Paper ID: 5137
student

38th STUDENT CONFERENCE (E2)
Student Conference II (2)

Author: Mr. Chen Chunliang
China Academy of Space Technology (CAST), China, chen-yel@163.com

Dr. Ming Li
China Academy of Space Technology (CAST), China, liming_cast@sina.cn

STUDY OF RAPID DESIGN METHOD FOR EARTH-TO-MARS TRANSFER TRAJECTORY

Abstract

Earth-to-mars transfer trajectories do noticeably deviate from simple conic motion about the Sun. The reason for this is primarily due to third-body perturbative effects upon the transfer trajectory, manifested by the persistent gravitational pull of the departure and/or arrival body upon the spacecraft, throughout most of the transfer arc. A number of suitable methods to account for the third-body perturbation have been developed. The overlapped-conic method, based on the pseudostate theory, is comparable to the patched method in terms of simplicity and execution time, yet it reduces patched conic errors by 80 percent. Based on the overlapped –conic method, a fast design method for mars satellite transfer trajectories is presented in this paper. This method is a pure algebraic algorithm without any numerical integration, which has an advantage of rapidity and high accuracy and is suitable for the preliminary design of earth-to-mars transfer trajectories. This method can also provide good initial guess value for precise trajectory calculation and greatly reduce the time for calculating precise transfer trajectories. In order to correct the earth's oblateness effect for trajectories initiating to the earth, the variation of parameters method is used to yield simple expressions for variations of the orbital elements, so that the accuracy of the result can be greatly improved.