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# IMPACT OF SOLAR RADIATION PRESSURE MODELLING ON ORBITAL DYNAMICS IN THE VICINITY OF BINARY ASTEROIDS

**Abstract**

Missions to asteroids are an important part of space exploration. Some well-known missions include NEAR Shoemaker (orbited asteroid Eros in 2000), Hayabusa (landed on asteroid Itokawa in 2005), Hayabusa 2 (planned to arrive at asteroid 1999 JU3 in 2018) and OSIRIS-Rex (planned to rendezvous with asteroid Bennu in 2018). Approximately 16 % of the Near-Earth Asteroids (NEA) are known to be binary asteroids, making them a non-negligible part of the NEA. A mission to the system Didymos 65803 binary asteroid system is planned to be launched in 2020.

Since the primary bodies of these binary systems have small masses, perturbations like the Solar Radiation Pressure (SRP) or the shape of the primary bodies have a great influence on the dynamics of a spacecraft in their vicinity. Most of the actual research is made using highly accurate models of the primary bodies, while low fidelity models of the SRP are used.

Previous studies have shown that it is possible to design closed form trajectories in the context of the Circular Restricted Three Body Problem (CRTBP), considering higher order gravitational potential of the primary bodies as well as the SRP. This paper shows that the orbital motion is affected by the change in the reflectivity and absorptivity values of a spacecraft and by the choice of the SRP model used (cannonball vs flat plate, for example). The present study focusses on this particular aspect by determining how different types of orbits available in the CRTBP are affected by variations of the type of model and parameters used to represent the SRP. This study contributes to the field of spacecraft dynamics about binary asteroids by:

- Providing information on different trajectories available and how they change when the model and parameters used for the SRP are modified;
- Providing attitude profile strategies, so that the SRP can contribute to the choice of possible trajectories.

The contributions made by this study will give greater confidence to the trajectory designers in the context of a binary asteroid system by giving a choice of possible trajectories and how they evolve based on variations of the SRP parameters and model used. It completes the knowledge of the dynamics in the vicinity of binary asteroid systems gained by high fidelity models of their primary bodies.