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Team F
Individual Lab Report 7

Individual Progress

This week I have made a lot of progress on the development of the electrical system, along with the camera system.

Last week I designed a Driver Board to hold all the different drivers and this week I fabricated it. I designed it such that we should just have wires coming from one side and going to the Arduino MEGA. It took many hours to complete it, but I wanted it to look clean. It is shown in Figures 1 through 3. These diagrams are from the initial board I made. The board now additionally has two LEDs for showing that the 12 V and 5 V lines are on. It also has new pins for powering the Arduino from the 5 V line. After I was done, I passed it on to David and SooHyun to make wires to go between it and the Arduino. I used all female headers since it is easier to make jumper wires using male headers than having to crimp wires over and over again, plus the Arduino only has female headers. The board is designed to supply power to the whole system, along with managing wires, and making replacement of components easy since it is all centralized. I accomplished the design and fabrication by myself, except for the integration of the LEDs.

The CMUcam4 has given me quite a headache. To reiterate what happened, the camera didn't seem to be getting the correct values for tracking the colors. When connecting with the FTDI cable, there were no issues. The images were crisp and sharp. When commanded by the Arduino, the images were not recognizable when tracking. I also created a mini target board for testing, shown in Figure 6, however it turned out to not work very well. The colors are just too different.

I tried a new library that seems to be much simpler. When I integrated it, I still had many issues. However, I instead wrote a very basic program and everything worked fine. I had a basic version with the switches made for the system demonstration. The code is shown in the Code section. Essentially, the system just looks at the initial switches and tracks based on which color switch is selected. I discuss it further below. For the System Demonstration, I rigged together the CMUcam4 with an Arduino UNO with a switch board to determine which color to track. This is shown in Figure 7. Figure 5 shows the assembly of the lower part of the system. Note the integration of the power supply and the Driver Board.

Last week I chose the power supply we wanted to use. I tasked it to David to figure out how to get it to work. I assisted him to make it work. The final product is shown in Figure 4. The jumper wire is soldered such that it will never fall out.

I assisted on debugging issues with the system when there were unexplainable issues. I discussed this in the Challenges section on the burned out stepper drivers.

Challenges

So we faced a couple of challenges. While David and SooHyun were programming over the weekend, they managed to burn out both of the stepper drivers. On Tuesday, a similar thing happened but only to the larger driver. This was a bit of a step back in both cases. When these things happen, we have to debug the system to track down the problem, and then once we find the problem, we have to test the component to make sure it is damaged. So when these stepper drivers died, we first had to determine they were in fact the source of the problem. After that, we had to test the driver to make sure it was definitely burned out. This is a challenge because it uses up valuable time and it costs the project money.

To resolve the problem, we are switching to a servo. We have burned through too much time and money trying to solve these issues. This makes our lives much easier. It eliminates the need for the limit switches, makes the code much simpler, and it makes the system faster by eliminating calibration time. This seems like a good solution to the problem.

The rack and pinion system not being done has definitely been a challenge. Without it, we haven't been able to get started on the look up table. This isn't Richard's fault since he's been playing catch up since his family emergency over the weekend.

The issues with the CMUcam4 have definitely been a challenge. I haven't been able to track down the source of the problem. It is unclear what the issue with the original code is, so thus I've had to essentially start from the ground up with the code. I need to further investigate why the original code doesn't work. I hope to figure this out as I rebuild the code brick by brick.

Teamwork

We split up the work as usual, however I also took on designing the board for the drivers. I also worked on the CMUcam4. Richard fabricated more parts. SooHyun and David worked on programming the system.

Richard was able to create a base for the system, made gears for the rack and pinion, and created an initial prototype for the ball feeder. The baseplate is essentially for mounting the power supply and for holding our electrical components. The rack and pinion is a work in progress, but he's taking the steps necessary to get it working perfectly. The ball feeder is considered lowest priority, but something that needs to be designed, tested, and improved.

