Paper ID: 77602
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IAF SPACE OPERATIONS SYMPOSIUM (B6)
Innovative Space Operations Concepts and Advanced Systems (2)

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# ONBOARD ADAPTIVE SPACECRAFT MODEL FOR OPTIMIZED SCHEDULING

**Abstract**

Recent satellite missions have shown a trend towards an increased computational power onboard, mainly driven by the growing interest in Artificial Intelligence (AI) applications. This leads to new opportunities in the research and demonstration of methods for a higher satellite autonomy. The research presented in this paper is part of the Autonomous Space Operations Planner and Scheduler (ASOPS), developed within the Seamless Radio Access Networks for Internet of Space (SeRANIS) project. ASOPS will be demonstrated onboard ATHENE-1, planned to be launched in 2025. ASOPS is an onboard software for the optimization of spacecraft operations. The generation of optimized schedules is aiming to maximize the scientific output of a mission while considering the various constraints given by the spacecraft and payload. Scheduling of spacecraft operations is based on the precise knowledge of the current status and the prediction of the future status of the spacecraft. The current status is estimated through sensor measurements while the future status is predicted through different models. These spacecraft and payload models are developed on ground and validated through testing, but the models for the evolution of the spacecraft system and payload behaviour over time, e.g. solar cell degradation, are subject to some uncertainties. The overall goal within ASOPS is the development of an onboard self-learning spacecraft model by adjusting parameters in the models for spacecraft, environment and payloads based on measured data. The aim is to increase the performance in the status prediction which ultimately allows for lower safety margins in the scheduling of operations. This paper presents the concept of the onboard adaptive spacecraft model. Additionally, different adaptive modelling methods, including AI-based methods, are compared on the use case of the power subsystem of ATHENE-1.