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FROM SIMULATION TO REALITY: CATALOGUING CAMPAIGN OF SPACE POPULATION  
BASED ON OPTICAL OBSERVATIONS

**Abstract**

This paper presents the main results from an observational campaign executed in October 2014 focused on the cataloguing of high altitude objects. The campaign lasted 9 observing nights, providing more than 200.000 observations from 3 surveillance and one tracking telescopes located in Spain.

Those observations are used to feed-up the cataloguing system developed at DEIMOS (CORrelation Tool, CORTO) and has allowed to create a catalogue of objects which are observable from southern Europe. In particular GEO ring longitudes covering Europe are well represented. About 300 objects are systematically observed during several nights, eventually reaching accurate orbits. The achievable accuracy of the observed orbits can reach values around 10-100 meters. Object manoeuvres are also observable. Example cases of observed manoeuvres are reported.

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 which imposes different correlation steps to avoid miss-correlation of objects. The approach undertaken in the CORTO software is based on a three step process: first correlation in the basis of comparison of observation with expected visibility considerations for every object, a second orbit determination compatibility cross-check based on the filtering residuals. Additionally a further processing of generated objects is executed to identify failures in the correlation that could lead to duplicated objects. Similarly, a cross-check to identify failure detections among the observations is implemented. The expected percentage of failed detections from observation process is below 0.7

CORTO cataloguing system is accompanied by a set of auxiliary tools, also described in the paper, which complete the capabilities of the system to ensure the proper cataloguing process. These tools include: CALMA for calibration of observation stations (used to qualify a number of observatories) and CHOCO which allows correlating the observed objects with the TLE ones. 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 that allows the user to search through the objects, analyse the resulting accuracy, the associated observations.