

Real Time Improvement of Orbits of Space Debris by fusing SLR and astrometric data Acquired by a Night-Tracking Camera

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The precise knowledge of the trajectories of space debris objects and in particular of defunct satellites is fundamental for satellite operations. Several studies showed that it is possible to improve the accuracy of the orbit determination results by fusing different type of observables, i.e. classical astrometric positions and range measurements. Particularly promising in the space debris field are the ranges provided by a satellite laser ranging system. The factors which limit the applicability of the SLR techniques are the accuracy of the predicted ephemeris of the target, the energy of the laser pulse, and the laser field of view. In this paper, we will show how the use of a night-tracking camera can overcome the challenges related to the quality of the predicted ephemerides providing both, real time correction to the pointing of the SLR system (active tracking), and simultaneously astrometric measurements which can be used to improve the orbits which will finally also allow studying the attitude of the target. After presenting the basic functionalities, the performance of the night-tracking camera, and the procedure to acquire the measurements, we will analyse the results of an orbit determination procedure when fusing the different observables. This study is carried out for defunct or recently decommissioned satellites. Only real angular/laser measurements provided by the sensors of the Swiss Optical Ground Station and Geodynamics Observatory Zimmerwald owned by the Astronomical Institute of the University of Bern (AIUB) are used to determine improved orbits in near real time.