ECE 1000 Final Report: Robotic Arm

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This project is a fully functional robotic arm. The reason our group chose to construct a robotic arm is because we wanted to incorporate our skills in construction, coding, and configuring servo motors to give us a robotic arm controlled by joystick as our final product.

Keywords—Micro Python, Servo, Joystick, Breadboard, Robot Arm, Raspberry Pi Pico

I. Introduction

The robotic arm constructed by our group has three main capabilities all controlled by joystick commands. Our robot arm has the ability to rotate 360 degrees, move up and down vertically, and has a functional claw that opens and closes. We chose this project as a group because the construction process and coding mechanics required to make this robotic arm fascinated us and we all agreed that we would enjoy the aspects of this project. A project such as this is could be utilized in a variety of different situations and professions. One example would be that a robotic arm could be used to perform surgeries as the human hand is not quite as precise as the functionalities of the robot arm. We are:

Ryan Ball – Computer Engineering Major

Logan Garrett – Electrical Engineering Major

Lloyd Harris – Electrical Engineering Major

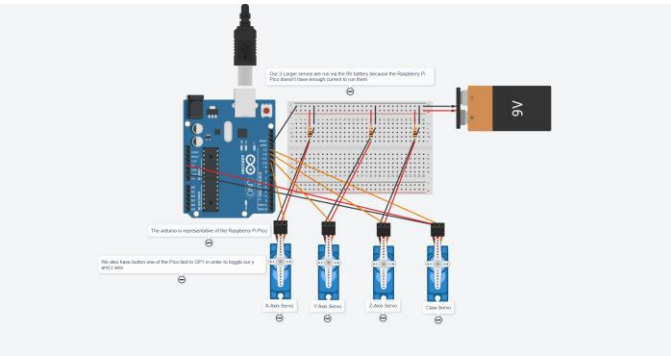
In constructing our robotic arm, we drew ideas from several different examples to make our own unique product.

II. Background

We started by deciding on our project, and after we chose the robot arm and informed JC, he sent us a few examples from Thingiverse. In that email JC sent us, we found the design we chose called "EEZYbotARM MK2" by user daGHIZmo. After we decided on the design, we submitted it to the iMakerSpace to get the parts 3D printed. We used ChatGPT to help during the coding process, using it to learn how to make the arm save its position when the joystick is released, what frequencies our servos run on, and what the function of each pin on the Raspberry Pi Pico board was used for. We also used a tutorial video called " EEZYbotARM MK2 3D Printed Robot Build" by user Chris Riley.

III. Project Description and Formulation

For our base servo, we ran a jumper wire for the pin, power, and ground corresponding to orange, red, and black respectively. The pin connects directly to the Arduino on the Raspberry Pi Pico, for our x-axis we connected to pin 10, our y-axis is connected to pin 11, our z-axis is connected to pin 12, and our claw is connected to pin 13. For our larger servos, we connect a 9 V battery to the breadboard, from there we ran a jumper wire to a row, followed by a resistor, followed by the power cable we connect to the servos. For our claw servo we connected the power directly to the 5 V output found on the Raspberry Pi Pico. To ground our circuit, we connect the breadboard ground to the ground on the Raspberry Pi Pico, and each larger servo is connected by a jumper wire to the ground of the breadboard. We use button one on the Raspberry Pi Pico to toggle between our y-axis and our z-axis. To do this we connect button one directly to pin one of the Arduino.



IV. Discussion and Results

The results of our robotic arm were a success. The robot arm was fully functional with the capabilities of 360-degree rotation, vertical movement, and an operating claw that opens and closes. Micro Python code was written to make the robot arm responsive to the commands of a joystick. If time permitted our group could have further adjusted the code to fix minor bugs/delays. We enjoyed the fact that we were able to decide on a design, construct our arm, and code all the programs required to make our final product a functional robot arm. Ryan was the main contributor in establishing a design and assembling the pieces to construct the robot arm. Lloyd was in charge of completing the GitHub page with all files and folders attached and also helped with assembly of the arm. Logan was the main contributor to the code written to perform the actions of the robot arm.

V. Conclusion

The purpose of our project was to create a robot arm that is able to rotate 360 degrees, move vertically, and have a functional claw. The skills acquired by the group were how to code in Micro Python, how to send 3D prints to the iMaker Space, how to integrate servos into coding, and incorporating general problem-solving skills. In the end, we successfully constructed

and coded a robotic arm with the capabilities to fully rotate, move up and down, and have a claw that opens and closes.

References

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