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Fall 2023

## Robotics Independent Study Project Proposal

### Project Summary

Last semester, two other students and I spent the vast majority of our time dealing with issues trying to connect the image we received from a camera with commands we send to the arm. For this project, my main goal is to standardize and simplify the usage of a camera with a robotic arm. This will be done by creating a standard rig for mounting a specific camera above the arm in a set location and then improving the algorithm for determining a location between the camera and the arm.

This project will have 3 distinct sections that must be accomplished mostly in order:

1. Creating a rig for a camera mounted above the arm.
2. Improving the calibration between the camera and arm for a camera in a set location.
3. Simplify and improve on the arm control by creating a more modular package that abstracts out most of the difficulty for future students to use.

I consider success for this project to be, at a minimum, creating a standardized way of setting up the camera and improving the calibration method. This is essentially just steps one and two from above, the third step is still my final goal but is mostly just to make using my code easier for others.

### Further Details

Section	Details and Implementation Ideas
1	The rig will most likely be made of 3D printed PLA (Possibly swap to stronger materials such as PETG if need arises). I have extensive experience using PLA and 3D printers. I have several ideas for how to set up the camera on a 3D printed stand that attaches to the base of the arm, but only iterative design and prototyping will determine the best method.
2	I have the basic math for connecting a location from the camera to coordinates for the arm, and once the rig is set up the variables can be dialed in much further. Until then, improving the formula previously used is a huge step in the right direction. To improve our formula I will most likely be plotting a line of best fit on as many data points as I can, the data points being the difference between location in a single direction and corrective variable needed for the arm to be accurate at that location. The more points I plot, the more accurate the model will be.
3	Similar to how Veronica created an interface to control the arm easily, I plan on creating an interface on top of that with methods specifically for semi-automated calibration, and if there is time, I will also be adding the secondary control methods for the arm that will follow objects and adjust the location of the arm based on the location of the object.

### Tentative Timeline

I have 12 weeks before finals, 13 weeks in total if I use time during finals. I am expecting steps one and two to take 4 weeks, with the remaining time being dedicated to step 3, but I will be working on multiple steps at the same time where I can so those numbers may not be accurate. Not to mention that as with all programming, nothing ever goes as smoothly as planned, but hopefully I can at least finish the minimum success requirements by the start of finals in time for some kind of demo or recording just before finals begin.