EE / CPrE / SE 492 – sdmay21-07

Small Rotor-Craft Obstacle Avoidance Radar System

Week 4 Report
Fall 2020 – Spring 2021

Mar 1 – Mar 15

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
This week marked the completion for the design of the printed circuit boards that we were required to design for this project. Along with this, we exported Gerber files to be given to a board manufacturing company for fabrication, and we will be looking ahead to receiving the completed boards for testing purposes.

On the software side, we downloaded and created a sample program to write information using UART protocol through Termite (on the PC). The correct python libraries were installed and tested.

This week we were also able to finally acquire a physical model of the antenna from the ETG CNC machine. We have begun the process of acquiring all the parts necessary to hook the antenna up to a testing machine that our advisor will be helping us use. Finally, a process was examined for how to begin cutting and sizing the connector pins we will be using to connect the antenna to the circuit boards.

Past Week Accomplishments
First antenna was successfully created using CNC Machine. Both PCB designs for the main circuit and ADC circuit were completed.

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	• Acquired test antenna from ETG • Ordered parts for testing of the antenna in advisor's lab	2	29
Joshua Welton	• Completed printed circuit board layout for ADC circuit • Exported Gerber Files for manufacturing	15	32
Felipe Varela Carvalho	• Started communication to set up communication between PC and microcontroller. Using Termite for UART protocol.	5	18
Matt McDermott	• Near completion of our Bill of Materials. • Ordered all of our main ICs in preparation for testing.	5	18
Michael Ostrow	• Found startup register values for all chips on PCB and adc board, and figured the settings. • Entered these values into pi code and began working on a process of sending these values through the SPI communication like they will be communicated to the PCB.	4	13
Leonardo Bertoncello Machado	• Continued work on PCB, adjusting RF lines and power divider • Finalized polygon pour for all layers in the PCB. Clearly defining between heat relief and direct connect for vias and components • Completed the work on assimilating PCB and microcontroller	15	40

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

Plans for the Upcoming Week

Antenna – Matt Bahr

- Once parts arrive, testing will begin for the antenna to ensure that the simulation results are replicated in the physical model.

Signal Processing – Felipe Varela Carvalho

- Consider Ethernet connection directly to the rasberryPi
- Test communication ports

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

- Finalized PCB design and ordered ICs
- Send Gerber files out for fabrication of the PCBs
- Prepare for soldering and testing when PCBs arrive

