Period-Multiplying Bifurcations in the Gravitational Field of Asteroids

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Motivation

Periodic orbit families around asteroids provide candidates for efficient spacecraft trajectory design

More such families can be computed as period-multiplying bifurcations

Existing algorithms for computing period-multiplying bifurcations do not provide solutions in asteroid environments

Objectives

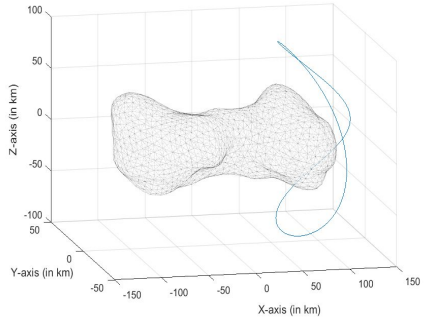
Suggest a computational approach to compute higher period orbits

Methodology

Locate bifurcations and perform numerical continuation to compute further family members

Shooting method (with higher order 8/9 RK integration) to compute periodic orbit families around asteroids (works for low periods)

Legendre-Gauss Collocation method to compute the period-multiplying branches (needed for continuation for higher periods)

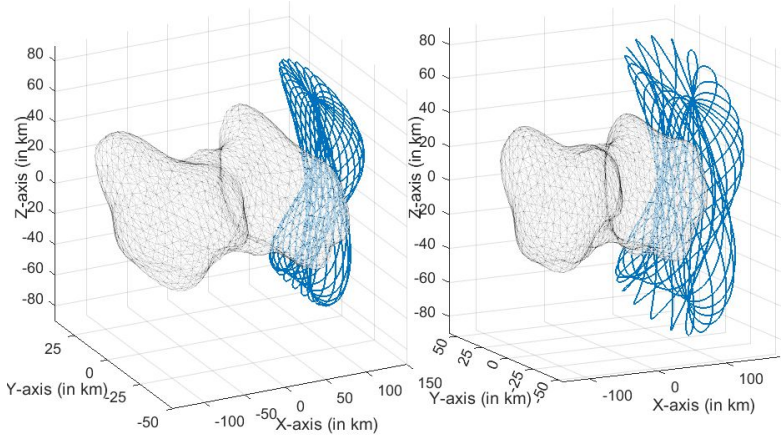


Results

(left) periodic orbit with time period of the order of rotation of asteroid

(down) higher period orbits computed as bifurcation

Note the extent of coverage of the high period orbit



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