

Carnegie Mellon University

16-681

MRSD Project 1

Individual Lab Report 5

Team C - COBORG

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Sponsor:

Biorobotics Lab

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1. Individual Progress

For this time period, I focused with Gerry on the assembly and testing of the Power Distribution PCB. For this task, we received all the parts, inspected and ensured the parts were what we ordered, and began soldering the components onto the board.

We had 3 parts on the board that were surface mount. No one on the team had surface mount soldering experience, so I took the time to research the best method to solder on the components. I initially used the skillet method, where we apply solder paste onto the surface mount pads, line up the components, then heat the skillet to above the melting point of the solder paste (160°C). Once the skillet reached the melting point temperature, we placed the PCB on the skillet and waited for the board to heat up. I used a laser thermal sensor to ensure that the board did not overheat during this process. I was moderately successful in soldering the components using this method, but we had difficulty removing the PCB from the skillet, and accidentally dislodged a component in the process. To remedy the issue, we used a heat gun to fix the TVS diode component. I then soldered in all the rest of the components using the traditional soldering iron method, and *Figure 1* depicts the current result of the board:

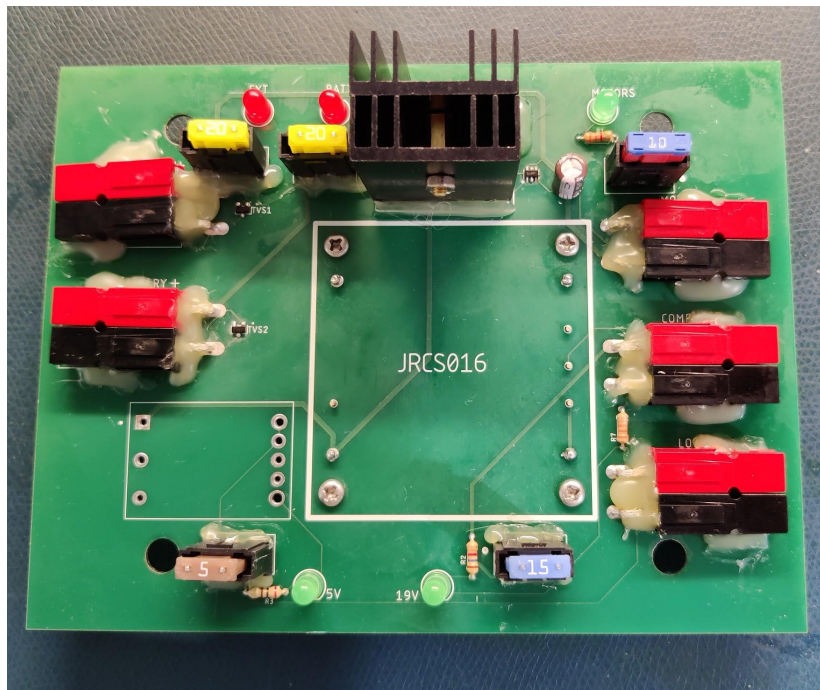


Figure 1. Power Distribution PCB

2. Challenges

A challenge that we are facing is that the 5V regulator we purchased for the PCB did not match what we had designed for. We found the correct part, however, when we ordered the component it turned out to be a variation of the datasheet we originally sourced. Luckily it was a relatively inexpensive part, and the extra 5V regulator we have will go into the MRSD DC to DC storage for future teams to utilize in their PCBs. Once the correct part arrives, we will finalize the board to display next wednesday.

Another challenge that I am facing is that we need to have a method of timing the subsystems as they are validated for the SVD. I have been tasked with creating a timing node that keeps track of when data inputs into the system and when that data translates into a subsystem action. For example, we need to know at what time the YOLOv3 node recognizes a hand and how long it will take for that hand to convert into a goal for our robot arm to begin its motion planning. The first ROS assignment is a great reference for this, as we had to track time of interactions between nodes for our submission. Below in *Figure 2* I show the output of the ROS node that will be the backend of our timing service for the SVD:

