

Several topics in satellite operations scheduling and optimization

Project-/Master Arbeit

Planning and execution of space operations can be quite challenging when it comes to dealing with multiple payloads, all having different goals, requirements, and constraints. Not all payloads can operate at the same time due to limited resources on-board a spacecraft, such as available power, data storage and downlink capacity. It becomes difficult for human operators to consider all the constraints and resources manually when generating a schedule.



The Autonomous Space Operations Planner and Scheduler (ASOPS) is a tool, aiming to generate optimized schedules. The development of the software (SW) is currently underway, and will fly on board the Athene-1 satellite within the framework of SeRANIS Project. The Software will run on an experimental computer (AI-OBC) on board the satellite in a docker container, allowing python scripts to be executed in space. Additionally the SW will interact with the AI-OBC via a mysql database to access data and store results.

In this scenario several topics can be investigated and be part of a Master Thesis. Topics can be discussed and detailed after a meeting.

Possible Topics:

- Scheduling and Optimization algorithms: Algorithms for automated generation of schedule and optimization with respect to one or multiple objectives (multi-objective optimization)
- Software architecture: generation of docker SW image and interaction with docker environment and AI-OBC (reading external database, writing on external database).
- System modeling: development of Python models of payloads, containing characteristics such as power consumption, data generation, operational modes, requirements, hardware.
- Constraint checker: development of a Python code able to evaluate constraints among different payload operations, considering the current status of the platform and the scheduled operations.

Empfohlene Vorkenntnisse

- Basic coding (Python) experience

References

Porcelli F.; Bachmann J.; Bilal M.; Kinzel A.; Gadzo E.; Hülsmann M.; Andert, T.

Autonomous Space Operations Planner and Scheduler (ASOPS) : Optimal and Autonomous Operations in Space. *International Conference on Space Operations (17., 2023, Dubai)*. 2023. S. 354.

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