Raspberry Pi Environment – Mike Ostrow

- Practice communication by communicating between multiple SPI microcontrollers

Summary of Weekly Advisor Meeting

The weekly meeting consisted of showing Dr. Al Qaseer our progress on our relative parts. We went over how to proceed with testing the antenna after fabrication was completed for it. We also went over our bill of materials, and the interface between PC and microcontroller. The rest of the meeting was dedicated to going over small details of both the main PCB and the ADC PCB. We were directed to make some changes to our designs, but was overall happy with the progress that was made on both designs. We were also asked to export our designs as Gerber files for him to go over once we were done with the changes to our boards.
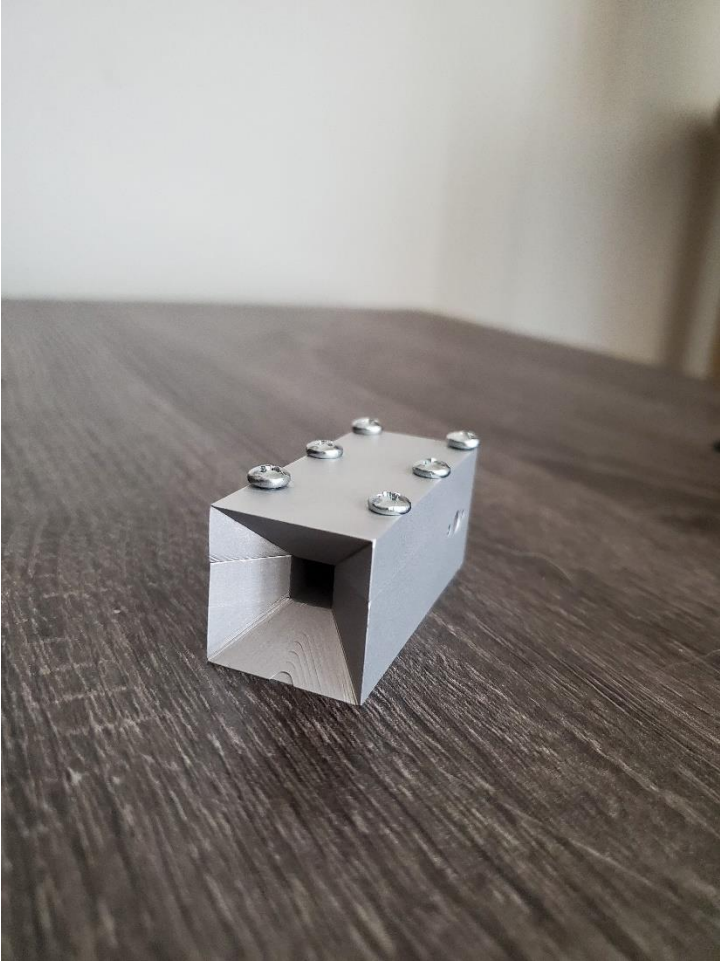
Figure 1: Antenna model
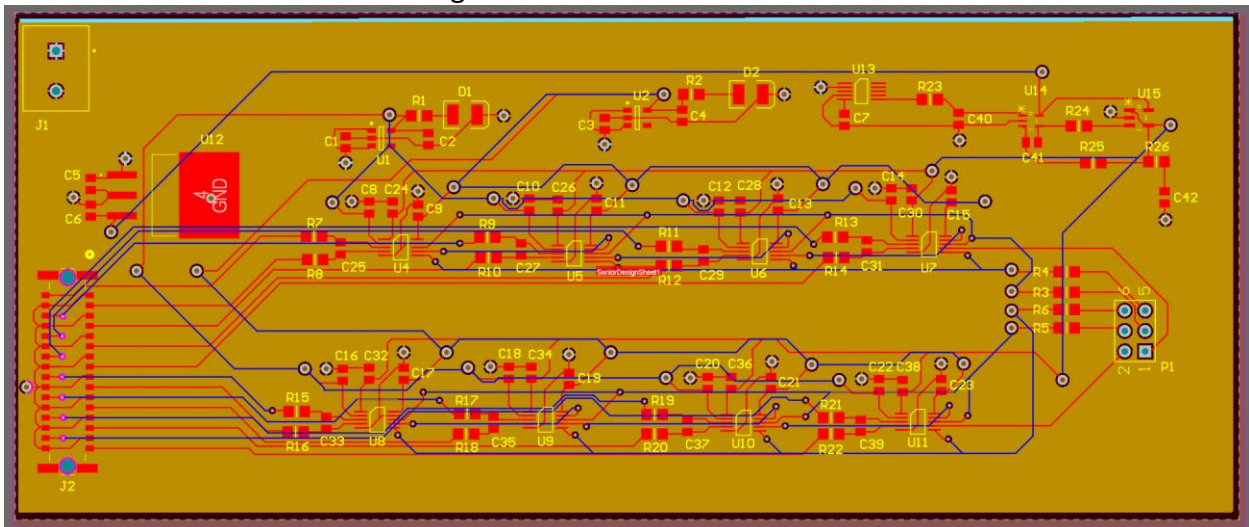
Figure 2: Side-view of Antenna
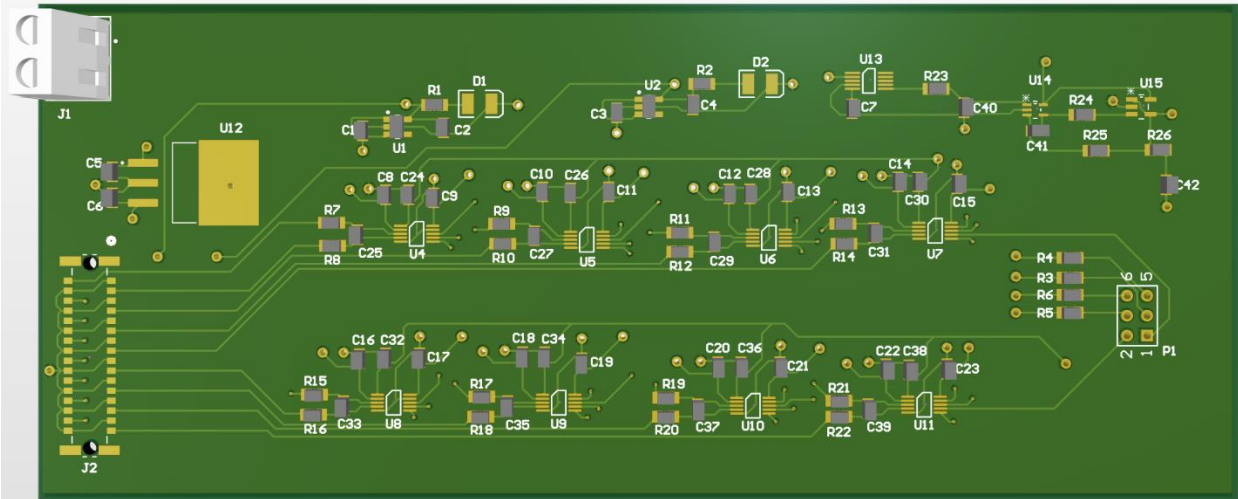

