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APPLICATION OF THE OPTIMAL MAINTENANCE AND SURVEY TASKING (OMST) STRATEGY AT THE TELESCOPE NETWORK SMARTNET

Abstract

As of February 2022, the catalogue of space objects in the geostationary region consists of about 5000 objects. With being geostationary, not objects are visible from a single telescope station. Furthermore, even all theoretically observable objects may not be observed within a single night. Together with the search for new objects, the task of catalogue maintenance becomes challenging.

With the telescope network SMARTnet, we test different strategies to optimise the observation schedules of the individual stations. One strategy is called Optimal Catalog Maintenance and Survey Tasking (OMST) and tries to achieve the maximum number of detections with the minimum amount of viewing directions in sum of all involved telescopes. The strategy may be applied to a single telescope as well as to a sensor network. In the latter case, an optimisation trade-off is made in terms of sensor availability, probability of detection including the local viewing conditions and sensor capabilities.

The telescope stations included are split between Northern and Southern hemisphere balancing the different night length due to seasons. The observation plan is calculated for each station at the German Aerospace Centre (DLR) and distributed to the partners of the involved telescope stations. Conditions permitting, each plan is executed as complete as possible. Afterwards, the resulting tracklets are analysed to deduce which objects were observed compared to those which were expected. From this, a new plan is compiled. Tracklets, which cannot be associated to already known objects, are checked to identify new objects, which are incorporated into the data base. Of course, the new objects are subject to planning to gain stable ephemerides of these objects. This procedure is repeated over a test period of one month. For comparison, another one month period is considered where each involved telescope station takes observations without OMST. The results of both periods are compared and discussed to show the differences in the approaches, e. g. in the coverage of the geostationary ring, new object detection, and stability of the resulting orbits.