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Space Transportation Solutions for Deep Space Missions (4-D2.8)

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OPTIMAL SPACECRAFT TRAJECTORIES UNDER UNCERTAINTIES

Abstract

In past three decades, for economical space transportation, minimum energy transfers in orbit or trajectories is sought for. This is done via in-depth research to understand intricate N-body problem dynamical structure. To deduce preferable and promising economical transfer trajectories, dynamical attributes of Circular-Restricted Three-Body Problem (CRTBP) is taken into consideration which perfectly works for multiple binary systems within our solar system. However, due to chaotic dynamics, capture/trap problem around smaller body becomes challenging and complex problem due to large gravitational impact of larger body in CRTBP. Earlier, in order to gain in depth understanding about chaotic dynamic nature, mapping technique was used to study trapping/capture concept which were limited to two-dimensional planar-capture solution space visualization. In this research, a new technique is proposed that allows better understanding and visualization of three-dimensional capture problem. For this CRTBP order is reduced, thus allowing condensation of larger information into a two dimensional image. Proposed map allows determination of not only economical trajectories for both planetary and orbital trapping/capture inclusive of sensitive and complex trapping/capture problem but also compliant and versatile deep space missions.