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Modeling and Risk Analysis (2)

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IMPROVING CA SERVICES: A POST-ANALYSIS OF THE S3TOC DATA, PRODUCTS AND OPERATIONS.

Abstract

In the context of the Conjunction Analysis, satellite operators face regularly the need to decide whether or not to perform a Collision Avoidance Maneuver (CAM). The decision-making process is highly supported by the CA services provided by third parties. The Spanish Space Surveillance and Tracking Operations Centre (S3TOC) provides support to satellite operators all over Europe in the frame of the EU-SST Support Framework.

The main challenge that the CA service providers currently face is the significant number of potential conjunctions between active satellites, making critical the quality of the data used for the risk assessment, in order to avoid overestimating or underestimating the actual risk.

This paper presents a historical review of all the events managed at the S3TOC since the start of operations in July 2016. This study covers two main aspects, one focused on the catalogue generated from Spanish Sensor Network and a second one focused on the quality of the CA products generated.

The first analysis consists on the evaluation of the catalogue generated based on measurements from the Spanish Optical Sensor Network. This catalogue is used as reference for the detection and risk assessment of conjunction events and it is the main source of information for secondary objects in GEO. The main parameters to be analyzed on the catalogue are related to the evolution over time of the number of objects observed and their size, per orbital regime and compared to the evolution of the population in the same time frame.

The second analysis focuses on the CA events monitored at the S3TOC, comparing the consistency of the different types of CDMs, depending on the sources of information for the primary and secondary objects, and analyzing the evolution of key parameters used to assign a certain level of risk. The analysis performs a thorough statistical evaluation per orbital regime from a user perspective of the events and main properties of those events such as miss distance, incidence angle, relative velocity, types of objects involved, timeliness of event detections, collision risk, collision avoidance manoeuvres, etc.

This analysis is aimed to draw conclusions representative of the events the S3TOC monitors (objects involved, impact of risk assessment method, level of reactivity, etc.) and to propose new requirements,

methods and procedures to improve the quality, automation and reliability of the predictions and recommendations provided to the users of the CA service.