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SCHEDULING SOLUTION FOR SPACE DEBRIS OBSERVATIONS

Abstract

The scheduling model of orbital debris can be considered as composed by a set of optical ground station which move with the surface of the Earth, a set of space situation awareness center which can be assumed connected to ground station, and orbital debris travelling through different kind of orbit generating visibility windows when the line of sight (LOS) to ground station exist. To solve this scheduling problem can be considered as the allocation of observing time of the telescope to collect measurements of the debris (i.e. to improve orbit or attitude determination, spin rate evolution, etc.). The increasing number of space debris to be observed with optical ground station has caused the combinatorial explosion in the number of intervals to be scheduled. Therefore, new scheduling approach to provide a solution to the new requests are needed. In the framework of the Agreement between Italian Space Agency (ASI) and National Institute of Astrophysics (INAF) "Supporto alle attività IADC e validazione pre-operativa per SST" (N.2015-028-R.0), S5Lab research group has developed a network of observatory fully dedicated for space debris observations. Moreover, a scheduler called NICO (Networked Instrument Coordinator for debris Observations) has been developed specifically designed for the harmonization of individual user requests by considering meteorological and astronomical constraints. This paper outlines the advantages of the developed custom solution based on modular architecture. NICO's architecture is based on a multi-layer system: the front-end is designed to allow external registered users to specify their observing requests and to assign specific scientific priority; the back-end is change for the business logic by determining the visibility windows for each request and to solve the conflict. The implemented conflict solver solution is based on genetic algorithms. This paper outlines the results of the application of NICO scheduler to recent IADC (Inter-Agency Space Debris Coordination Committee) optical observing campaigns.