Paper ID: 32888
oral
student

SYMPOSIUM ON SPACE DEBRIS (A6)
Orbit Determination and Propagation (9)

Author: Mr. Michiel Zittersteijn
Astronomical Institute University of Bern (AIUB), Switzerland, michiel.zittersteijn@aiub.unibe.ch

Prof. Thomas Schildknecht
Astronomical Institute University of Bern (AIUB) / SwissSpace Association, Switzerland, thomas.schildknecht@aiub.unibe.ch
Dr. Alessandro Vananti
Astronomical Institute University of Bern (AIUB), Switzerland, alessandro.vananti@aiub.unibe.ch
Mr. Juan Carlos Dolado Perez
Centre National d'Etudes Spatiales (CNES), France, juan-carlos.doladoperez@cnes.fr
Mr. Vincent Martinot
Thales Alenia Space France, France, vincent.martinot@thalesaleniaspace.com

ASSOCIATING OPTICAL MEASUREMENTS OF GEOCENTRIC OBJECTS WITH A GENETIC ALGORITHM: APPLICATION TO EXPERIMENTAL DATA.

Abstract

Currently several thousands of objects are being tracked in the MEO and GEO regions through optical means. With the advent of improved sensors and a heightened interest in the problem of space debris, it is expected that the number of tracked objects will grow by an order of magnitude in the near future. This research aims to provide a method that can treat the correlation and orbit determination problems simultaneously, and is able to efficiently process large data sets with minimal manual intervention. This problem is also known as the Multiple Target Tracking (MTT) problem. The complexity of the MTT problem is defined by its dimension S. Current research tends to focus on the S = 2 MTT problem. The reason for this is that for S = 2 the problem has a P-complexity. However, with S = 2 the decision to associate a set of observations is based on the minimum amount of information, in ambiguous situations (e.g. satellite clusters) this will lead to incorrect associations. The S > 2 MTT problem is an NP-hard combinatorial optimization problem. In previous work an Elitist Genetic Algorithm (EGA) was proposed as a method to approximately solve this problem. It was shown that the EGA is able to find a good approximate solution with a polynomial time complexity. In this work the algorithm is applied to follow-up observations taken by the ZimSMART and ZimSpace telescopes of the Zimmerwald observatory. In the ambiguous case of correlating the observations of a satellite cluster, the results are compared to those of an enumerative algorithm.