Motor Motion Control System: Project Summary

I. Explanation of Design

Oregon State's Mars Rover Team has received national recognition for its work in developing, building and operating a small-scale Mars Rover. While the six-axis arm works extremely well from the outside, the motor controllers within the arm have two major flaws: they are difficult to reprogram and lack customizability. To combat these problems, our team developed a custom motor controller that can be easily programmed and controlled via a custom GUI. The system consists of a motor and quadrature encoder connected to a custom PCB. The built-in microcontroller is controlled by the custom GUI.

II. Approach

The project was first developed by Trevor Murphy, a member of the Mars Rover Team. He identified the flaw with the motors currently in implementation and worked with the Mars Rover Team to identify a solution. Our team then looked at the big picture project, which was too large for the scope of this term. We evaluated the fundamental principles of the large-scale solution and developed a smaller-scale project to show these ideas. Much of the work we did this term demonstrates the concepts that could be implemented on a larger scale for use in the Mars Rover Arm.

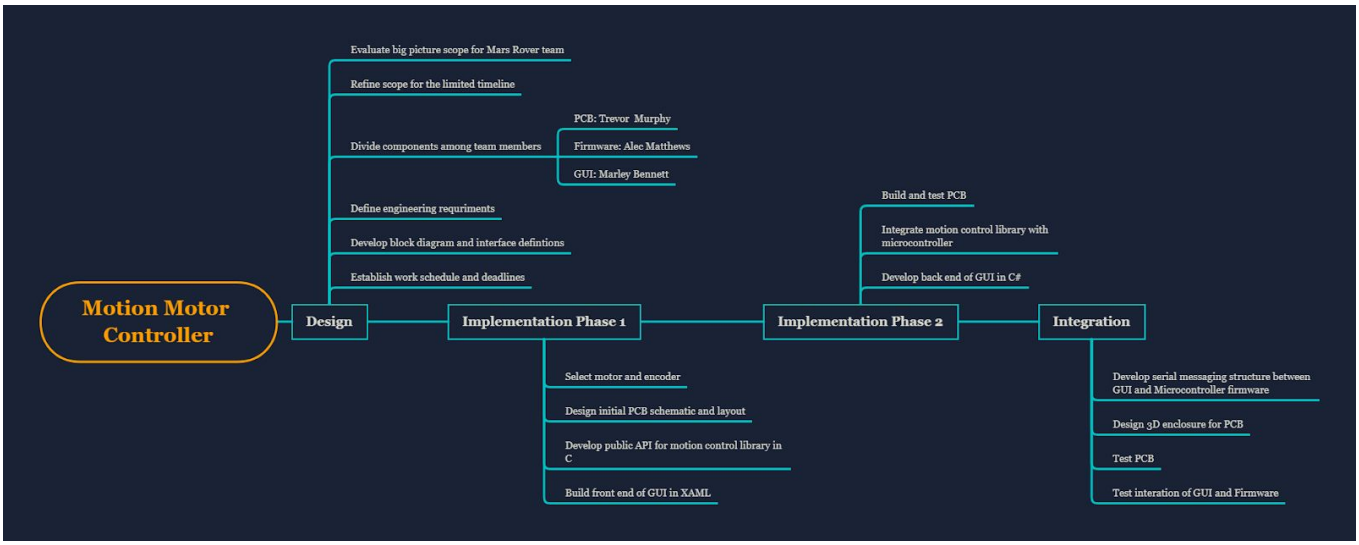
In the next stage of development, we separated the design work into pieces. Trevor Murphy was responsible for the PCB, Alec Matthews was responsible for the firmware code, and Marley Bennett was responsible for the GUI.

The team then integrated our individual pieces to the best we could given the restrictions of being remote. This resulted in the integration of the GUI and firmware code. This was tested on a development board with an embedded microcontroller chip.

In the final stage of development, we reflected on what we accomplished and how it can be built upon to eventually be implemented in the Mars Rover Arm. We are hoping to continue working on this for senior design in order to fully implement it (hopefully without remote restrictions) and expand the scope to properly meet the requirements for it to be used in the Mars Rover Arm.

III. Project Timeline

The project timeline can be found as an attached artifact. It represents the big picture scope of the project with developing phases consisting of design, implementation phase 1, implementation phase 2, and integration.



IV. Key Lessons

- Start early when designing electric circuits that need to be manufactured.
- Plan time for debugging PC software and microcontroller firmware. There will be issues with these items no matter how hard you try to make if perfect.
- Global pandemics tend to shift the availability of parts and manufacturing.
- Designing and building a custom microcontroller platform is really hard!

- Remote collaboration takes time and effort from everyone involved. Having a relaxed attitude is not possible when so much orchestration needs to happen for a remote project to come together.