

Project Plan



sddec24-01

Project Overview

- Project: Make to Innovate (M2I) group H.A.B.E.T.
- Objective: Develop a high-altitude balloon project for atmospheric data collection and near-space video recording/streaming.
- Altitude Goal: Up to 30,000 meters.
- Current Challenge: Reliable video communication using a 5.8GHz radio signal.
- Solution Approach: Implement software-defined radios (SDR) for control of 900MHz to 1.2 GHz signal modulation (phase and frequency).
- Key Benefit: On-the-fly signal corrections for clear visual data.
- Design Constraints:
 - Portability
 - Weight: Less than 12 lbs. (FAA regulations)
 - Power consumption monitoring

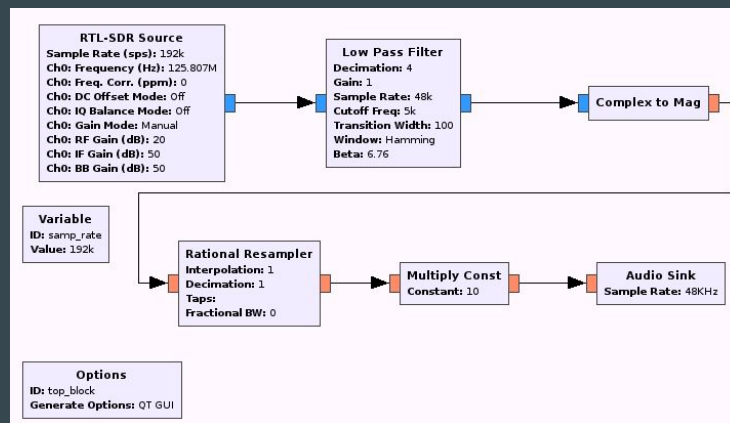


Project Management Style

- Hybrid management style.
- Waterfall approach - must meet a certain date for the H.A.B.E.T. launch.
- We meet regularly with our advisor/client to get updates and ask questions which we follow an agile approach to.
- Hybrid approach helps keep us on track but still allows us to ask questions and give our larger team updates.

Task Decomposition

- Software
 - GNU Radio SDR
 - Define flowgraph and necessary modules
 - Modulation and filtering
 - Upload C code to Linux Raspberry Pi machine
 - Test to ensure system can run within power constraints with desired video quality
- Hardware
 - Determine size of battery required
 - Add additional filtration to deal with noise
 - Acquire new transmitter/receiver if the losses require it.



Example of an SDR flowgraph

Key Milestones, Metrics, and Evaluation Criteria

- Comparative analysis of SDR tools (Analyze MATLAB Simulink vs GNU Radio)
 - Completed already, it was determined Simulink would process faster, but would not be maintainable long-term due to licensing issues.
- Successfully transmit video broadcast on date of eclipse in April
 - Transmission can be of any level of quality. The goal is to transmit *something*.
- Use custom designed and implemented SDR modulation circuit for a launch.
 - Ideally, at the end of our project we will have designed our own modulation circuit to optimize the system's efficiency and quality of output.

Key Risks and Risk Mitigation Strategies

- Tracking connection loss with onboard system causing loss of whole balloon
 - Mitigation: Dynamically adjustable receiver that can be properly tuned to reduce the chances of a system connection failure.
- Power supply issues for data transmission on the balloon
 - Mitigation: Have some 'wiggle room' in the link budget to allow for increased power demand if necessary



Conclusions

- Our task management is mix of hybrid and waterfall methods.
- We break down our tasks to software and hardware tasks and track what individual members are working on.
- By using multiple different approaches to project management we can ensure that important tasks are being completed while we stay on task with the project as a whole
- Questions?

