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Author: Dr. Pierfrancesco Di Cintio
Consiglio Nazionale delle Ricerche (CNR), Italy

Dr. Alessandro Rossi
IFAC-CNR, Italy
Dr. Giovanni B. Valsecchi
Institute for Space Astrophysics and Planetology (IAPS), Italy

SYMPLECTIC INTEGRATORS FOR THE SIMULATION OF SPACE DEBRIS EVOLUTION

Abstract

In the study of the long term evolution of the space debris population it is of paramount importance to be able to achieve a good compromise between accuracy and computational speed, in order to propagate the orbit of thousands of objects at the same time.

We present a novel implementation of a symplectic orbital propagator in Cartesian coordinates for the dynamics of space debris from the Low to High Earth orbit range.

Test simulations including luni-solar perturbations suggest that our optimized numerical code can attain a significant reduction in computational times with respect to previous orbit propagators based on averaged dynamics in orbital elements.

Moreover, we show preliminarily results for case studies where the effects of non-gravitational perturbations such as solar radiation pressure and atmospheric drag, often not accounted for in symplectic integrators, are considered.

Finally, the comparison between the results of a few long term evolution scenarios simulated with the SDM model, using both the original propagator (working on averaged dynamics in orbital elements) and the new one, are presented.