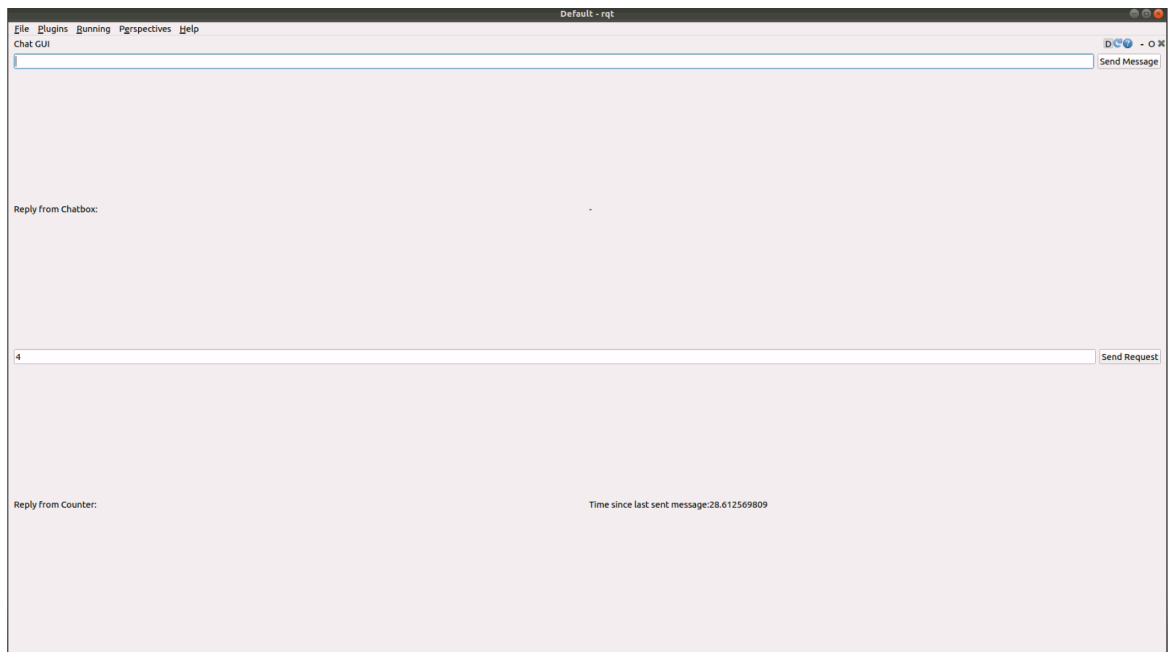


Figure 2. ROS Timing Service

3. Teamwork

Below I detail the progress of the team as the project progresses:

- Jonathan Lord-Fonda:

His role is going to play a critical part in the upcoming weeks. Jonathan is incharge of integration and validation testing, so he will be setting up validation testing and executing it alongside subsystem leads to ensure that everything goes well for SVD. He has been updating the validation plans, including updating the strength test of our robot to match what we will be demonstrating in the fall. Outside of subsystem validation, he has been working with Jason to implement impedance control for the robot arm.

- Gerry D'Ascoli:

Gerry has been the technical lead for our electronic hardware components and the voice subsystem. We have both been active in testing, validating, and soldering the Power Distribution PCB for the upcoming demonstration. He has also worked with Jonathan to finalize the voice subsystem validation plan for SVD.

- Feng Xiang:

Feng is incharge of the motion subsystem of the Coborg. Together we calibrated the robot arm to the URDF model, and after that was completed he measured the transform between the robot frame and camera frames for validation. He also worked with Jonathon to perform pre-SVD testing on the actuated manipulation subsystem.

- Yuqing Qin

Yuqing is the vision subsystem lead, and this week she wrapped up the vision system. After completing the subsystem, she worked with Jonathan to validate the vision subsystem performance and integrate the vision system into SVD testing. She then worked with Jason on the integration of the vision system with the actuated manipulation in preparation for the Fall semester.

4. Plans

We are on track for the Spring Validation Demonstration (SVD). To prepare for the SVD, we will time a full run the weekend in advance to ensure that we can demonstrate all of the subsystem components in the allotted time. If we find that our subsystem demonstrations take too much time, we will pivot into partially recording the validations that are less important and demonstrate live the main features of our robotic platform. We are also looking into demonstrating integration of the subsystems hopefully for the SVD Encore as a means to stay ahead of the Fall schedule, which will be demanding.

SVD:

- Conduct a full demonstration of all subsystems and validate performance to pave the way for the Fall semester integration.