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Individual Progress update

This week I worked on the design of our Power distribution board PCB, focusing on completing the schematic. I worked around the following constraints:

- Power out requirements
    - 12V and at least 2 amps for the Velodyne Puck Lidar
    - 12 V and at least 2 amps for powering the Nvidia Jetson
    - 5V and at least 3 amps for powering an IMU

Based on these requirements and my own experience designing similar PCBs in the past, I selected a LM2678 voltage regulator (I was also considering a RECOM DC-DC converter, as I mentioned in the concept design for the PCB). From that decision, other component selections fell into place. I wanted to go with SMD components as much as possible to reduce size, but I decided to use through hole for electrolytic capacitors that I needed for output stabilization and for the fuse and diode placement because of the relatively high voltage levels and the relatively high cost of SMD components that meet those specifications. I selected some tantalum capacitors for the input voltage stabilization that were SMD parts but differed from the standard package size of 1206 based on sourcing limitations.

I designed the schematic to have independent power lines to avoid current throughput limitations, and included some LEDs for power line functionality indications. In addition, I included a breakout header for the battery cells, which will be tied to 0-3.3V input to the GPIO pins on the Jetson with voltage divider circuits.

I also worked this week on updating our project management plan and risk assessment table. Last week, when I worked on the first version, I had about 30 risks identified and about 2/3rds of them had specific risk mitigation strategies documented with a risk owner. Right now, I have 40 risks all with risk strategies and risk owners. As part of my responsibility as a project manager, I'll check up on these risks on a regular basis to make sure they are being properly mitigated as we go along.

I also documented our schedule in more detail allowing us to track progress as we approach FVE in a gantt chart. I organized the schedule based on our key subsystems and work functional groups.

Finally, I've helped start to formulate the system links between the onboard computer and the AR interface, and will work more with others on this for next week. We've decided (hihg-level) to have the onboard computer determine an occupancy map and send the data via ROSserial in a matrix to the Epson, which will render the image. This maintains certain abstraction barriers and allows us to better develop the two subsystems independently.

Challenges
We had some initial difficulty getting the Jetson environment set up, but after re-imaging the device we were able to get ROS working on the computer.

As we have continued to work with datasets, there have been some initial limitations there, with the data from LIDAR being so vast as to limit potentially limit our ability to process it in real time on the Jetson, yet at the same time not being super fine to detect small obstacles. We have adjusted a few of our requirements to reflect these challenges and have started to work with some NEA engineers and Air Lab students on solutions, including buffering and sampling. Some of this work has been a bit slow so far since we are limited to work on the NEA datasets at NEA currently, but we are working on getting increased access to more datasets and certain data off-site (this is one of the key risks that we are dealing with).

Teamwork
Joao: Joao met with Jack Mostow this week to discuss recommendations for using speech recognition to switch modes in the FlySense system. He also worked with Nihar to define the preliminary protocol for communication between the AR headset and the FlySense onboard computer in order to effectively communicate the warnings the pilot needs to see. He also started to design some tests and conduct research for hardware tests.

Nihar: After getting the Epson AR headset this week, he worked to create a simple demo with the glasses to test out the performance. He also worked with Joao to define the communication protocol and also met with Prof. Mostow and researched Android options for speech recognition.

Shivang: Shivang worked on getting the Jetson environment set up and got Octomapping running on the computer. He also worked with Hari on refining the 3D mapping and worked with Nihar and Joao on the protocol from the onboard computer side of the interface.

Hari: Hari continued his work on 3D and 2D mapping, exploring optimizations to Octomapping as well as gridmapping, meeting with Vishal Dugar and NEA engineers to work on figuring out the best options.

Figures

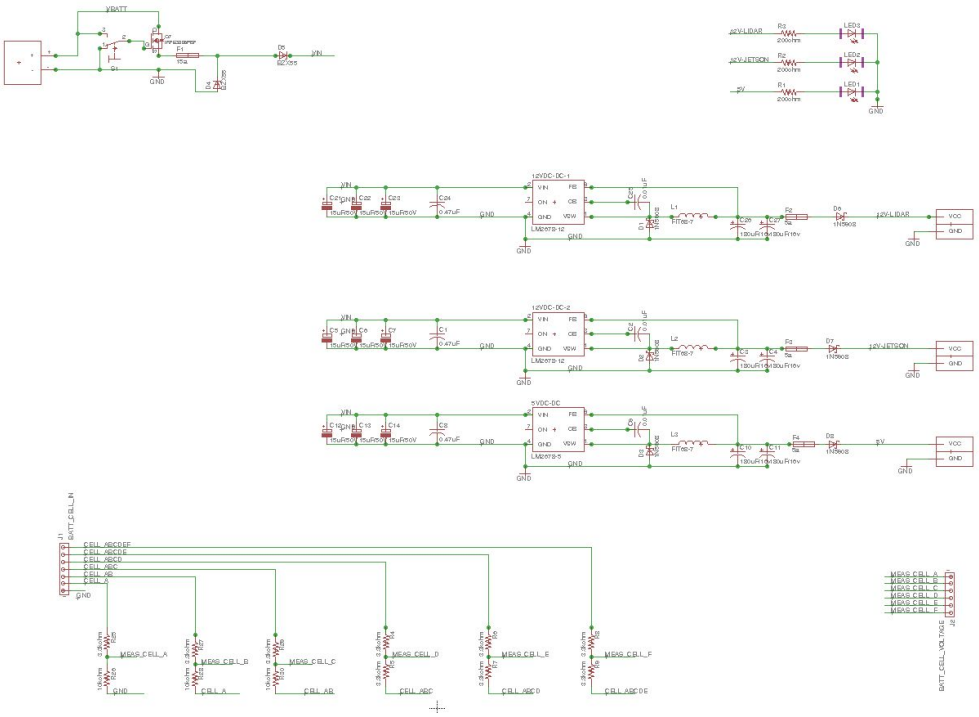

Figure 1: Power distribution board schematic

Figure 2: Part of current schedule. Colors denote risk level attached to each task

Future Plans

Individually, I will work on the layout of the Power distribution board and finalizing the design and components. Similarly, once we get confirmation on levels of support from NEA, I'm going to finalize the design of experiments for our FVE and general systems level testing. I'm also planning to continue my work supporting the mapping to user interface systems integration, working on getting a simple flow from end to end working as soon as possible.

Additionally, I'm going to continue to monitor our key risks and keep our project management schedule and goals up to date.

As for the rest of the team, we have progress goals focused on the following areas:

- Refining obstacle mapping in 3D (Hari)
- Obstacle mapping to 2d (Hari)
- Epson demo of system (Nihar)
- Finalize protocol for communication (Shivang, Nick, and Nihar)
- Jetson work in ROS (Shivang)
- Lidar Testing (Nick/Hari/Shivang)