

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Interactive Presentations (IP)

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REAL-TIME DATA ACQUISITION PLATFORM USING THE OPENROCKET SIMULATOR

Abstract

In the development of research for high power rockets, it is very valuable to understand the conditions in which the vehicles are evaluated, and this is possible by implementing a telemetry system. Most of the high power rocketry research begin with simulations of the rocket under study. The objective of this project is to integrate rocket simulations with the acquisition of midflight, real-time data, giving the user the possibility to compare simulations results and real-data within the same interface. The motivation to develop this platform comes from the first Costa Rican aerospace camp, where researchers and students from the University of Costa Rica (UCR) launched the first rockets in our country. In this event, rockets carried a payload that consisted of a simple embedded system for the telemetry including sensors for measuring pressure, acceleration, magnitude and gyroscopic speed. An early prototype of this application was developed in Python; it stored in a file and displayed the results in a graphic interface. In the rocket design process of the UCR's aerospace camp, OpenRocket was used to simulate different kind of engines and airframes. OpenRocket is an open source rocket simulator coded in Java, which also has an extensible property by the usage of plugins. The implementation proposed in this paper comprehends 3 subsystems. First, the payload consists of an embedded system that reads data from sensors and transmits it to the ground station. Second, the ground station reads the data sent from the rocket and stores it into a database. Lastly, the proposed platform reads the data stored in the database and deploy it to the user through OpenRocket. The platform will be able to make mathematical computations with the data, such as computing the attitude of the rocket based on its velocity and acceleration. The development of this platform is complemented by the payload's hardware development as part of a parallel project within UCR's aerospace program. The proposed platform will be tested during the UCR's aerospace camp in July 2016 and its results and analysis will be reported in this paper. The implementation of this platform and its usage in high power rocketry research could establish the first aerospace technology developed by the aerospace program of the UCR aligning with its main objective: transform Costa Rica into a launch center for suborbital payloads.