IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
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LAYOUT CANDIDATE SCHEMES FOR SMALL SATELLITE BASED ON MULTI-OBJECTIVE OPTIMIZATION ALGORITHM

Abstract

In the system design phase of a space mission, the selection of satellite architecture has been driven by a mission requirement for high performance, low production rates, and non-recurrent fabrication costs. Nowadays, a modular-based architecture was frequently used as a reference to be a microsatellite structural design baseline for the feasibility of low-cost satellites using Commercial-Off-The-Shelf devices; this is a new trend in the space industry. Although modular-based architecture can reduce the development costs by allowing standardization, reuse of an existing design, decoupling of manufacturing, finding the optimum layout of satellite components and/or subsystems is still done based on the engineer's experience. In this research, we are addressing the three-dimensional modular-based microsatellite layout design problems with behavioral constraints. The proposed method has variables to be considered, i.e., a center of gravity, a moment of inertia, inertia angle, and thermal distribution via a multi-objective methodology based on a genetic algorithm combined with Computer-Aided Design (CAD) tools. As a case study, the design methodology applies to the layout optimization of a Thai Space Consortium satellite in a comprehensive framework for automatic modeling and finding an appropriate solution under a complex environment, which greatly restricts the optimal layout candidate schemes and exploration.