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SOFTWARE DEVELOPMENT FOR THE BUDGETING OF A CUBESAT SYSTEM DESIGN BASED
ON VARIABLE PARAMETERS

Abstract

System design is characterized by the simultaneous contribution of different engineering and scientific disciplines, and by a strongly iterative process. In the corporate and academic fields, methods and techniques are being studied in order to speed up the system design process, especially for the development of CubeSats, as the shortening of design times leads to a reduction in costs. In a modular design approach, the components can be changed also in later stages (after preliminary design review and before initial testing), which requires a better system to estimate the margins. A software capable of calculating all system budgets (such as mass, volume, power, data, attitude, pointing, thermal and mechanical budgets) is being developed, as a master thesis project. The software will present the calculation of the budgets with the margins related to the different parameters involved in the calculations. The budgets are used to let the designers understand whether the mission requirements and constraints are met by the spacecraft design. The usual procedure is iterative and proceeds by trial and error, choosing the components for each subsystem and calculating the resulting budgets. If these do not meet the requirements, a new selection of components is needed, and the process is repeated until convergence is achieved. By considering margins for the different parameters that change during the iterations of the design, it is possible to predict different behaviors of the system based on the range of variation of the parameters. It is therefore possible to define the values of the parameters that make the budgets meet the requirements and constraints, while the values that do not comply with them can directly be discarded. This will then result in an easier way of selecting the components of the various subsystems, thus avoiding a large number of iterations. This paper presents a technique that can lead to the reduction of system design times, simplifying the iterative processes, in particular by working on the budget calculation of a CubeSat. The approach followed for the development of the technique through the use of Matlab software, and how the theory of error propagation is used for the calculation of margins will be presented.