

SPACE DEBRIS SYMPOSIUM (A6)
Modelling and Risk Analysis (2)

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A CLOUD BASED CONJUNCTION ANALYSIS AND VISUALISATION TOOL USING A POWERFUL
FILTERING METHOD AND STATE OF THE ART SOFTWARE TECHNOLOGIES

Abstract

Debris orbiting the Earth have been recognised as a growing hazard to missions' safety and conjunction prediction is therefore becoming ever more important to ensure safe operations of spacecraft. Tools and services covering that already exist, but they have limitations like late warning times, difficult maintenance due to out-dated software technologies, poor graphical interfaces or restrictive IPRs.

Moreover, the performance of current codes performing all-on-all analysis on large catalogues is limited by bottlenecks at the initial filtering for potentially colliding object pairs. As the population of registered debris will increase the issue of computational efficiency will gain more attention.

A tool to perform conjunction prediction will be presented, with the capability of performing analysis between large sets very efficiently. Innovations have been implemented at multiple levels: within the underlying mathematical algorithms, the software architecture and the user interface.

The filtering algorithm implemented in the tool is based on a nearest neighbour search technique used in various fields like data compression and computational genomics.

A client-server architecture has been chosen for the tool, with the potential of parallelising the number crunching computations and of running it in the cloud. The propagations, the filtering and the probability computations run on the server side, using updated catalogue data.

Usability and ease of access were identified as paramount to ensure that the scientific data can be exploited by the majority. Latest web technologies, using graphical acceleration and streaming, were adopted so that it can be run smoothly from a web browser, without the need to install a plugin, while ergonomics and visualisation design concepts were borrowed from the gaming industry in order to optimise the interaction of the end-user with the functionalities offered by the tool and with the vast amount of data it relies on.

Such a tool has big potential, due to its performance, its ease to expand with more accurate models and functionalities, its ease to operate and maintain and its potential accessibility to the end user through any device with a browser.