

Logan Wan

MRSD Team B: Arcus

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ILR04

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Individual Progress

This week, I was unable to focus as much as I would like on software. Instead, much of my time was spent on board layout and component sourcing, as well as initial vehicle mechanical prototyping for data collection.

On the PCB layout side, I worked with the schematic that Maitreya had laid out, and sourced alternative components that were actually available on Digikey/Mouser. Many of these components did not have preexisting library files, so some time was spent integrating these packages into EAGLE. This meant that our specified linear regulator needed to be replaced. Since TI provided a very handy component specification and sourcing tool, we decided to also switch to a boost-buck 12V converter for greater efficiency. I also led the manual layout of the board, initially placing components in an easy to understand arrangement such that assembly errors would be minimized. However, in the interest of minimizing board size and shortening traces, components were rearranged for greater space efficiency while being conscious of appropriate trace width.

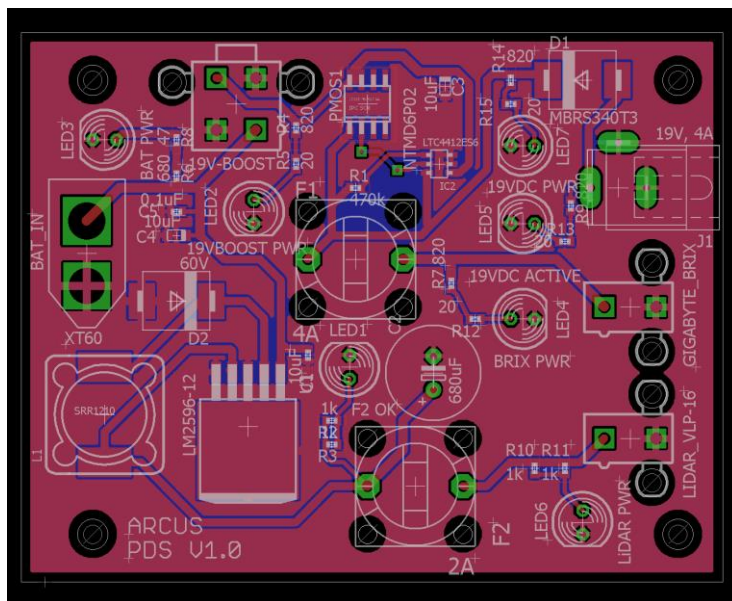


Figure 1: Final PDS board layout from EAGLE

On the mechanical side, I worked with Clare to review, iterate, and manufacture the sensor mounts for the vehicle. These sensors were mounted on the hexrotor vehicle such that we could capture data in-situ, which would be representative of the final data collected by the vehicle in-flight. Final sensor mount CAD is shown below. Because the machine shop was not open, I was unable to fabricate an aluminum heatsink/mounting plate for the Velodyne LiDAR. An MDF version was substituted for the data collection and testing last weekend. Other parts were 3D printed.



Figure 2: CAD of hexrotor vehicle with sensor mounts



Figure 3: Hexrotor vehicle with GPS, IMU, RGB Camera, LiDAR, battery mounted

I also worked with Clare to quickly design and build a rigid vehicle mount for field testing. For convenience and simplicity, we had decided to collect data and test the vehicle while on the ground; agnostic of the flight subsystem. My truck would be the mobile platform, with the hexrotor with sensors mounted to the bed and powered by the built-in inverter in the bed. This testing setup is shown below. The vehicle mount was built out of scrap wood from the NSH wood shop.



Figure 4: Testing setup at LaFarge pit quarry

Challenges

There were 3 main challenges for myself these past two weeks, largely driven by unexpected amounts of time sunk into hardware integration. Because the initial design of the sensor mounts were not flight and 3D printable, we needed to spend more time iterating and improving the design in time for our weekend data collection milestone. This was exacerbated by my inability to access the RI machine shop, despite having taken Larry's machine shop course.

Although expected, I spent much more time sourcing actual components and generating library files in EAGLE. Maitreya and I had chosen components that we largely assumed were readily available on Digikey. This was not the case.

Due to the amount of time spent on the hardware integration, I was unable to make progress on mapping software.

Teamwork

Maitreya worked with me to review the schematic and provide feedback on parts that I had sourced. He has also worked hard on bringing up our calibration pipeline in preparation for our data collection milestone.

Angad spent less time last week on state estimation and testing, and instead also focused on calibration.

Clare worked with me extensively on sensor mount design, as well as fabrication of the vehicle test mount. She also helped Maitreya and Angad with the calibration pipeline.

Plan

Although much of the hardware integration is done, I still need to design the flight electronics packaging, as well as prepare the cabling for when the PCB arrives. I anticipate assembling the board and working with Maitreya to completely validate and test it before we integrate it into the system.

I also intend of diverting more of my time into learning about the mapping aspect of the software, since the integration is now behind schedule as per our timeline.