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A MISSION ANALYSIS TOOL FOR AIDING FEASIBILITY STUDIES IN SMALL SATELLITE MISSION PROJECTS

Abstract

Nowadays, as spaceflight becomes more commercialized, space hardware cheaper, and space-based services more affordable and ubiquitous, many new sectors of the space market emerge that were previously marginalized and neglected. Telecom megaconstellations that are being deployed these days, complicated Earth-observation missions in very low Earth orbits, asteroid reconnaissance, in-orbit maintenance, debris removal and other applications spark interest and drive the demand for new powerful simulation tools and methods. The most common and widely-used tools that either exist on the market or accessible for free are, firstly, rather universal which requires an excessive training for common user to be able to use them, and secondly, not always optimized enough for more specific applications, such as modelling large constellations, precise orbital slot maintenance, or dynamics and control, which hinders the possibility of using those tools efficiently in many cases described in the present work. We present a software tool to assist in early stage mission analysis for small satellites. This tool is used for constellation analysis, modeling swarm control, intersatellite link analysis and telecom services. In early design phases it is important to have a "single source of truth" model, which is visible to all members of the team. First of all, a method is described to store the information about the satellite subsystems within the model in a way that all the parameters of a defined set are accessible for users, and at the same time a reference is preserved to an actual device data in cases when the subsystem was imported from an external database. Secondly, the suggested tool has a simple interface with other assisted design tools, namely concurrent design environments, in order to make the design process more flexible and allow outputting the results of analysis directly into other environments. Finally, the paper discusses the functionality of the developed tool, its robustness in various applications, the ways it might be implemented within the framework of space industry and education, and the marketing perspectives of such tool.