.