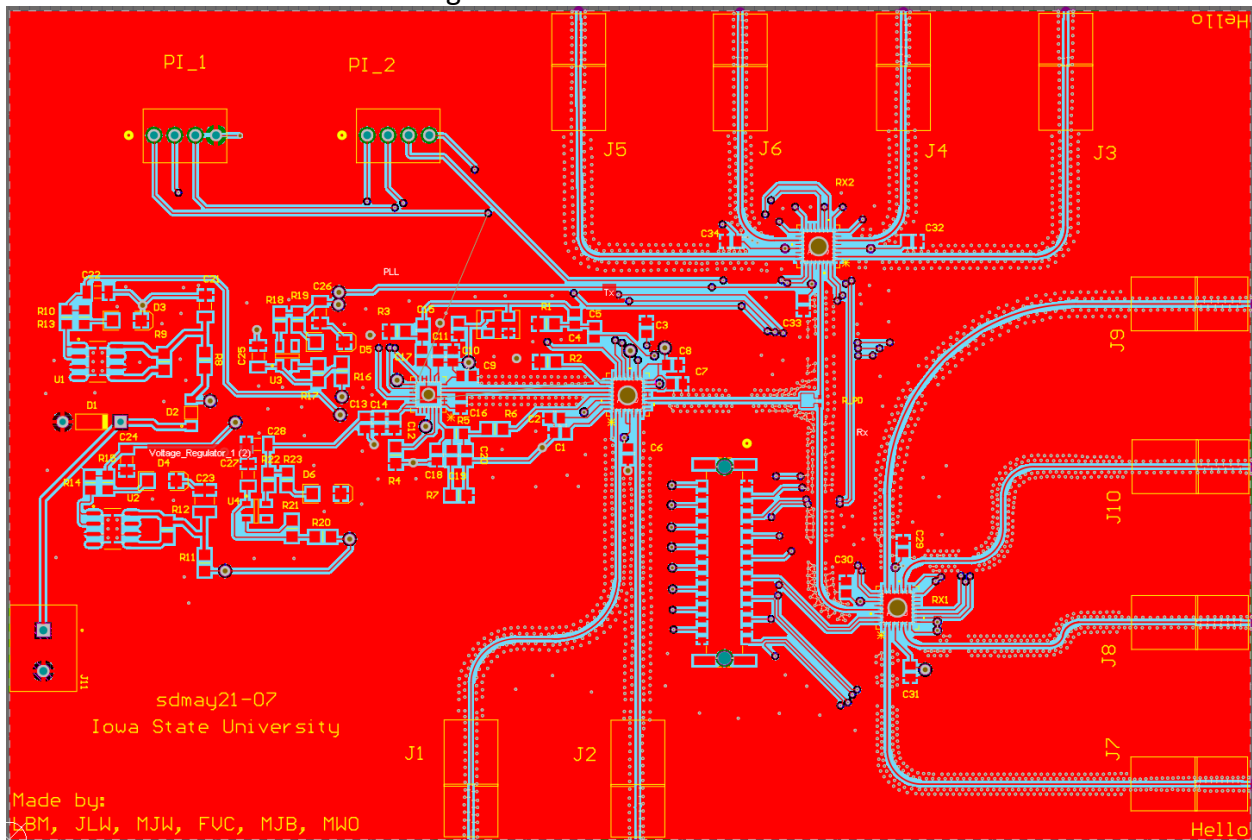Figure 3: Layout of ADC Circuit
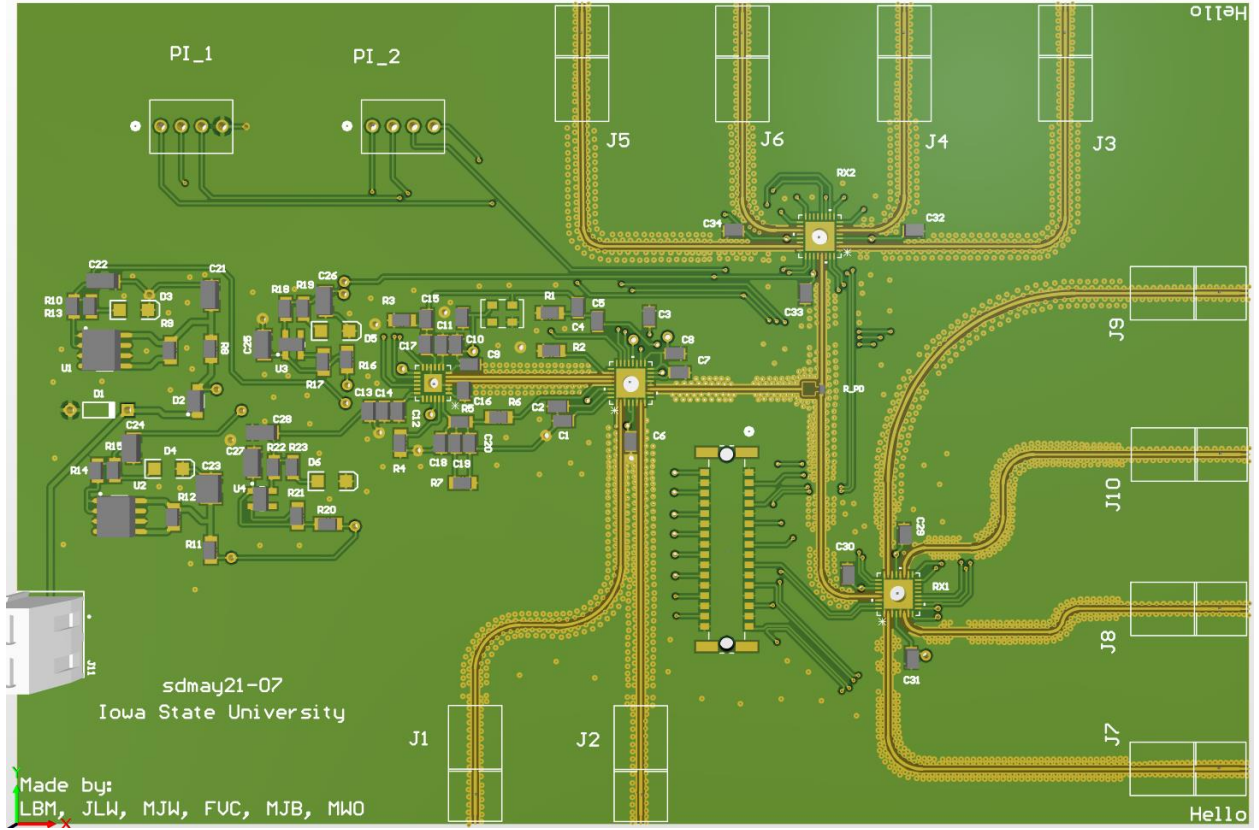
Figure 4: 3D View of ADC Circuit

Figure 5: Layout of Main Circuit

Figure 6: 3D View of Main Circuit