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AN AUTOMATED STATISTICAL DESIGN TOOL FOR LEO COMMUNICATION SATELLITE CONCEPTUAL DESIGN

Abstract

Considering the weight and importance of conceptual design for the success of a satellite design process, new processes that can speed up the process with acceptable accuracy can positively affect project cost and overall schedule. This paper introduces a statistical design method (SDM) for conceptual design of LEO communication satellites, implemented in an integrated automated and easy to use tool. While the idea of statistical design process can be easily customized for different types of missions, here in this study, it is developed for conceptual design of LEO communication satellites, within the weight range of 10 to 500 kg, effectively and efficiently. The process reduces the amount of labor required for the conceptual design, reducing cost and time as a result. The architecture of the tool consists of three layers, with the SDM core implemented in the inner layer. SDM determines the essential conceptual design parameters in few seconds with acceptable accuracy. The method uses the design parameters derived from a satellite database of more than 500 LEO satellites launched between 2000 and 2015. The data derived from the database acts as a reliable design reference point. The software uses characteristic trend equations for system budget, mass and power. The paper describes the method, architecture of the tool, and a case study to verify the process proposed. The method's accuracy has been verified using an operational satellite design as a case study, with mean error of around 18