SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Detection and Characterisation (6)

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CONSOLIDATION OF EUROPEAN SPACE SITUATIONAL AWARENESS ARCHITECTURE REQUIREMENTS FOR CATALOGUING OF LEO RESIDENT OBJECTS

Abstract

Space debris represent a growing threat to space assets and thus to associated services. That is why the precise knowledge of orbital population situation is a major issue. Thereby, ESA aims to give Europe an autonomous access to this knowledge and has launched the European Space Situational Awareness (ESSA) Preparatory Programme. As part of the CO-I part II contract that ESA has awarded to a consortium led by Thales Alenia Space (France) in order to consolidate Customer requirements and to define the System requirements of the ESSA, Onera is performing an evaluation of the LEO cataloguing performances of the future Space Surveillance Tracking segment for different architectures concentrating on the trade-off between the targeted orbital population and the sensor architecture taking into account sensors feasibility.

Designing a SSA system for space surveillance and tracking requires adequacy between targeted orbital population and sensors architecture and data processing performances. These are expressed in terms of catalogue population coverage and accuracy of formed tracks along with population of space objects that are undetected, untracked or uncatalogued. In this paper, a method for evaluating such performances is presented. To perform this analysis, we carried out a high level simulation on the whole cataloguing chain based on the propagation of orbiting object over a fixed time period (e.g. 10 days). Then, a simulation of sensors geometric and then radiometric observations was performed for a possibly large number of sensor systems forming the architecture. Detected plots were associated into tracklets with corresponding estimated accuracy. Finally a global catalogue was built from scratch using different merging strategies on the tracklets provided by the sensors.

Simulations results will be presented for three sensors architectures composed of both radar and optical systems towards LEO orbital population which represent more than 50,000 objects from 1 centimeter to several tenths of meters. Performances in terms of detected, tracked and catalogued objects with respect to the targeted population and traceability of undetected, untracked and uncatalogued space objects will be emphasized. Updates on the targeted orbital population requirements and/or suggested architecture will be proposed according to the simulations findings.