Thesis Announcement

Entwicklung und Implementierung eines Regelungsansatzes zur Formationshaltung von Satelliten basierend auf dem Konzept der differentiellen aerodynamischen Kräfte

Development and implementation of a formation keeping control approach using differential 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 constraints 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 VLEO, atmospheric forces are a possible solution for propellant-less relative motion control.

In the course of this thesis, a differential aerodynamic forces based formation keeping control approach using a Linear-Quadratic Regulator (LQR) shall be designed, developed and implemented (MATLAB®). This will be done using the linearized set of equations of motions developed by Schweighardt and Sedwig (SS) which are able to take the influence of the J<sub>2</sub> effect into account. The ability of the controller to withstand given perturbations and to maintain the formation for different relevant formation geometries shall be verified using dynamic simulations.

Task:

- Familiarization with formation flight as well as the method of differential aerodynamic forces
- Familiarization with LQR control theory
- Design, development and implementation (MATLAB®) of a control strategy for formation keeping using differential aerodynamic forces
- Verification of the developed controller for different formation geometries using dynamic simulations
- Documentation

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.

PD Dr.-Ing. Georg Herdrich
(Responsible Professor)

Signature of the student

Legal Restrictions: The author/s of the bachelor thesis is/are not entitled to make any work and research results which he/she receives in the process of writing this thesis accessible to third parties without the permission of the named supervisors. The author/s shall respect restrictions related to research results for which copyright and related rights already exist (Federal Law Gazette I / S. 1273, Copyright Protection Act of 09.09.1965). The author has the right to publish his/her findings as long as they incorporate no findings from the supervising institutions and companies for which restrictions exist. The author must consider the rules and exam regulations issued by the university and faculty of the branch of study where the bachelor thesis was completed.