



Bachelor thesis announcement

Umfassende Literaturrecherche zur Modellierung von GPS-Sensor Fehlern und dem Konzept des differentiellen GPS zur Anwendung bei Satellitenformationen

Comprehensive literature review on GPS sensor error modelling techniques and the concept of differential GPS for satellite formation flight applications

Motivation:

Differential aerodynamic forces are a promising option to control the relative motion of satellites which are not equipped with dedicated thrusting devices. At the IRS, the methodology is actively researched since 2018 and high-fidelity maneuver sequences which are robust towards uncertainties in the available control forces are under development.

Especially in the case of Cube- and NanoSats, one of the methodology's main target group, the accuracy of the available absolute and relative states estimation concepts is limited. So far, however, no assessment of the impacts of relative state estimation errors on differential drag and lift controlled maneuvers is available in literature. To address this research gap, it is foreseen to accurately include GPS sensor signals and the respective errors (such as ionospheric effects, broadcast ephemeris errors and sensor noise) in the simulation and to use the concept of differential GPS to obtain a realistic estimate of the relative states.

Within this thesis, an in-depth literature review on GPS sensor signals and errors (with a main focus on its modeling techniques) and the concept of differential GPS for satellite formation flight applications shall be conducted. The goal of the work is to prepare a structured document which gives a comprehensive overview over the field. In addition, the document shall build the basis for a subsequent implementation of the concept in the existing simulation infrastructure, which is foreseen in the near future.

Tasks:

- Familiarization with satellite formation flight.
- Familiarization with GPS based satellite navigation and the concept of differential GPS.
- Conducting a comprehensive literature review on GPS sensor signals and errors as well as the concept of differential GPS.
- Documenting the findings in a structured report.

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