Evaluation of stable periodic orbits about non-spherical objects

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Planetoids in our solar system are non-spherical with non-uniform mass distribution and nonhomogeneous density. While an approximation of the trajectory and nonlinear dynamics for a small satellite about an arbitrary object-of-interest is generally understood, the optimal thrust required to transfer between stable, periodic and/or quasi-periodic orbit solutions is not well established. This research primarily focuses on the development and validation of hybrid orbit propagator based on State Transitions Matrices, Gauss Variation of Parameters, and MacCullagh's approximation. An extended effort to solve for periodic orbits is completed. This work preludes a constrained minimization problem to discover optimal thrust control inputs and state vector uncertainties for small satellite trajectory transfers about non spherical planetoids, given a closed set of periodic orbits.

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