

Motor Motion Control Systems; Anticipated Questions

Below is a list of anticipated questions. Any additional questions can be directed to the group members at the emails listed below:

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1. How would you continue development if given more time?

If given more time, we would first fully integrate our project. The constricted timeline coupled with the remote restrictions made it impossible to fully integrate our components. After that, we would expand the scope of our project and develop a more robust system with the Mars Rover Team's specific parameters and needs in mind.

2. What lessons did you learn from the project?

I think the key lesson we all learned was the importance of communication. When meeting in person, it's easy to have a cavalier attitude towards teamwork because everyone is so accessible. When relying on virtual communication, however, everything is just a little bit harder. It required a more concerted effort to work effectively and efficiently. We found that integration became especially difficult because of communication blips throughout the process.

3. What would you do differently if you could do it over?

If we could do it over, we would plan out the big picture more completely. While we did make plans for the overall project, because of the constricted timeline and the surprise of working remotely, many of the details of our project were refined along the way. While developing a more detailed plan at the beginning would still have been difficult, we would have saved time and reduced stress by having those details ironed out earlier.

4. What was the biggest challenge and how did you approach it?

Our biggest challenge was certainly working remotely. While we made use of task managers like Trello, had weekly meetings, and communicated regularly over text, virtual communication, as previously mentioned, is difficult. It's hard to see if the work is being evenly divided or if someone is struggling and looking for support. This difficulty was exacerbated by the inherent need to be together to complete our project. While, for

the most part, we had the tools we needed for individual development, it was impossible to fully integrate and test our system without being in close proximity.

5. How would you change the firmware if you had more time to develop?

If this firmware had more time to be refined, I would have chosen a different approach to standard libraries. Currently this project used the ST HAL (hardware abstraction layer) libraries. These are known to be of mediocre quality. Any real world application should be using their own abstractions on top of the standard ARM development libraries. Creating our own abstractions would remove code bloat, shrink binary size, and provide more insight into the inner workings of the microcontroller.

6. How would you change the GUI if you had more time to develop?

If there was more time to develop the GUI, I would have focused more on designing the user interface and developing a better understanding of the end product. I ended up having to make changes to the front-end throughout the development process because I didn't understand the end goal well enough when I made my initial design decisions. I also would have gathered more information about how the project would be expanded and what impact that would have on the GUI. I am not sure how a future developer would extend this project, so while I tried to make the code extensible, I am not sure if I did so in the best way.

7. How would you change the PCB if you had more time to develop?

The PCB ran into multiple issues in its development from the idea into a physical working prototype. I would have spent more time developing the schematics and researching the parts that were used for PCB to slim them down and lower the cost of the parts on the PCB. There were also issues with getting design reviews done and getting them right from the start. A few key elements were glossed over from not allocating the proper time to revising the issues that were diagnosed from the reviews. Also I didn't notice my issue of forgetting to add thermal reliefs to the GND pads, but that is one of the key issues with manufacturing this version of the PCB.