SooHyun and David assisted in making wires for the Driver Board to the Arduino MEGA. They were also tasked with programming the system, however they've been greatly limited because Richard hasn't completed the rack and pinion. Without that working consistently, programming for the look up table for shooting cannot be started. David also was tasked with figuring out the power supply and what needed to be done to hook it up to the system.

Future Work

All the work this week is towards completing the system.

For the next week, Richard should finish the rack and pinion system. He should also have a fully completed feeder system that we can test. This is of course based upon the servomotor coming in on time. We do not need the feeder system to be able to start creating the look up table.

Given that the rack and pinion system is done, we will be able to start on the look up table. SooHyun and David should have a basic look up table done by next week. They do not need the feeder system to test.

I will have hopefully figured out the mystery of the CMUcam4 by next week. Things seem to be going better now, but who knows. I will be gone this weekend, so I'm pushing to make a lot of progress on Thursday and Friday.

Figures

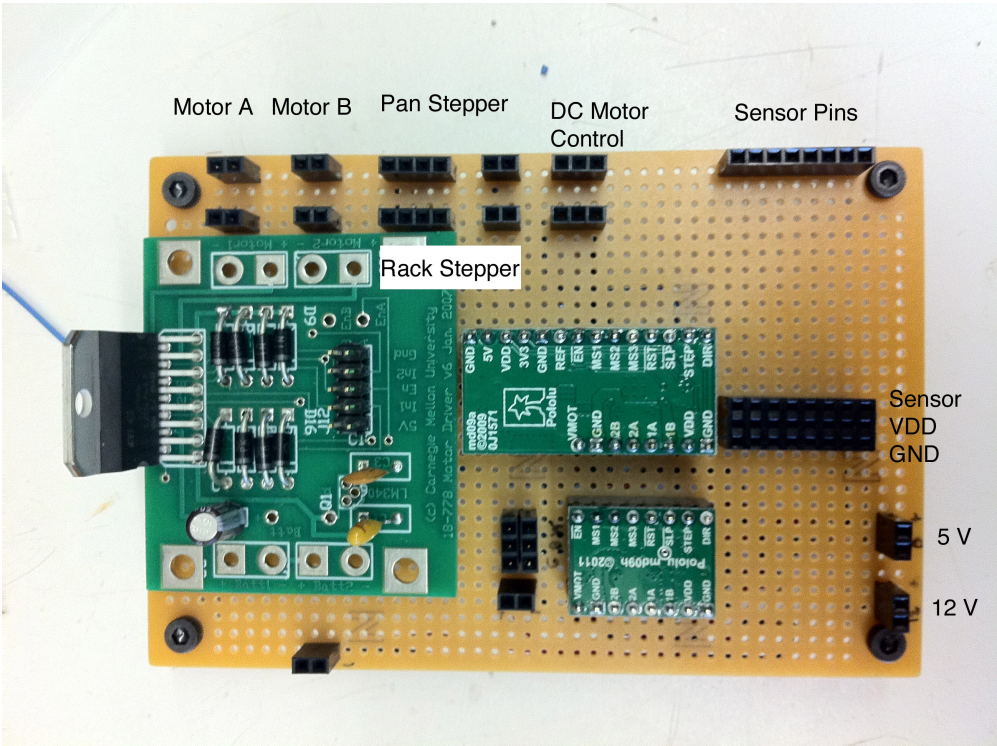


Figure 1. Driver Board Top View

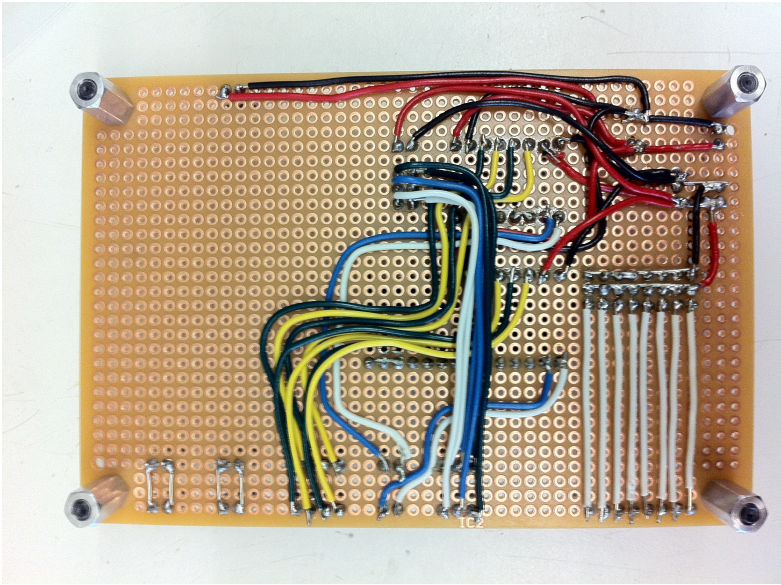


Figure 2. Driver Board Bottom View

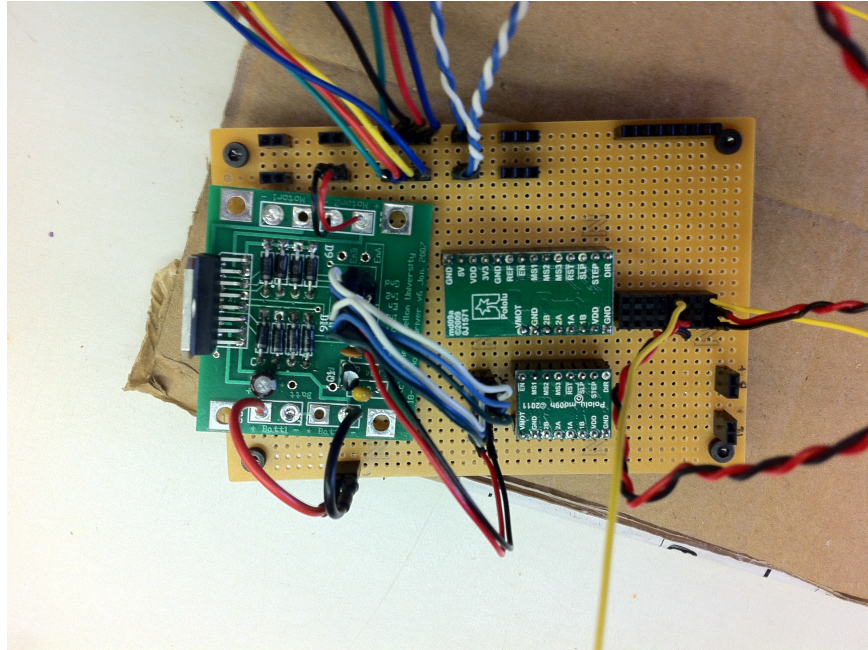


Figure 3. Driver Board Partially Wired

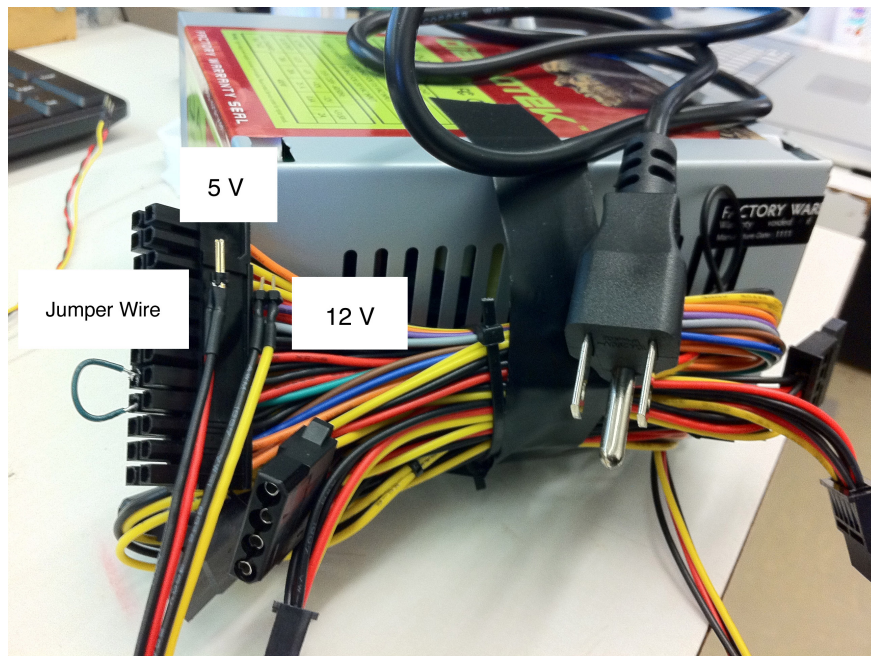


Figure 4. Power Supply

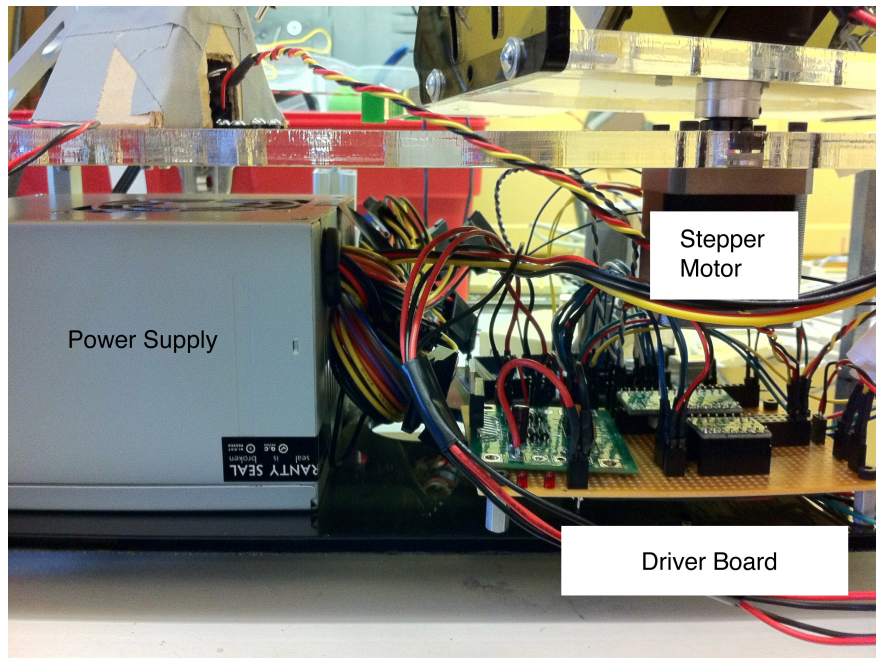


Figure 5.

