Problem Statement

CS Capstone
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Abstract

In June 2017, the OSU chapter of the AIAA will launch a rocket in the Mojave Desert. The software team will develop the tracking software that receives telemetry from the rocket during its flight and displays the data in real-time for the entire OSU rocketry team. This software must be flexible, robust, and accurate in order to ensure that the variety of engineers on the project all receive the data they need on launch data. This document will give an overview of the problem, the software team's proposed solution, and describe how the success of the project will be measured.

I. Problem Definition

In June 2017, the Oregon State University (OSU) chapter of the American Institute of Aeronautics and Astronautics (AIAA) will launch a rocket in the Mojave Desert. This rocket will ascend to one hundred thousand feet Above Ground Level (AGL). Designing, building, and launching the rocket will require the collaboration and expertise of dozens of engineers from a variety of disciplines, including mechanical, electrical, computer, and software.

Many rockets record data during the flight. This data may include altitude, latitude, longitude, and more. Latitude and longitude data is helpful for locating the rocket after it lands, but if the data is located on the rocket, then it is useless for this task. Altitude data will tell the rocketry team if we have met the objective of one hundred thousand feet, but if the rocket is damaged or cannot be located for any reason, then the record of this achievement may be lost.

However, the chicken-and-egg problem of not being able to access the location data before the rocket is found may be avoided by sending telemetry from the rocket in real-time. Telemetry may be received wirelessly by the rocketry team while the rocket is in flight, giving them access to useful information such as the rocket's last known location and the highest altitude reached. This telemetry will aid in the rocket's recovery and provide a log of the rocket's flight even if recovery is impossible.

II. Proposed Solution

A. The Ground Station

With the aid of the computer engineers in the avionics team, the software team will design, build, and deploy a ground station capable of receiving and displaying essential telemetry in real-time. At a minimum, this telemetry includes highest recorded altitude and last known latitude and longitude. In addition to displaying the data in real-time, this data should be logged so it can be accessed later.

B. Desired Features

After the primary objectives outlined in the previous section are met, there are a number of optional features that have been requested by the OSU rocketry team. Because the reliability of this software is essential on launch day, additional features will only be implemented after the stability, robustness, and accuracy of previous features is ensured.

A customized web server will be developed for the ground station, and the rocketry team will be able to connect to the ground station though a wireless access point. Once connected, data will be able to be viewed in real-time in a graphical format through their web browser.

The software team will work closely with the engineers in the rest of the rocketry team to ensure the software meets their needs on launch day. These features will be considered and prioritized at a later date, but should never compromise the stability, robustness, and accuracy of the system or its ability to display the essential telemetry.

C. Launch Simulation

The mechanical engineers of the group have requested a launch simulator that would allow them to control sensors on-board the rocket in order to test systems that rely on certain sensor data. This will consist of a separate software package that will only be designed and implemented after the essential features of the ground station are complete. The launch simulator will be prioritized along with the other desired features at a later date.

D. Expo

At the engineering expo, the software team will demonstrate their software in a simulated environment. This may include replaying real data from test launches or using hand-crafted data. If the desired web server function is complete, then people will be given the ability to connect to our server with their personal computers and view the data themselves. Ideally, this task would be done by working closely with the avionics team to highlight the combined achievements of our hardware and software.

III. Performance Metrics

The successfulness of the project will measured by whether the data is successfully recorded and made accessible to the rocketry team on launch day. To ensure the software is ready for launch day, we will consider three primary performance metrics:

- Stability: the software should not crash or otherwise cease operation
- Robustness: the software should handle bad inputs gracefully
- Accuracy: the software should correctly report all telemetry

In order to meet these requirements, a comprehensive test plan will be written and executed. This plan will involve sending large amounts of random, recorded, and live data to the software and recording the results. The software will only be considered successful if it passes all of these tests with no errors.

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