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MULTI-OBJECTIVE GENETIC ALGORITHM BASED METHOD FOR SATELLITE PAYLOADS CONFIGURATION DESIGN OPTIMIZATION

Abstract

A non-trivial task performed in the early phases of a space mission is designing the payloads configuration. With increased launch opportunities and demand of satellites in the new-space era, the development time of satellites has been reduced which in turn has led to the development of satellite product lines that can host a variety of different payloads with various requirements and constraints. Due to the reduced development times and the additional constraints imposed by satellite product lines, finding an optimal payload configuration, which was previously done manually by engineers with the use of computerized tools, has become more difficult. To optimize the configuration design process, this paper proposes a method based on a multi-objective genetic algorithm. This optimization approach satisfies basic geometrical, mechanical and thermal requirements of the payload components through their adequate placement on a product line satellite. It aims to greatly reduce the effort required by an engineer to produce the payload configuration design in the early phase of any new-space project. This paper addresses the quantification of the mechanical and thermal requirements, implementing them in the algorithm, and presents the first results which provide more insights into the complexity of payload configuration design and the use-case of machine learning in solving the engineering payloads configuration problem.