Linear CubeSat Center of Gravity Optimization

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Abstract:

Nowadays, CubeSats are being developed by many organizations and universities. It is due to it being relatively low in cost and having a short development cycle. CubeSats development process requires various system analyses before launch; to ensure meeting all design and mission requirements. The mechanical analysis includes calculating the mass budget, volume budget, components allocation with an optimal center of gravity, and vibration test. Finding the Optimal center of gravity is critical for CubeSats' stability; due to it being proportional to the environmental disturbances that profoundly impact CubeSats in low earth orbits. Currently, the optimal center of gravity is found by the trial and error method. The trial and error method is an inefficient method as its time consuming, and its results may not be optimal. This research proposes an optimization model that automates finding the optimal center of gravity in the CubeSat development. The proposed system is more timely-efficient than the trial and error method, as it takes all possible solutions to find the optimal solution in less than one second. This research proves the ability of the proposed model to find the optimal center of gravity for different mission scenarios that have different design requirements and constraints.