Subject: Automated Microbial Analysis Update

Date Sent: 03/10/2020

Hello Scott,

We have made some good progress towards the overall design of the project. We have partitioned the workload into Mechanical, Electrical and Computer Science sub groups to help with organization.

**Mechanical**

The mechanical system has undergone a few upgrades and optimizations since the last update. We have added some structural supports to the 2020 T-slot extrusion that will offer more stability and durability to the overall frame skeleton. We have also 3D printed new arms that are more material efficient and weigh less (allowing for more torque to go towards the end effector). Right now the goal is to cut the final plastic sheets that will act as end stops for the motor and for enclosing the system workspace. These will be made using black ABS and thin, clear polycarbonate and will be cut using a precision laser CNC machine. Looking forward we are going to print some PLA spacers for the arms that will increase rigidity and will give more freedom of motion to the ball joint ends.

**Electrical**

The Electrical portion of this project has made great progress since the last update. The system now has full range of motion utilizing the new PCBs. There is a video showcasing such movement here: <http://bit.ly/2vYo9RF>. There are a total of four PCBs in the system as of now: three Stepper Driver PCBs and one Central PCB. The Central PCB is responsible for sending the control signals to the correct Stepper Driver PCB, while the Stepper Driver PCB is responsible for translating such signals into physical motor movements. Furthermore, the signal generation software has undergone a few minor changes in order for smoother motor operation while using less current. Additionally, the new Stepper Driver PCBs utilize a different model of Stepper Driver daughterboard, which allows for much quieter operation compared to the previous drivers. In the coming weeks, the homing process will be implemented on the new chassis, and the end effector is after that. Progress has been consistent, and I’m optimistic of the future of the electrical aspect of this project.

**Computer Science**

Since our last update the computer science portion of the project has progressed significantly as well. The user interface is complete and displays all the appropriate information. Additionally, the system is outputting all of the collected data to a .csv. We will continue refining these features to fit your needs as far as formatting the .csv file and displaying the information that you will want to see. Zach will be contacting you next week via email to discuss these and other questions we have on some of the finer points of the project. We have also integrated the automation controls into the system which includes adding the vacuum pump to allow for picking up of samples.

In the coming weeks we will continue to integrate our designs into the system. All of the updates we have provided in this email, as well as any future updates can also be viewed on our GoogleSite. As always, we will all be available by email to answer any questions you might have.

Thank you,

Zach Bendt

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