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BUILD-UP AND MAINTENANCE OF A CATALOGUE OF GEO OBJECTS WITH ZIMSMART

Abstract

The geostationary ring (GEO) is a highly populated orbit region. Within the scope of safe operations and collision avoidance it becomes increasingly important to create and maintain a comprehensive catalogue of GEO orbits, which should be complete at least down to the threshold size of catastrophic collisions and accurate enough to allow reasonable conjunction analysis. The AIUB with the **Zimmerwald Small Robotic Telescope** (ZimSMART), located 10km South of Berne, regularly surveys the GEO region. The aim of these surveys is a homogeneous coverage of a given region around the celestial equator without a priori information any object catalogue. Furthermore the object catalogue shall be established and maintained with a pure “survey only” approach, i. e. without tasked (follow-up) observations.

In this paper the build-up and maintenance of a catalogue of GEO objects with ZimSMART observations is discussed. The object identification is performed in three steps: first, each tracklet (a set of at least three observations belonging together) is correlated with the official USSTRATCOM catalogue of Two-Line element sets (TLE) and the internal catalogue of the AIUB. In a second step the uncorrelated tracklets are analysed whether or not some of them in fact stem from the same object. Tracklets for which at least another associated tracklet could be found are called object candidates and the others remain single. In a third step the object candidates are compared via their orbit parameters to the single tracklets from previous nights and to those objects which are neither part of the USSTRATCOM catalogue nor part of the internal catalogue. At the end of the correlation process the object candidates which could not be associated with object tracklets of previous nights are added to the AIUB internal catalogue.

Between the June 9th, 2008 and August 1st, 2009 there were 92 nights of observations with a total number of 20109 tracklets. Performing every correlation step a total number of 19210 tracklets could be correlated, which equates to 95.5%. We could identify 899 objects of the USSTRATCOM catalogue and 591 which were not part of it. The latter are most likely not all unique objects due to difficulties to connect short orbit arcs with long gaps in between.