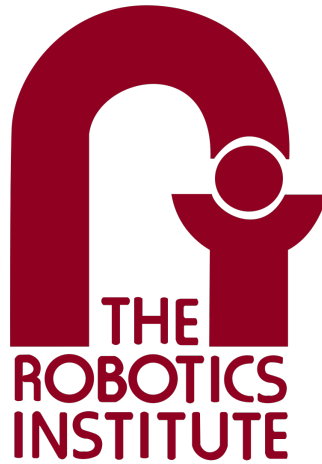

Individual Lab Report - ILR05



Lunar ROADSTER

Team I

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1 Individual Progress

In this phase of the project (from PR3 to PR4), I have worked on the following tasks:

1.1 PCB Manufacturing

We received the printed boards for our Power Distribution Board and all the required components. I worked with the team to solder the components and assemble a working PDB for our rover. We soldered spares too, in order to avoid any hardware redundancy that might arise in the future (Figure 1, picture taken by Ankit). We tested the PCB on bench, and it was successfully distributing the 12 V input to 3 channels (1 each for the 2 motor-controllers and 1 Linear Actuator Controller).

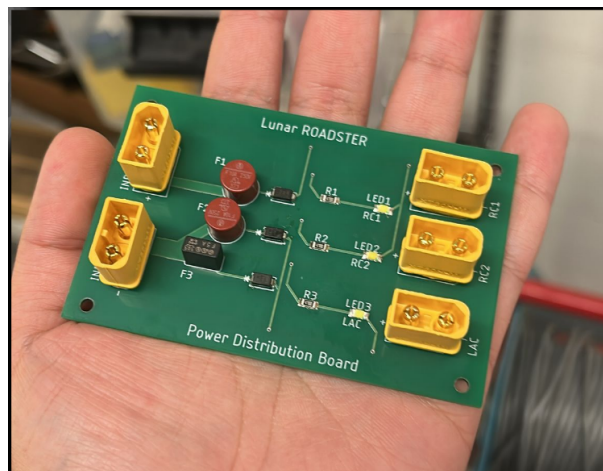


Figure 1: Manufactured Power Distribution PCB - Figure by Ankit

1.2 E-Box Manufacturing and Assembly

As presented earlier, we had 2 different options for E-box walls, and we went ahead with the 5 mm option. There were some inconsistencies with the mounting holes of some components and the locations of the the components on the walls and base were interfering with other parts on the chassis. Thus, I did a quick redesign and laser-cut new sheets.

After this, I worked with other team members to put together the entire electrical assembly – crimping new wires, integrating the PCB with the rover, assembly of the components with the new walls and base, efficient routing of the cables and soldering worn out connections. After the assembly, we tested the PCB on the rover with all the components integrated, and successfully got everything running. (Check out Figures 2 and 3)

