23rd IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Interactive Presentations - 23rd IAA SYMPOSIUM ON SPACE DEBRIS (IP)

Author: Mr. Nicolas Gras
SODERN, France

Ms. Lisa-Marie Memmi
SODERN, France
Mr. Laurent Majewski
SODERN, France
Mr. David Soulard
Sodern, France
Mr. Antoine LECOCQ
SODERN, France

A METHODOLOGICAL FRAMEWORK FOR ASSESSING CONTRIBUTION OF SPACE-BASED OPTICAL SENSORS FOR SSA SERVICES

Abstract

The Proliferation of space RSOs leads to a need for a better awareness of spacecraft surroundings with regards to space traffic management or collision avoidance. This can be achieved thanks to space-based SSA systems. Such systems include multiple optical sensors, a processing unit and software components. As such, a complex multi parameter trade-off is required when designing SSA payloads. In that context, Sodern proposes a methodological framework to quickly assess optimal configurations, based on the key parameters of each subsystem, such as quality of measure, data flows and overall contribution to service, and integration constraints such as cost, size, weight, and power (C-SWaP). This framework uses RSO analytical data as an input. Parameters thus include hardware key design drivers such as field of view, sensitivity, resolution, spectral range for sensors, reliability, availability, alignment of the field of view with regards to the satellite reference frame, but also processing algorithm key performances and low-level software features including processor speed and communication speed. It must be noted that optical sensors generate huge amounts of data, even more so for high performance sensors. This in turn leads to harsh requirements on space to ground communication systems if no data reduction and/or processing is performed on board, finally leading to an increase in the C-SWaP requirements for mission design while the synthesis of the valuable data is achievable by the optical sensor itself for a global optimization. Eventually, this methodological framework aims at defining standardized and modular technology blocks in order to propose the best set of subassemblies for SSA services, being versatile and iterate-able to allow trade-off between existing and future technologies (such as new generation sensors or artificial intelligence). This framework relies on Sodern's legacy, which allowed building a reliable simulation tool providing accurate performance assessment. This paper will demonstrate how this tool is used throughout our framework on several use cases such as LEO, MEO or even GEO orbits, with several of fields of views, processing units. Giving reliable performance assessment for each scenario. It will help the community to optimize their operations for on-going missions, to better design future missions and to identify key technologies that will benefit to all stakeholders.