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Bachelor/Master Thesis

Announcement

Entwicklung von Kollisionsvermeidungsstrategien basierend auf aerodynamischem Widerstand für Mehrfachannäherungen

Development of collision avoidance strategies using aerodynamic drag for multiple conjunctions

Motivation:

With a raising number of satellites launched into Low Earth orbits, the number of close encounters increases and threatens operative satellites. Especially those without thrusting capabilities face the problem of not being able to perform impulsive avoidance manoeuvres. A possible solution to that are manoeuvres exploiting aerodynamic drag forces via changes in the ballistic coefficient. At IRS, strategies for collision avoidance manoeuvres using aerodynamic drag are researched and an according analysis tool is under development.

Two objects in similar orbits often encounter each other several times in successive revolutions. The current analysis tool at IRS considers only singular close encounters. An important next step, therefore, is the investigation of multiple close encounters and the development of promising collision avoidance strategies. Analysing the collision risk over multiple encounters, an optimum manoeuvre shall minimize the overall collision risk.

During this thesis, a literature research on collision avoidance strategies and manoeuvre optimization shall be performed. Based on this, a manoeuvre strategy involving aerodynamic drag shall be developed to minimize the overall risk during multiple encounters. The strategy shall be implemented in a tool and tested using exemplary cases.

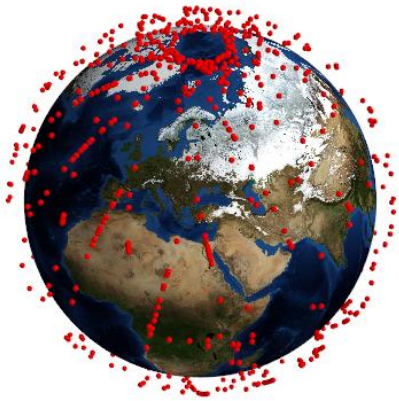

Fig. 1 Locations of close encounter warnings issued for the university satellite Flying Laptop from July 2017 to September 2022

Task description of the Bachelor/Master thesis work:

- Literature research on collision avoidance strategies, especially for multiple encounters, and manoeuvre optimization
- Development of an optimization method for collision avoidance strategies considering multiple encounters using aerodynamic drag
- Implementation of the manoeuvre optimization
- Testing of strategies based on exemplary cases
- Documentation

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