EE / CPrE / SE 492 – sdmay21-07

Small Rotor-Craft Obstacle Avoidance Radar System

Week 1 Report

Fall 2020 – Spring 2021

Jan 25 – Feb 8

Faculty Advisor: Dr. Al Qaseer

Team Members:

Matt Bahr – Antenna Designer

Joshua Welton – RADAR Firmware/PCB Design

Felipe Varela Carvalho – Signal Processing

Matt McDermott – PCB Design

Mike Ostrow – Pi Data Flow

Leonardo Bertoncello Machado – PCB Design

Weekly Summary

The overall objective for this week of work was to move closer to finalizing the hardware designs for the antenna and the integrated chips / PCB. The antenna design was improved upon and now the antenna is almost ready for creation using a CNC machine. The schematics for the ICs are being transferred to the PCB design

Past Week Accomplishments

Finalized Antenna Design – Matt Bahr

- Designed a reformatted antenna design without waveguides. This design has the coaxial cables built into the antenna itself instead of using a separate connection that splits off from the antenna.
- Ran simulations on new design to test electrical parameters of the antenna. These simulations provided acceptable results.
- Started preparing the antenna design files for export for use in a CNC machine.

Pending Issues

There are no issues that the group is facing at this. We are steadily working through the required work for this project.

Individual Contributions

Name	Individual Contributions	Hours worked this week	Hours Cumulative
Matt Bahr	• Redesigned antenna to operate without external waveguide • Prepared antenna for creation using CNC machine	12	15
Joshua Welton	• Started schematic for onboard ADC • Started schematic for MCU integration	5	5
Felipe Varela Carvalho	• Scheduled recuring meeting between Faculty Advisor and group members	5	5
Matt McDermott	• Started the last schematic builds in preparation to completing our PCB design. • Provided feedback to the initial layout for the PCB and any corrections that were made.	6	6
Michael Ostrow	• Obtained access to raspberry pi and began building up the environment • Started a git for raspberry pi code	5	5
Leonardo Bertoncello Machado	• Fixed net errors within schematics to ensure clear connection between different document ports • Imported previously made schematics to PCB layout in Altium Designer	7	12

Note: Hours Cumulative is for this semester of class only.

Plans for the Upcoming Week

Antenna – Matt Bahr

- Finalized the dimensioning and modeling for the antenna
  - Get proper screw hole sizes and dimensioning figured out
- Meet with the ETG to begin construction of the antenna using the CNC machine

Signal Processing – Felipe Varela Carvalho

- Use Data Generation program to start design of signal processing algorithm using Python
  - Create a program to read, understand and process incoming data
  - With the processed data, start building the Python visualization algorithm
- Help with Antenna Desing and communication with the ETG lab

PCB Design – Joshua Welton, Leonardo Bertoncello Machado, and Matt McDermott

- Finalize schematic for ADC and help with PCB layout
  - Includes interface between Raspberry Pi and ADC/Antenna ICs
- Finalize PCB outline and make significant advancements in the traces of each component
  - Verify that each component's trace is in the appropriate layer of the PCB

Raspberry Pi Environment

- Finish building the environment so that a register setting initial code can be run on startup.

Summary of Weekly Advisor Meeting

The meetings with our advisor Dr. Al Qaseer these past two weeks have been focused mainly on helping the students that are working on the hardware side of the project. Specifically, we have discussed what is needed for the antenna model to be complete and what is required for our PCB design. Our advisor has been helping us quite a bit with working through any roadblocks we have encountered.

Our advisor is planning on meeting one on one with Felipe to work out how to visually recreate what the antennas are seeing using Python. This will be done by creating simulated data that will closely match what the antennas will see.