



Sugar Shot to Space

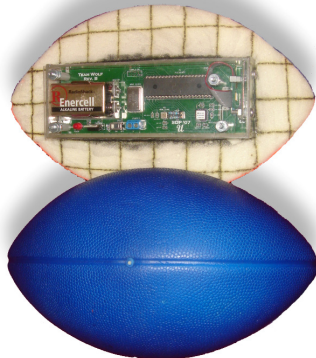
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Background

Monitoring the flight path of a projectile is a difficult process. There is a high potential for noisy data and sensor failures due to environmental conditions. This is also true in other applications such as robotics and automotive systems. Critical decisions must be made autonomously based solely on the data collected. Thus, it is essential for sensor data to be as accurate and precise as possible at all times during operation. To ensure functionality, it is necessary to implement a system capable of identifying sensor failure and allow for proper operation without interruption.

Project Description

In our project, we have developed a sensor system that can detect launch conditions to determine flight path of the rocket by correlating different sensor inputs. The information provided by our system can be used by the flight computer to detect and correct the potential sensor anomalies, making output valid for use in triggering critical events such as parachute deployment etc. By processing data from all sensors and correlating events, our system can determine speed, flight angle, and other important information. The sensor system is embedded in a football that can be thrown to simulate a typical flight path. Using two accelerometers and one gyroscope, in-flight sensor data is sent to an embedded microprocessor for processing. A wireless data link is used to relay this information to a workstation computer where flight information is displayed.

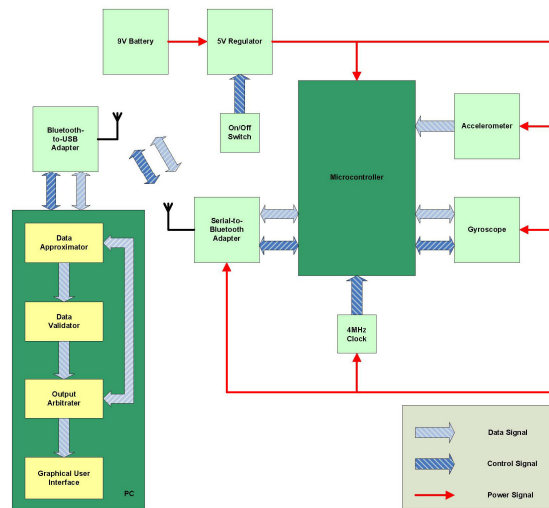


Prototype embedded in a foam football

Design Challenges

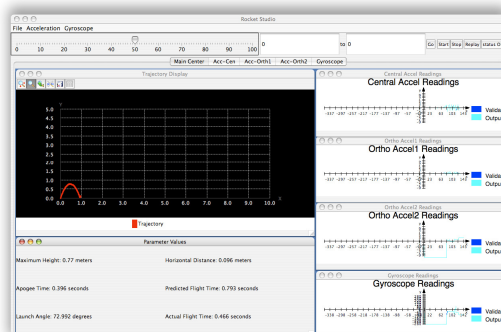
- Sensors choice and placement
- Erroneous sensor data
 - Unreliable sensor values
 - Multiple sensor failures
- Approximating sensor data based on previous values
- Determining the most appropriate sensor value to output to resources
- Compact design for implementation in different applications
 - Small Volume
 - Light weight

System Block Diagram



Demo Setup

- Prototype is embedded in a foam football
- Noisy sensors and sensor failures are simulated.
- User throws the football in a parabolic path to reproduce a possible flight path of a rocket.
- During the initial launch of the football, an estimated flight path and other flight parameters are estimated.
- These values are relayed down to a base PC using a Bluetooth wireless link..
- The information gathered is displayed on the PC using a graphical user interface.



Graphical user interface



From left to right: Jeffry Gummeson, Jared Lucey, Professor Wolf, Shobana Shankar, and Jared Eldredge

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