Paper ID: 43336
student

16th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Interactive Presentations - 16th IAA SYMPOSIUM ON SPACE DEBRIS (IP)

Author: Ms. Harleen Kaur Mann
Astronomical Institute University of Bern (AIUB), Switzerland, harleen-kaur.mann@aiub.unibe.ch

Dr. Alessandro Vananti
Astronomical Institute University of Bern (AIUB), Switzerland, alessandro.vananti@aiub.unibe.ch
Prof. Thomas Schildknecht
Astronomical Institute University of Bern (AIUB) / SwissSpace Association, Switzerland,
thomas.schildknecht@aiub.unibe.ch

PERTURBATIONS IN THE OPTIMIZED BOUNDARY VALUE INITIAL ORBIT DETERMINATION APPROACH

Abstract

One of the increasing threats to functional spacecraft around Earth is that of Space Debris. The risks that it poses for current and future space operations due to collisions are growing in an exponential manner. It is essential to create and maintain a catalogue of space debris to monitor the space environment. Optical survey observations from the Zimmerwald Observatory, Switzerland, are used to discover space debris objects. The result of these surveys are observations of objects on very short arcs. Optimized Boundary Value Initial Orbit Determination (OBVIOD) is one existing method to associate short-arc observations with each other and to compute orbits. One of the main challenges is to include perturbations in this initial orbit determination method. This work deals with this challenge and the respective analysis of different factors including computational complexity, the time taken for the algorithm to converge as well as the effect on its performance. The latter refers to its capability of correlating the short-arc observations which truly belong to the same object. It is analyzed till what extent the Keplerian model gives acceptable results and under what conditions it becomes imperative to include perturbations in the model. The OBVIOD method is based on the solution of the Lambert problem and here we include the perturbation terms of Earth's potential. One way to accomplish this task is using shooting methods. In these methods hypothetical initial values are chosen at one boundary and, after integration up to the second boundary, the end values are compared with the boundary conditions. The tests done include simulated observations for the GEO orbital regime from consecutive nights.