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Team G, Bobs the Builders

Teammates:

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Individual Progress

The first task I worked on was the completion of the sequence diagrams that define how each step in our process will function. Many of the diagrams for moving the part from the camera to the tray had to change because of a redesign in the system. We are now using electromagnets as both a way to pick up parts and as a way to flip parts over if they are upside down. Previously, we had intended to use a combination of servos and different paths to flip pieces over but now it has been simplified to only use a single servo and a single electromagnet. Next, I worked on control software and wiring for the rail system. The system needed to be tuned to allow for a full range of motion without over extending in either direction. Also, I was able to fix a problem with the stepper motor used in the rail system. The motor was overheating because the enable line was always set which means that the motor would draw current even if it was not moving. Now the enable line is controlled with the arduino so it can be disabled when stationary. Finally, I added additional picture to the website and updated the parts list.

Challenges

A problem with the rail system was that there was not a good way to attached the timing belt to the tray. The crimps that we were trying to use did not bend how we expected so the connection was not as secure as we wanted. We used tape for the other timing belt connection which is only a temporary solution. Another problem with the rail system was that the mount for the stepper motor was a little too small which caused the shaft of the motor to rub against the mount. We were able to adjust the screws and fix the problem but in the long term the hole in the mount will need to be drilled to a larger size.

The hoppers that we prototyped did not preform as well as we had expected. First, we were not able to create all of the prototypes due to problems with the 3D printers we were using. Second, the pieces required a large amount more agitation then will believe is possible with a vibration motor. Once the rest of the hopper prototypes are made, which is a goal for next week, we will have more information on how to resolve this challenge.

Teamwork

I worked together with Guillermo on the software for controlling the rail system. Guillermo had been working on the GUI previously so he integrated the control software with a GUI for the lab demo. Christian made the CAD designs for the hopper prototypes. Together Christian and Michael 3D printed two hoppers and tested them to see how easily parts would be able to fall through the hopper in the correct orientation. Michael lead the construction of the rail system which included cutting mounts, attaching the timing belt, and setting up motors.

Figures

There will be three total rail systems for our project. On the bottom of the frame will be the rail system for the tray (see figure 1). On the top of the frame will be the rail systems for the part placer and the flux and wire dispenser. Each rail system is controlled by a single stepper motor. There is a timing belt that connects to one side of the tray, wraps around both the stepper motor and a pulley, then connects to the opposite side of the tray. The tray is mounted to two rails with linear barrings which allows it to slide with minimal resistance. Now that we have a functional rail system for the tray we will be able to copy the design for the upper rails without needing significant changes.

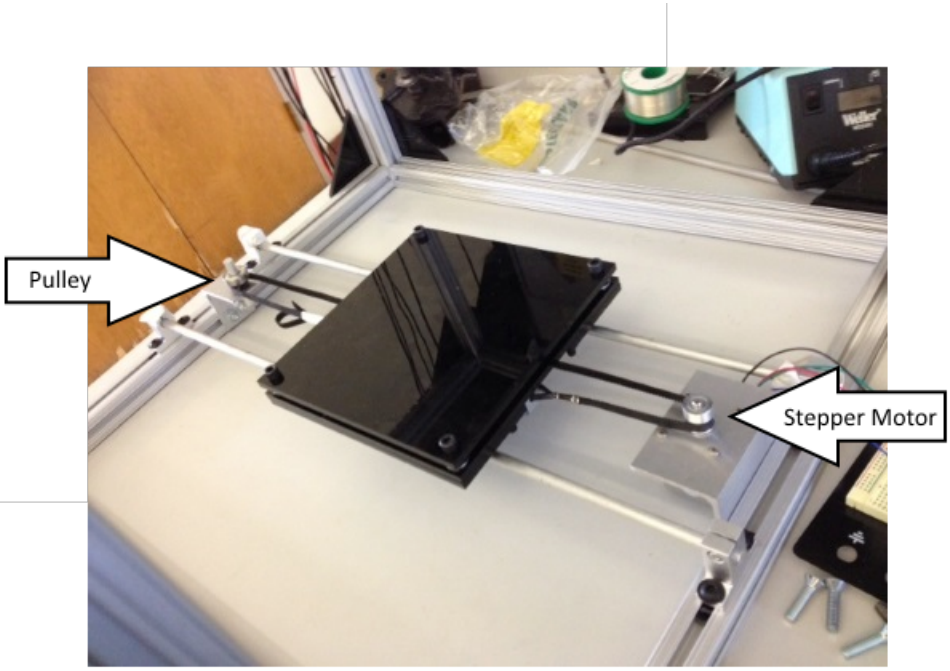

FIgure 1. Rail System for tray

Plans

The main goal for next week is to have the ability to pick up and place parts. A linear actuator will be built using a rack and pinion and DC motor with a optical encoder. At the end of the linear actuator will be a servo and electromagnet. The electromagnet will allow for the part to be picked up and placed and the servo will allow for the part to be rotated if it is not in the correct orientation. The entire system will be mounted to one of the two upper rail systems. Together with the lower rail system that was built this week we will be able to move pieces from one location on the tray to any other location on the tray. Michael will be working on manufacturing the mounts for the motors and rack and pinion. Also, Michael will assemble the upper rail system once the parts arrive. Christian will be finishing the prototypes for the hoppers. Guillermo will be proofreading the website since the first website check is soon. Additionally, Guillermo is working on a way for the GUI to be a stand alone executable.

I will be working on control software for the part placer based on sequence diagrams 2.1, 2.2, and 3.1. The software will need to be tuned to calculate the distance the the rail systems move based on the number of steps that the motor moves. This may require changing the step size to use micro-steps, which are up to 1/16 the size of a full step, if the precision of the system is not fine enough. Additionally, I will be working with the camera to begin the basics of the vision processing that will be needed to determine part orientation.