Bachelor/Master Thesis Work

of Mr. -

Analyse des Durchführbarkeitsbereichs von Rendezvous Manövern unter Ausnutzung von aerodynamischen Kräften

Analysis of the Feasibility Range of Rendezvous Scenarios Using Aerodynamic Forces

Motivation:
Using several small, unconnected, co-orbiting satellites rather than a single monolithic satellite has many advantages. However, due to their tight volume and mass constrains other solutions than using chemical and/or electric thrusters to withstand given natural perturbations and/or to perform reconfiguration maneuvers are of highest interest. In LEO, atmospheric forces are a possible solution for propellant-less relative motion control. Since lift acts perpendicular to drag, the latter (originally proposed by Horsley in 2011) offers the unique possibility to propellant-less control both in-plane as well as out-of-plane relative motion and, in addition, to reduce the orbital decay caused by the control actions.

In this thesis, a MatLab® based simulation tool for the rendezvous of two spacecrafts using aerodynamic lift and drag shall be verified and further developed. In a second step, analysis on the interdependence of different parameters on the maneuver times as well as the feasibility range of the method shall be performed and the results evaluated.

Task:
- Familiarization with the method of using aerodynamic forces to perform rendezvous maneuvers and assessment of relevant literatures
- Verification of the simulation tool for different initial conditions
- Further development of the tool
- Analysis of the interdependence of different parameters on the maneuver time and feasibility range
- Documentation

Preferred Skills:
- Experience in MatLab® programming

Supervisor: M.Sc. Constantin Traub

Starting date: -

Submission until: -

Acknowledgement of receipt:
I hereby confirm that I read and understood the task of the bachelor thesis, the juridical regulations as well as the study- and exam regulations.

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(Responsible Professor)

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Signature of the student