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INVARIANT STRUCTURES RELATED TO LONG TERM CONFINEMENT OF CAPTURED ASTEROIDS IN THE EARTH-MOON SYSTEM

Abstract

Near-Earth Asteroids (NEAs) are strategic assets to scientific exploration and a potential source of raw materials to aid continued human space exploration. Also, they may pose potential risks to Earth due to the closeness of their orbits. The problem of establishing trajectories for reaching, capturing, and relocating NEAs has been approached in a number of ways. Two-body dynamics has been widely exploited to investigate the feasibility of identifying, robotically capturing and returning to NEAs translunar space. However, in order to widen the possibilities of reaching and repositioning NEAs many-body models can also be used. In particular, the Restricted Three-Body Problem (RTBP) provides a promising alternative to establish low-energy mission profiles. This contribution deals with capture trajectories for asteroids in the RTBP using the invariant solutions related to the effective stability regions of the Earth-Moon system. We extend preliminary results previously presented and explore the applicability of the invariant structures connecting Lagrangian point orbits around L3 and L4,5 to provide low-energy transport within Earth-Moon distance.