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OPERATIONAL APPROACH FOR SPACE OBJECT CATALOGUING ACTIVITIES

Abstract

This paper presents the operational approach for cataloguing Earth orbiting objects based on the DEIMOS CORrelation Tool (CORTO) and provides information of real cataloguing activities based on optical observations. The approach undertaken in CORTO is based on a three step process: first correlation in the basis of comparison of observation with expected visibility considerations, a second orbit determination compatibility cross-check based on the filtering residuals. Additionally a further manual processing of generated objects is executed to identify failures in the correlation that could lead to duplicated objects.

CORTO cataloguing system is accompanied by a set of auxiliary tools, which enhance the capabilities of the system to ensure the correctness of the cataloguing process. Two modules, CORTOHouseKeeping and CORTOEditor allow enhancing the run-time performance and modifying the CORTO catalogue accounting for the operator feedback. Additionally, the auxiliary tools used together with CORTO include CALMA (for calibration of observation stations) and CHOCO (which allows correlating the observed objects with those in the TLE dataset). This tool serves to assign the international ID to the CORTO objects, but is not mandatory for successful correlation of objects within CORTO. The catalogue is finally made available through a restricted web system (CAWEB) that allows the user to search objects, analyse the resulting accuracy, the evolution of the orbital information computed for each catalogued object, etc.

Together with the detailed description of the cataloguing approach, the paper provides a summary of the processing of observations from sensors located in Spain, at DEIMOS Sky Survey (DeSS) facilities. Optical observations are used to feed-up the cataloguing system CORTO, allowing the creation of a catalogue of objects which are observable from southern Europe. In particular GEO ring longitudes covering Europe are well represented. The achievable accuracy of the observed orbits can reach values around 10-100 meters. Object manoeuvres can also be observable. Example cases of observed manoeuvres are investigated. The main results from this cataloguing experience are summarised, describing the observation strategy and the measurement distribution. This summary highlights the main difficulties in the correlation activities and how the appropriate observational approach may minimise those difficulties.

Achievable accuracies under tracking and surveillance mode are shown, allowing the evaluation of the tracking activities to contribute to accurate orbital computation. This is particularly interesting for the case of eventual conjunction events to refine the orbit of objects to discard or confirmed the event and assess the need of further actions.