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OPTIMAL PLANNING OF SPACE SURVEILLANCE NETWORK FOR ORBITAL DEBRIS

Abstract

The need to improve observation capabilities in monitoring and cataloguing space debris is constantly increasing, due to the continuous growth of number of operative satellites in both GEO (Geostationary Earth Orbit) and LEO (Low Earth Orbit) regions. Italy is developing a fully dedicated network for orbital debris monitoring based on mid-latitude and equatorial observatories. In the framework of the agreement between ASI (Italian Space Agency) and INAF (Italian National Institute for Astrophysics) in support to IADC (Inter-Agency Space Debris Coordination Committee) activities, a scheduler has been developed by S5Lab (Sapienza Space Systems and Space Surveillance Laboratory) research group to manage the network. The custom software is called NICO (Networked Instrument Coordinator for space debris Observations) and its main purpose is to allocate visibility windows to each optical sensor of the network by solving priority conflicts of the scheduling tasks. NICO is designed to process users' requests for different kinds of orbits by applying different observing strategies (i.e. tracking, beam-park and follow-up). The goal is the harmonization of the different requests by taking care also of external limitations such as astronomical constraints and weather conditions. This paper deals with the design of the scheduler with special focus on the scheduling problems and constraints. Moreover, detailed explanations of the processing phase based on Genetic Algorithms and the implemented observing strategies are given.