ECE 1000 Final Report: Robotic Arm

1st Jocelyn Lee, 2nd Jack Fennell
line 2: *ECE Department*
line 3: ECE 1000: Explorations in ECE
line 4: Cookeville, TN
line 5: jalee45@tntech.edu & jafennell42@tntech.edu

Abstract— For our final project we selected the robotic arm. We made this choice because it seemed like an interesting challenge that incorporated our interest in robotics and was a fun way to learn how to integrate code and physical components. It can move based on the input from a joystick and can pick up items and move them.

Keywords – Arduino Joystick Robotic Arm, Raspberry Pi Pico Robotic Arm

I. Introduction

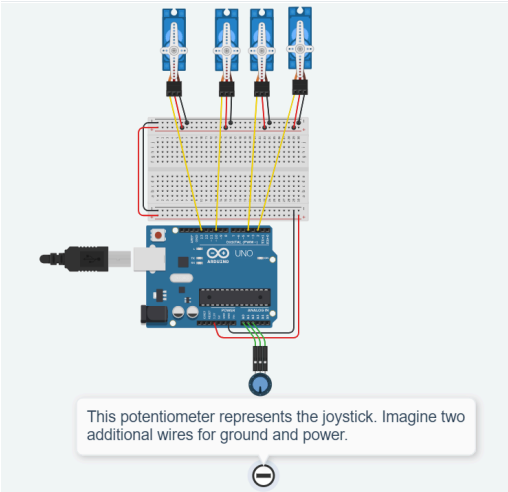
We are both fascinated by the idea of robotics. It's a field that has revolutionized industry, medicine, and countless other things. When allowed to pick our projects this one stood out immediately. We want to jump head-first into the realm of robotics and this seemed like a great way to do that. We will be able to carry this experience and knowledge with us through the rest of our major and even into our careers.

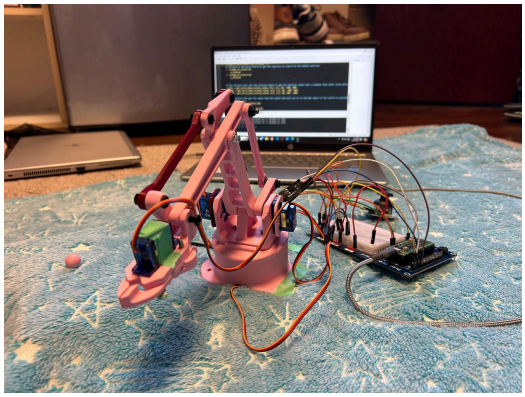
II. Background

The source we used to create this project was "EEZYbotARM" which was made by Carlo Franciscone. We used their 3D model blueprints of the robotic arm and their Instructables for reference when putting the robotic arm together. Portions of the code were sent to us by JC and we adapted it to fully fit the needs of the arm.

III. Project Description & Formulation

The majority of the magic was done in the code. It utilized MicroPython code and the machine library that comes with it. Using the ADC function, pins twenty-six and twenty-seven are assigned to the x and y-axis inputs from the joystick itself. The switch is connected to pin 16. The servo instructions are sent out through pins zero and one with pin zero instructing the rotating base and pin one with the hinging arm. Pin three instructs the claw to close based on the switch input. Using functions to read the joystick input and translate it to a more readable form, we can instruct the servo motors to move up to ninety degrees left and right. The 3.3-volt pins are wired directly to the joystick, as that is the voltage required, as well as the breadboard to allow us to send the power out to all of the motors. Ground is also wired to both the joystick directly and into the breadboard to allow for easier distribution. The hinging part of the arm includes two motors for better balance and weight distribution. Since the motors are facing one another they have to mirror each other in motion to be able to function. To solve this we wrote code that instructs one of the motors to rotate left when its counterpart rotates right and vice versa.





IV. Discussion and results

The project as a whole was a success. We were able to create a working robotic arm with four servo motors and a raspberry pi pico. Were we to continue working on it, we would like to change the code that interprets the joystick movements to allow the motors to move with less force. If we made this change the arm would move smoother and be easier to control with fewer jerky movements. We would also like to re-route the wiring to make the whole project look cleaner. We enjoyed having a first look into the realm of robotics and experimenting with the pi pico and the micropython code. The process of 3D printing, though difficult at times, was very interesting and ended up working perfectly. Jack Fennell worked to create the program using the building blocks that JC provided. Jocelyn Lee found the 3D print files for the robotic arm. Together we built the model using the 3D printed parts, wired the system, and troubleshot the project once it was assembled.

V. Conclusion

We built the robotic arm as our final project since we both have a fascination with robotics. Just from this project, we learned how to program a MicroPython script and operate 3D printers. As well as how to take analog input, and convert it to digital information using the Raspberry Pi Pico, and to cooperate efficiently with another person on an engineering project. The assignment resulted in a working robotic arm and newfound knowledge that we can translate to our future classes, projects, and careers.

References

[1] Franciscone, C. (2015, September 21). *EEZYbotARM : 19 Steps*. Instructables. https://www.instructables.com/EEZYbotARM/

[2] Franciscone, C. (2015, September 21). *EEZYbotARM by daGHIZmo*. Thingiverse. https://www.thingiverse.com/thing:1015238

[3] Williams, JC. (2024, April 15). *ECE-1000-Spring-2024-Final-Project-Insert-Project-Name*. GitHub. https://github.com/JCWilliams1003/ECE-1000-Spring-2024-Final-Project-Insert-Project-Name/tree/main