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# ON-BOARD RE-PLANNING OF AN EARTH OBSERVATION SATELLITE FOR MAXIMISATION OF OBSERVATION CAMPAIGN GOALS

**Abstract**

Earth Observation (EO) Satellite task planning entails careful temporal consideration of actions depending on the assigned mission goals required for scheduling. Mid term plans are derived on ground and uploaded to the spacecraft for execution. However once in orbit, to maximise scientific mission return, the satellite needs to have autonomous re-planning capabilities to account for unforeseen events. This compensates for the reliance of communication with the ground stations, especially due to the limited frequency of transmission.

In the specific case of EO satellites, experienced uncertainties can be due to environmental or observational conditions, which can affect the optimal execution of mid term plans. Autonomous on-board re-planning ensures the maximisation of the observation campaign goals within the problem constraints.

An efficient Real Time Optimisation (RTO) algorithm via a Stochastic Optimization (SO) approach is implemented through the generation of a model required for on-board re-planning of actions to reduce dependency on human interaction. This is to attain updates for an executable plan to maximise observation campaign mission goals. The updated decisions and data related to environment and operations, are used to provide explanations to ground operators, enabling a human understanding of the actions taken autonomously by the system on-board.