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# EVALUATION OF CHANGES IN DESIGN PARAMETER RANGES WITH A VALUE INTERVAL STRATEGY FOR SOLVING CONFLICTIVE GOALS IN SATELLITE DESIGN

**Abstract**

The main goal during satellite design is to be compliant with mission and system requirements and thus meeting the mission objectives. This, however, can raise conflicts on lower system levels, necessitating trade-offs and compromises in system design and restricting the feasible design solution space. A holistic, systems-engineering view on the ensemble is necessary to take account of all conflicts. In the scope of this paper, we limit ourselves to discuss exemplarily the conflict between a sufficient power performance and the induced drag force due to the residual atmosphere for a scientific satellite in low Earth orbit with inertial attitude over an orbit.

To solve the conflict, we employ a method which is based on varying the values of system design parameters in given intervals. In a simplified model of the problem, the size of the solar panels and the sun aspect angle are varied and power production and deceleration of the spacecraft are calculated for a complete orbit and finally evaluated.

During the design process design parameter values as well as complete parameter intervals can change as mission and system requirements evolve. Furthermore, the size of the parameter intervals changes multiple times as the intervals have to be narrowed in the end of the different phases, leading to one or very few design solutions. In order to clarify the consequences of this evolution, the effects of variations in the design parameter intervals in terms of size and value range on the design solution space will also be presented for the case study.

With the presented approach not only the design solution space can be determined, but design decisions can be verified by quickly representing and evaluating the compromises between competing requirements and design constraints. Design parameter ranges can be balanced and the impact of interval as well as parameter changes can be estimated right from the early design stages, reducing costly design iterations.

Concrete results will be presented for the case study, using specific parameter value intervals based on the fictive FireSat mission.