



## Master Thesis Work

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### Implementation and test of a pointing system for the BUBBLE balloon gondola

#### Implementierung und Test eines Pointing-Stabilisierungs-Systems für die BUBBLE Ballongondel

##### Motivation:

The Small Satellite Student Society (KSat e.V.), in cooperation with the Institute of Space Systems (IRS), is conducting regular flights of high altitude balloons with the BUBBLE gondola from Stuttgart. While the gondola is developed and provided by KSat e.V., payloads are provided by external research groups and customers, ranging from astronomical instruments to tests of new generations of solar cells.



One of the main limitations of the BUBBLE gondola at the moment is that its attitude is not actively controlled. Pointing stabilization and eventually control would significantly increase the range of payloads that can be flown on the platform and improve the quality of data obtained by the experiments.

In order to stabilize the gondola in azimuth, it is planned to equip it with a small satellite reaction wheel provided by the University of Würzburg (Chair of Computer Science VIII). Within the context of this master thesis, the azimuth pointing stabilization using the reaction wheel shall be implemented and tested on ground, if time allows also during a flight experiment.

##### Task:

In particular, the following tasks should be worked on:

- Analysis/review of attitude data from past flights
- Simulation of the stabilized system based on past flight data with Simulink
- Implementation of the azimuth stabilization in the BUBBLE balloon gondola, including installation of the reaction wheel, pre-processing of data from the on-board accelerometers, and implementation of the azimuth controller in a Raspberry PI or Arduino environment
- Extensive ground tests of the stabilization system
- Depending on time, a test flight may be performed during the duration of the thesis
- Detailed documentation of the results as well as presentation

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Starting date: 01.08.2022 (or later)

Submission until: [Click for date](#)

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##### 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.

Prof. Dr.-Ing. Sabine Klinkner  
(Responsible Professor)

Signature of the student

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