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Team G, Bobs the Builders

Teammates:

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IRL02

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Individual Progress

For this weeks lab I worked on setting up electronics and writing software to interface with the sensors. I soldiered the DC and stepper motor drivers. Also, I preformed all of the wiring from the sensors, buttons, and motors to the Arduino. The work for the software was divided such that Guillermo would complete all of the GUI and I would complete the state machine for controlling the motors using sensor inputs. The software had a idle state which commanded each motor to stop and an activate state for each motor sensor pair. The state was changed by a limit switch that we used as a button. The denounce for the button was handled in software that required a rising edge and operated at a low enough frequency that is was not possible to detect multiple edges in a single button press. The first state was for the servo which had it's speed controlled by a flex sensor. The second state was for the DC motor which was controlled by a potentiometer. When the angle on the potentiometer was changed the motor would rotate to match the change in angle. If the motor overshot it would then rotate in the opposite direction until it reached a resting position. Then angle of the motor was tracked through a optical encoder handled in a software interrupt. The third state was the stepper motor controlled by an IR sensor. The motor would act as a linear actuator and as the distance from the IR sensor changed the motor would follow the object viewed by the sensor. Then we combined the code into a single program for the Ardiuno.

Also, I worked on updating some of the documentation for the team website. I updated the parts order form. Then I began to work on designing sequence diagrams for each step of the machine's task. The task was broken down into five steps some of which could require a different solution depending on part orientation. The steps consisted of first moving the part from the separator to the camera. Second, picking up the part from the camera. Third, playing the part on the tray. Fourth, fluxing the flux onto the part. Fifth, Dispensing wire onto the part.

Challenges

The component that caused the largest amount of issues this week with the optical encoder on the DC motor. There was not a lot of good documentation for the encoder so some simple mistake were made that could have been avoided. The first issue was that I did not realize that the output from the encoder required pull-up resistors in order to give correct logic high and logic low values. Once this was fixed the software for the optical encoder also caused issues. Initially handling the square wave output from the encoder was done in the main loop. However, this meant that the value of the output could miss rotations if the sampling frequency was too low. The solution was to instead have the sensor input handled in a software interrupt that was triggered whenever the input changed.

Another issue was that often software that was providing good control would become unstable once changes to other systems were made. In particular once the software for the GUI and the state chart where combined the performance of the system decreased dramatically. So much time was spent working on the GUI and the sensor control state chart individually that there was very little time left to solve these bugs before the lab demo.

Teamwork

Michael and Christian continued to work on the CAD design of the rail system and the hopper. They worked together to cut new rods and assemble a rail system with sliders for where the part orientation system, tray, and flux and wire cutter will go. Also, Christian helped update information on the git hub account. Michael also laser cut a rack and pinion

out of acrylic to be used with the DC motor. Guillermo worked almost entirely on the GUI for the lab presentation which was a very difficult and buggy task.

Figures

The purpose of a sequence diagram is to demonstrate the order in which data will be received from sensors and sent to motors. Events are shown with an arrow and events occur from top to bottom. An example of a sequence diagram can be seen below (Figure 1). This diagram shows the process for moving a part from in front of the camera to the tray. The part must first be moved to its pick up location. Then the part placer must mobe along it's rail so that it is also at the pick up location. The the part placer extends its magnet to grab the part. Then the part placer and tray move so that the part can be placed in it's final location on the tray. Once a sequence diagram is made for each possible use case of the pre-tinning machine generating the software will simply require translating each sequential event into a command to a motor or an interrupt received from a sensor.

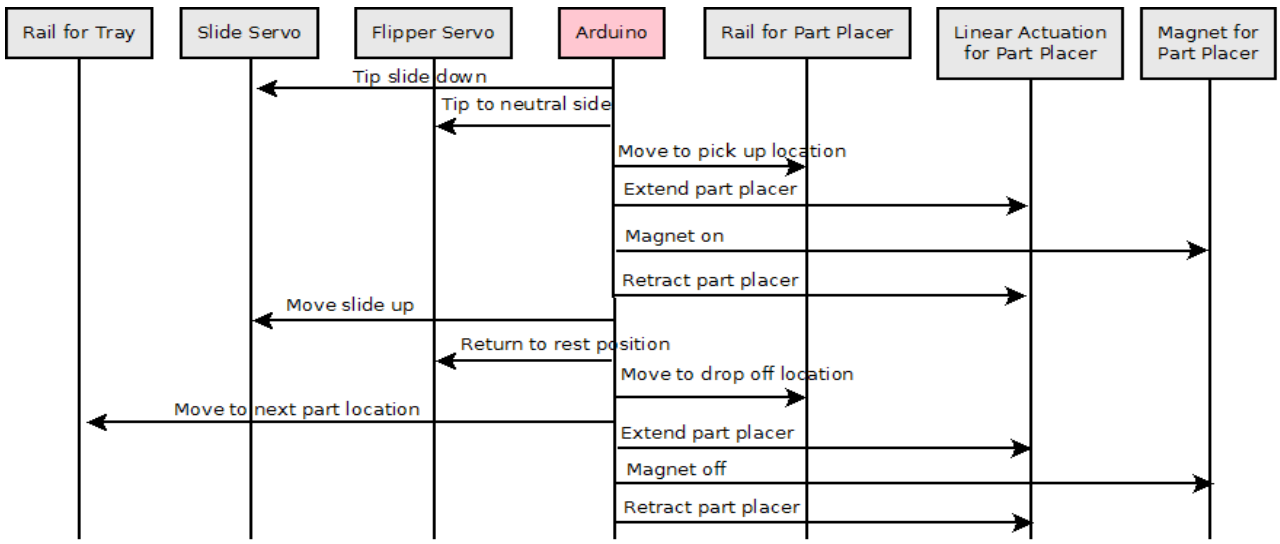

Figure 1. Sequence Diagram 2.1: Pick up part from camera (correct orientation)

Plans

For the following week we plan to finish the sequence diagrams and have a more clear understanding of how we will go about re-orientating parts. Currently we have several ideas for flipping parts over which include using a trap door, using electromagnets, or using different slides. The order for the electromagnet arrived so it is now possible to create some tests to see which of these implementation will give the best results. I will most be working on setting up the camera for use will the raspberry pi. I now have the libraries available for interfacing. I will be writing software to capture images and seeing how easily the images can be processed. Guillermo will be working on coding a serial connection between the raspberry pi and the arduino so that once the vision processing code is complete we can use the data to start controlling motors.

Once the final parts for the timing belts arrive the team will be constructing a single rail system. We are only constructing one for now because we want to analyze the effectiveness before ordering the parts for the order two rail systems. Michael will be working on completing the rack and pinion with the DC motor. Christian will be 3D printing and testing different hopper designs for the part separator.