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ANALYSIS OF A FAMILY OF PERIODIC ORBITS AROUND MARS IN THE FRAMEWORK OF RESTRICTED THREE-BODY PROBLEM

Abstract

In the present work we explore regions of periodic orbits around the planet Mars in the framework of the planar circular restricted three-body problem, the Sun-Mars-particle system. In this model, it is assumed that the Sun and Mars revolve in circular orbits around their center of gravitation, and that the motion of the particle (satellite) is given by the gravitational attraction of these masses (Szebehely, 1967). First, the location of periodic orbits is searched numerically, adopting the approach of Poincare surface of sections. Secondly, the stability of these periodic orbits is measured in terms of the maximum amplitude of oscillation of the quasi periodic orbits about it (Winter, 2000). Further, the perturbation due to oblateness of Mars has also been taken into consideration (Sharma and Subba Rao 1976). Simulations start from an Earth Parking orbit from where an impulse of ΔV1 puts the spacecraft into transfer orbit to Mars. The trajectory is determined using the patched conic technique. On reaching the stability zones in the Sun-Mars system, the spacecraft is put into desired periodic orbits, identified by the above mentioned method and using another impulse ΔV2.