Near-Optimal Finite-Thrust Orbital Control Near A Binary Asteroid System

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Abstract. Taking 66391 Moshup as an example, this paper applies bilinear tangent guidance (BLT) law, an optimal control traditionally used in a planar gravitational field for constant-thrust launch vehicles, to the irregular gravitational field near a binary asteroid system. A predictor-corrector algorithm using BLT is designed, based on which finite thrust transfers are devised between different libration point orbits. Through several Monte-Carlo simulations, the performance of BLT predictor-corrector algorithm is quantified and analyzed. The control scheme's fuel efficiency and robustness in accuracy and computation are then investigated and discussed. For example, a 2,360 kg spacecraft with a 236mN thruster performed some aggressive coplanar and non-coplanar maneuvers and orbital transfers with large energy gaps. Finally, the BLT predictor-corrector algorithm's robustness and capability near binary systems are verified and its further utilization is prospected.

Keywords: Restricted Three-body Problem, Binary Asteroid System, Libration Point Orbits, Bilinear Tangent Guidance, Finite Thrust.

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