

C.R.O.P.P.

CubeSat Research of Plant Platforms

Computer Science Contribution 2021-2022

Project Plan

Team Members

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Client

NASA

Meetings with Client

Given general project goals from previous year. Plan comes from AEE Faculty Advisor and representatives of NASA.

Goal and Motivation

The goal of the project is for NASA to test plant pathogens in space without risking health of astronauts on a manned mission. Testing on the ISS for example can potentially put the crew at risk. The isolated CubeSat provides a test bed incapable of doing harm.

Approach

- Control of on-board systems such as lighting and environment monitoring with FlatSat kit. FlatSat STEM Kit contains many modular pieces of hardware to provide lighting and monitor environment factors of the plants growing. With native Arduino support these chips will be used to operate a large portion of the CubeSat.

- A ground station capable of connecting to CubeSat. Fox in a Box is a Raspberry Pi ready open-source software for telemetry of the satellite. This will be used for ground station communication.
- Cameras to monitor changes to plants. Perhaps the most important part of the project is being able to get pictures of results. They will have to be integrated into the other hardware and software to communicate images.
- Creating a system that can be contained in the CubeSat size required. Allowing Aerospace Eng team to develop apparatus to work with sensors and Raspberry Pi computer.

Technical Challenges

- FlatSat Kit is new to me and I will need to explore how to use it. It interfaces with Arduino and comes with code to get you started. I am still somewhat new to Arduinos as well.
- Fox in a Box is an open-source software I have not seen before and will need to get familiar with that and how it works with Raspberry Pi.
- Getting all software and hardware to work together will be the major challenge. Using breadboards and ready-made hardware together and bringing it together to make the apparatus functional.

Milestone 1 (October 4th, 2021)

- Explore Fox in a Box and Flat Sat.
- FlatSat already purchased and team has kit.
- Provide small (“hello world”) demos:
 - Fox in a Box
 - FlatSat
- Familiarize with software and hardware to resolve technical challenges.
- Collaboration Tools:
 - Team Communication on Discord
 - Sharing of non-programming files in Google Drive CROPP Folder
 - GitHub set up for code and website
- Create Requirement and Design Documents.
- Create Test Plan.
- Find what from previous year can be adapted.

Milestone 2 (November 1st, 2021)

- Get some functionality on FlatSat.
 - Demos
- Collaborate with team to have complete understanding of what CubeSat will need from my contributions.

Milestone 3 (November 29th, 2021)

- Get Raspberry Pi functional.
 - Local demos
- Have more FlatSat function working.