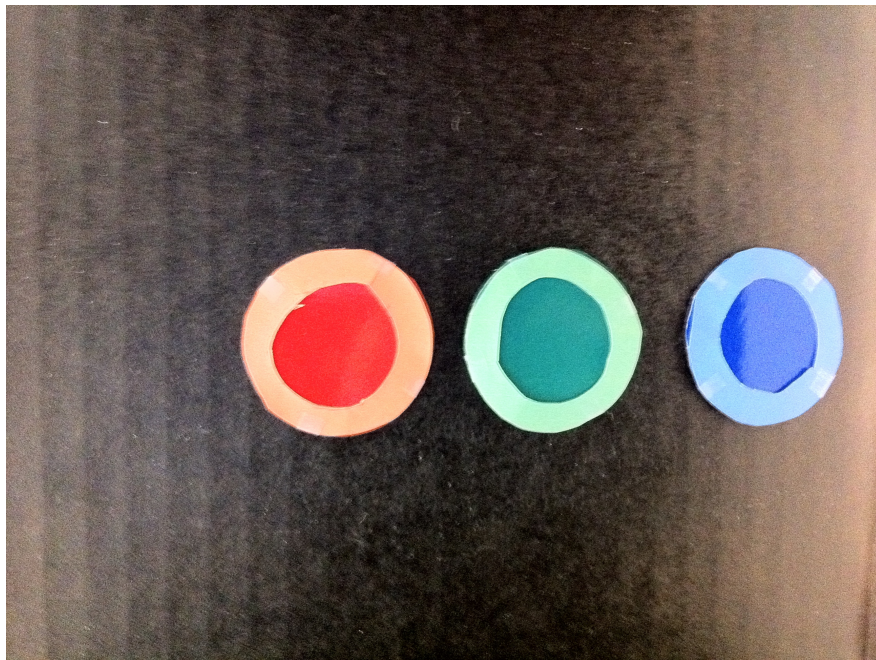


Figure 6. Mini Target Board

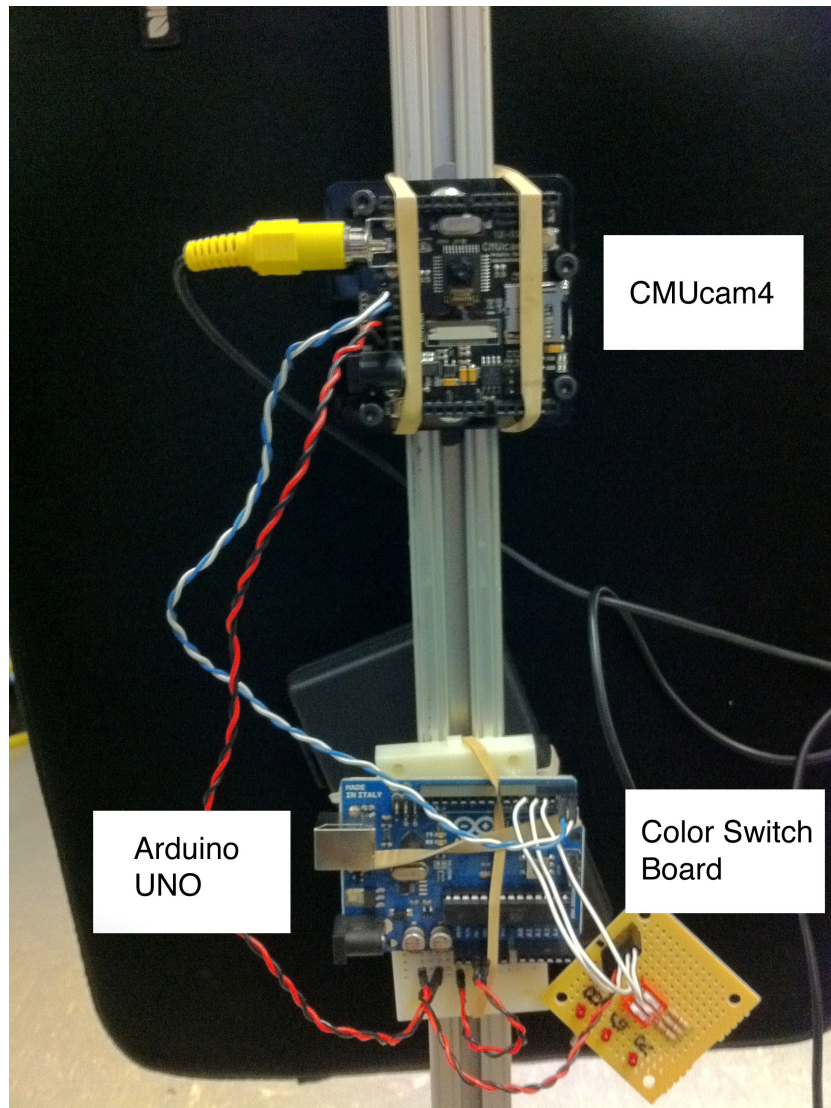


Figure 7. System Demonstration

CMUcam4 Pseudo Code

This code is designed to just track a specific color and print out the data. Nothing fancy. Like I said earlier, I had to go back to the basics. This code is mainly for being able to see what the camera sees.

