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

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AN ACCURATE AND ROBUST METHOD FOR INTERPLANETARY ORBIT DESIGN

Abstract

The orbit equations of two-point boundary-value multi-body problem are discretized as fourth-order compact finite-difference equations, which are solved by iteration with the acceleration terms expressed as a block tri-diagonal matrix of positions and the gravitational force terms treated as known. The force terms can be further linearized to increase the diagonal domination and hence the convergence. With the stability and accuracy, this algorithm is very useful for the orbit design of interplanetary transfer. It is applied to the transfers from low-Earth orbits to low orbits of Moon, Venus, or Mars based on DE431 solar ephemerides. It is also applied to find halo orbits and low-energy transfers in the rotating frame. The computation efficiency and accuracy are compared with other methods like Picard iteration.