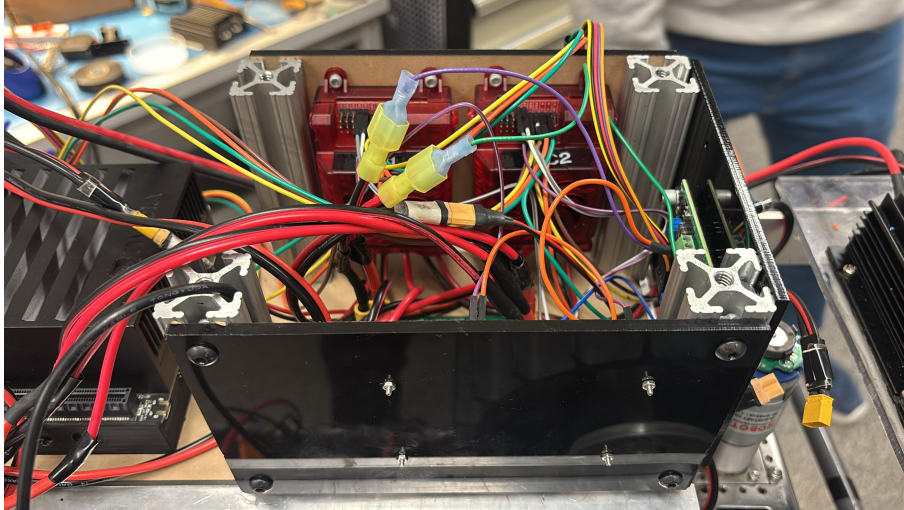


Figure 2: All components integrated with the new E-Box

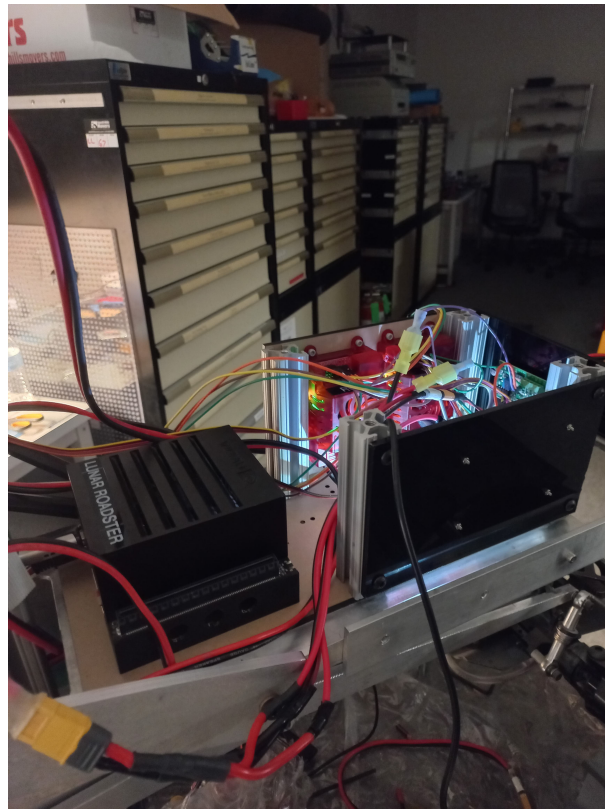


Figure 3: E-Box mounted on the rover

1.3 Software Architecture

I also worked on going through, understanding and charting out the important nodes and messages that flow through the planning stack from CraterGrader's software. This will allow us to understand how the planning stack integrates and works with the other important subsystems like mapping, navigation and actuation. I charted out a rough map to visualize this, as can be seen in Figure 4.

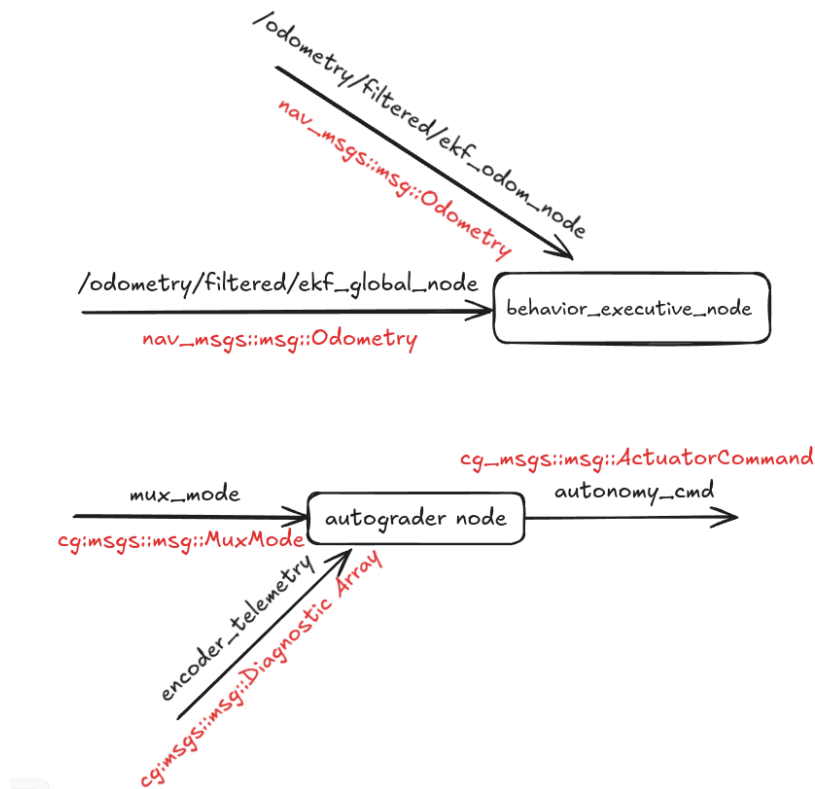


Figure 4: Planning Software Stack nodes and messages.

2 Challenges

- The initial design of the the walls of the E-box had some inconsistencies, and some considerations about wiring weren't taken while designing. I fixed this by redesigning and laser-cutting the new and improved walls and the base of the E-Box.
- We faced some issues with incorrect wiring when we first try to bring-up the rover on jacks with the new E-box. To mitigate this we carried out rewiring individual components and unit testing to map all components and terminals in the electrical subsystem, and avoid any future similar problems.
- I was also tasked with visualizing the planner goals on RViz. I tried understanding the visualization code and figuring out the issue, but was unable to get the goals printed on the screen. This step was essential in order to progress with the tuning and development of the planning stack. Finally, William assisted Ankit to get this up and running, and the goals are now being visualized properly on RViz.

3 Teamwork

The team completed many individual and collaborative tasks this week, which are listed here:

- **Ankit:** Ankit worked on getting the tool planner ready. He implemented it and used the latest map created by Simson to test it. He was able to visualize the

goals created by the planner's optimizer. He also collaborated with Bhaswanth, Simson and I to solder the PCB and troubleshooting electrical hardware issues. He worked with William to integrate the tool planner with the FSM.

- **Bhaswanth:** Bhaswanth worked with William to debug the global localization and correct the rover's yaw error. He also collaborated with Simson to integrate the localization stack with the navigation stack and created an environment in the MoonYard that would closely resemble our demo environment. I collaborated with him to solder the PCB and to manufacture and assemble the E-box.
- **Simson:** Simson was primarily tasked with setting up the navigation stack and integrating that with the localization stack in collaboration with Bhaswanth. He also created a new and improved map using the FARO Laser Scanner with him, that would closely resemble our demo environment. Like other members, I collaborated with him for PCB and E-box assembly.
- **William:** William's work involved debugging the global localization with Bhaswanth. After this, he has individually worked on setting up the sensing stack and integrating an active mapping stack for the same. He also wrote the skeleton code for the FSM behaviour tree, in collaboration with everyone in the team, taking inputs about what each sub-system would require and how everything fits into the behaviour tree.

4 Plans

From now until SVD, I'll be mainly working on integrating all the sub-systems and testing with the team to make sure that the rover performs as expected, and we achieve all system and sub-system level goals for our Spring Validation Demo.