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An Assessment on Binary Asteroid Deflections

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In the last two decades, studies related to missions to asteroids has gained much attention in the space research community. Among different reasons for that, which range from scientific to economic interests, the collision of a Near-Earth Asteroid (NEA) to the Earth, considered the main interplanetary threat to life on Earth, has increasingly aroused interest. In this decade, NASA should launch the DART spacecraft to the Dydimos binary asteroid, in order to test a kinect impactor and to estimate effects for future deflection strategies. There are many different strategy proposals for asteroid deflections in addition to this deflection approach. Following the kinect impactor, the one considered in a more readiness technological status is the gravity-tractor. This deflection approach consists in the use of a massive spacecraft inertially hovering about an asteroid to produce, through the gravitational interaction between both, a deviation in the heliocentric orbit of the later. Among all known asteroids, it is estimated that the binary asteroids make up to 15% of the total. Although many studies considering deflections strategies are found in the literature, none of them, as far as we know, concentrates in studying the effects of these options applied to such a large asteroid population of binaries. In this work, we plan to study the dynamics when placing a gravity-tractor spacecraft in a binary asteroid system, as well as the effects of a kinect impact in one of the binary's bodies. This is done by applying Two and Three-Body Problems composed by the binary and the massive spacecraft. For a first approximation we consider that both bodies are ellipsoids and study the coupled effects of the gravitational and attitude dynamics [1].

Comments:

Preference for oral presentation, but no restriction to poster. If the student competition applies for PhD candidates, we would like to participate.

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