IAF ASTRODYNAMICS SYMPOSIUM (C1)
Orbital Dynamics (1) (6)

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KEYNOTE: ON PERTURBATION SOLUTIONS IN THE RESTRICTED THREE-BODY PROBLEM DYNAMICS

Abstract

The well-known lack of existence of enough integrals to provide a closed form solution to the restricted three-body problem makes approaching it with numerical methods customary. However, useful approximate analytical solutions of this problem can be constructed in particular regions of phase space with the help of perturbation methods. A brief description of three different cases of interest in astrodynamics illustrates the possibilities of the perturbation approach in mission planning of space orbits. Namely, the motion inside the sphere of influence of the primary of smaller mass, which applies to science orbits about planetary satellites, can be approached like the classical case of perturbed Keplerian motion. The motion about the libration points, where the conspicuous Lyapunov and Halo orbits exist, can be treated like a case of perturbed elliptic oscillations. Finally, the co-orbital motion of the satellite and the smaller-mass primary about the primary of bigger mass which gives rise to the so-called quasi-satellite orbits, is a particular case of co-orbital motion with low eccentricity that can be described in terms of perturbed harmonic oscillations.