KEVIN STINE TECH 05.05.15 9:00 AM

REVIEW: ROCKET AVIONICS AND DATA ACQUISITION

LIGHT READING

THE OREGON STATE UNIVERSITY ROCKET TEAM

"HOUSTON, WE HAVE a problem". A phrase which no one wants to hear that conjures up the image of a problematic rocket as the hull integrity is compromised. Thankfully you won't hear that phrase uttered from bystanders that witness the launch of the Oregon State University Team's rocket. Comprised of 16 Mechanical Engineers, 2 Electrical Engineers and 3 Computer Scientists, this rocket has been designed by the best. Sponsored by Dr. Squiers, a professor at Oregon State, NASA Oregon, Lancair Inc, and many more, this project takes all of the industry's heavy hitters focused on one goal, designing a rocket that is capable of launching 30,000 feet above ground

level. The ESRA team (experimental sounding rocket association), a chapter of the American Institute of Aeronautics and Astronautics, has won the past few years at this competition, successfully creating a rocket that achieves 30,000 feet above ground. While launching a rocket up into space is cool, the real challenge is collecting scientific data from the rocket as it launches into the atmosphere.

RECOMMENDS 2017

RADAV
8/10

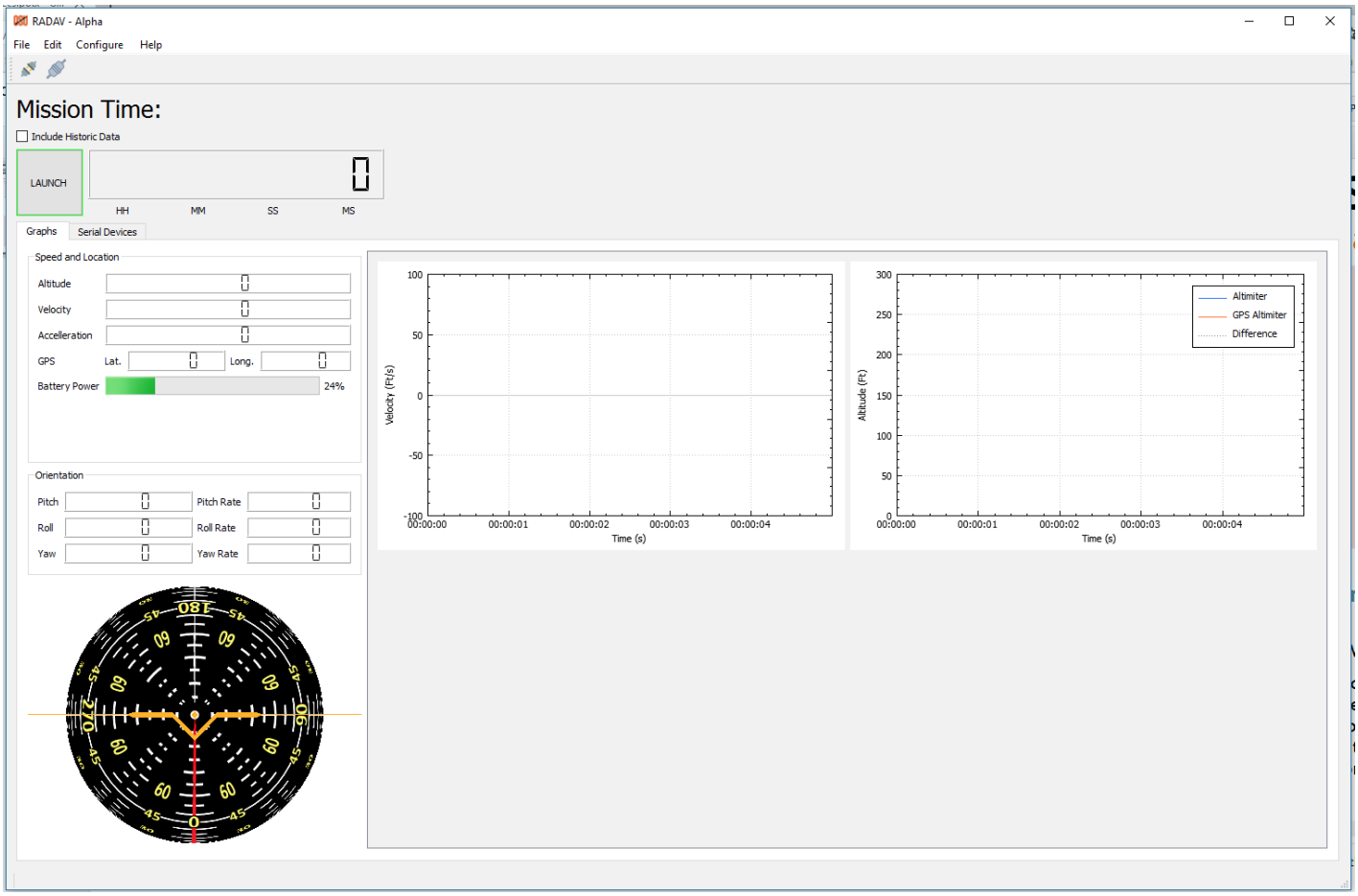
WIRED
Easy to use application which allows users to see all information regarding the rocket. Well documented and easily extendable allowing for future development by other teams.

TIRED
Lack of current support for other platforms requires users to use Windows 7-10 exclusively.

The Computer Science team worked on the rocket avionics and data acquisition portion of the project. Coined RADAV, the focused on acquiring all the data relevant to the rocket's avionics. While the rocket is in the air, there is valuable information ready to be collected regarding the world around the rocket. Some of this information includes: telemetry data, direction, speed, altitude, acceleration, g-forces and gps location. Rather than letting this valuable information go to waste, the Computer Scientists took to designing a way in which they could retrieve the data from the rocket that didn't require them to be physically launched into space with the rocket. In cooperation with the other teams working on the project, a sensor was created which allowed for the rocket to collect data, enabling the CS team to work on an application that would read that data. Originally slated to be a cross-platform application running in MacOS, Linux and Windows, this application would allow for users to understand all of the information that the rocket was sending to them. The application is neatly displayed allowing users to see the mission time as well as graphs of velocity and altitude and includes more detailed information such as altimeter, GPS altimeter and difference. One of the coolest features is the ability to see flight dynamics in real time, allowing you to see the pitch, roll and yaw of the rocket as well as the rates of those three items respectively.

ARDUINO AND RADIO

Using a wide array of sensors, this data is collected and passed via the radio waves, allowing the rocket's team to view and analyze data mid-flight. Utilizing a radio and an arduino, a microcontroller kit for building digital devices and interface objects that can sense and control objects in the physical world, the team created a computer application which allows them to read the data through the radio waves and display them in a recognizable language. While the data that comes through the radio waves is being sent as a stream of bits, the team took to parsing the data so they would be able to read it in a way that everyone understands. The team has setup a serial connection which allows them to plug in a connection to a USB and it acts like a receiver, getting the data that is passed to it over the radio waves from the rocket.



APPLICATION USER INTERFACE

While the application was initially designed to work on multiple platforms, the current model only works with Windows 7-10. However the team has utilized a framework which allows the app to be extendable to other platforms in the future. This would allow future developers to port the application over to MacOS, Linux and potentially mobile platforms such as iOS and Android. In addition to the potential of adding more platforms in the future, the team made sure to document all of their code well. This will enable future developers to easily navigate through their code enabling them to add more features, new sensors, and continue development to constantly improve the state of the application.

Thanks to Alex Wood, one of the teams developers, for spending time with me explaining how the application and rocket work.