Chair of Spacecraft Systems
TUM School of Engineering and Design
Technical University of Munich

Engineering Project

Student: Team of up to 3 Students

Start date: As soon as possible

Topic: *A mission analysis tool for stratospheric balloon missions*

Goals

- Create or extend a simulation tool for the mission simulation of stratospheric balloons, including filling, ascent, descent, for multiple balloons
- Analysis of several possible failure scenarios and their implications

Tasks

- Based on an initial set of needs, define requirements for a stratospheric balloon mission analysis tool
- Create a new tool or extend an existing tool for stratospheric balloon mission analysis
- Implement functionalities as defined by the created requirements list, at least:
    - Variable Balloon and payload size
    - Estimation of payload train drag based on rough parameters (box, barrel, ball shape)
    - Mission Events (e.g. payload separation), that change the mission configuration during the mission
    - Exposing core functions as a library to be part of a larger software stack
    - Simulation of payload data (pressure, temperature) based on standard atmosphere models
    - Visualization of mission via web-interface
    - Provision via a container for quick start
- Validate the functionality by comparison with existing tools as well as comparison with existing balloon flight data
- Create comprehensive user documentation (e.g. in the form of a wiki, reStructuredText in combination with Sphinx, Doxygen comments)
- Prepare a short report and presentation to present the approach, results and the validation of the tool

Requirements

- Knowledge of Python, C/C++, Matlab or another programming language
- Knowledge of Object Oriented Programming
- Knowledge of fluid dynamics governing stratospheric balloon flights

Expected results:

- An extendable simulation tool capable of simulation pre-defined scenarios
- Documentation of the developed tool and code stored on a Gitlab repository
- A short report and presentation documenting the approach, results and validation of the approach
- Based on mission availability, the opportunity for participation in a stratospheric campaign of the Chair of Spacecraft Systems may arise

Supervisor

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