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Author: Mr. Benedikt Reihs
Astronomical Institute University of Bern (AIUB), Switzerland, benedikt.reihs@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

COMPARISON OF NEW METHODS FOR THE CORRELATION OF SHORT RADAR TRACKLETS

Abstract

Radar systems are heavily used to track the increasing amount of space debris in Low Earth Orbit. At the same time, the increasing sensitivity of radar systems leads to a higher number of detectable objects, whose orbits have to be maintained. Thus the tracking time for each individual object has to be reduced in order to track as many objects as possible. The disadvantage is that short radar tracklets do not allow a reliable orbit determination from a single tracklet. Instead, two or more short tracklets have to be successfully identified to belong to the same object, i.e. correlated, before obtaining a reliable initial orbit. Current research at AIUB explores new techniques for the correlation of these short radar tracklets.

The work presented in this paper uses the concept of attributables to correlate radar tracklets and to calculate an initial orbit. Different novel approaches are tested and compared with regard to their accuracy, efficiency and robustness. The approaches mainly differ in their initial restriction of the problem, i.e. the number of considered observables, which directly affects how the initial orbit is calculated, e.g. by directly solving an analytic equation, and which quantities are used as discriminators for a positive correlation.

The comparison includes the theoretical investigation of the algorithms with regard to the underlying assumptions and solving techniques as well as results from simulated radar measurements. Quality measures, e.g. accuracy of the orbit or robustness against noise, are used to evaluate the performance of the methods. The output of this analysis is used to select the most promising method, which will be extended further in future.