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Rigorous global optimization for collision risk assessment on perturbed orbits. (English)

Zbl 1380.90301


Summary: In this chapter, a method to assess the occurrence of impacts between objects (either spacecraft or space debris) orbiting around the Earth is presented. The method is based on the computation of the minimum distance between two evolving orbits by means of a rigorous global optimizer. Analytical solutions of artificial satellite motion are utilized to account for perturbative effects of Earth’s zonal harmonics, atmospheric drag, and third body. It is shown that the method can effectively compute the intersection between perturbed orbits and hence identify pairs of space objects on potentially colliding orbits. Test cases considering sun-synchronous, low perigee and earth-synchronous orbits are presented to assess the performances of the method.

For the entire collection see [Zbl 1362.90005].

MSC:

90C90 Applications of mathematical programming
70F15 Celestial mechanics
65K05 Numerical mathematical programming methods

Keywords:
nminimum orbit intersection distance; space debris; Taylor models; global optimization; orbital perturbations

Full Text: DOI

References:
