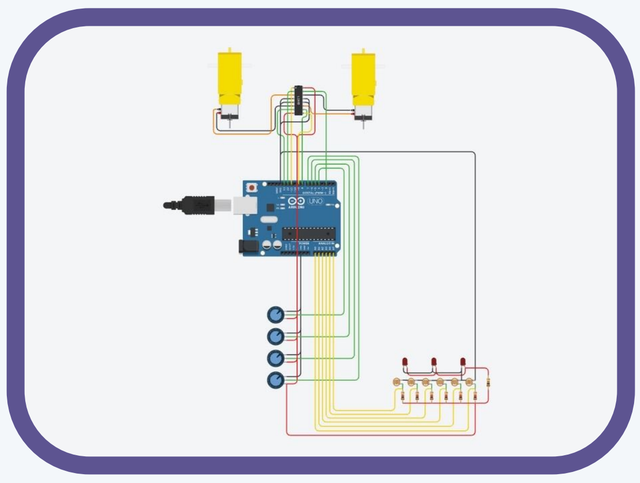
ECE 5 | Fall 2025 | Lab 4

Robotics and Control Systems

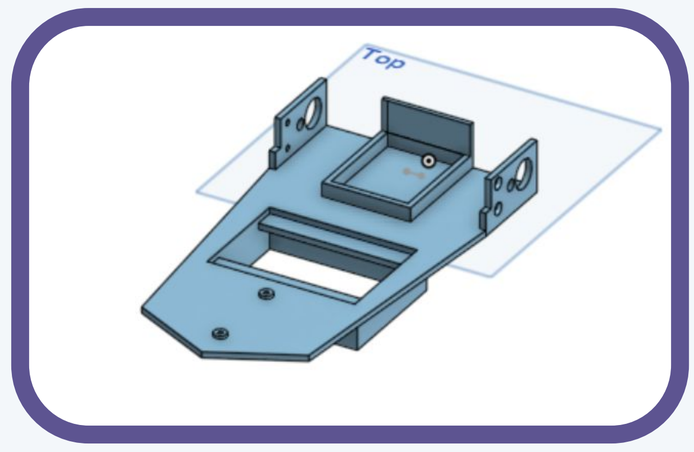


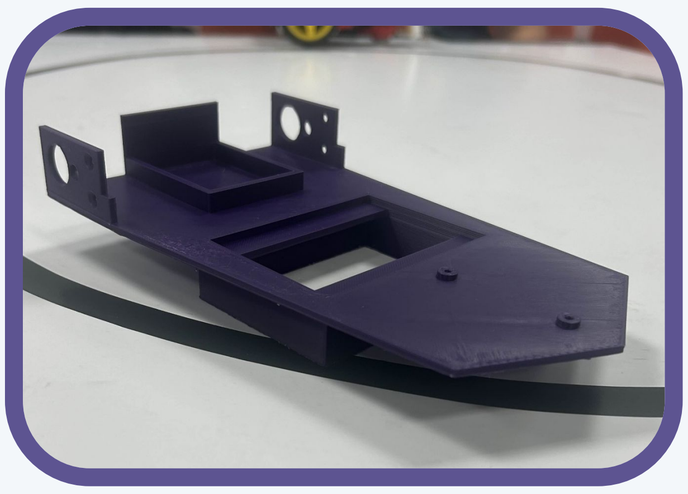
SYSTEM BLOCK DIAGRAM

- Using PID, the robot is able to take inputs from the photoresistors to follow a line
- Manual adjustment is available by turning the potentiometers to alter the P, I, and D speed levels
- Appropriate power is then sent to both motors independently

CAD MODEL

- A cutout was made to house the protoboard with the photoresistors
- A light shield was constructed to prevent outside light interference of photoresistor readings
- A wall was constructed in the rear to support the potentiometer protoboard



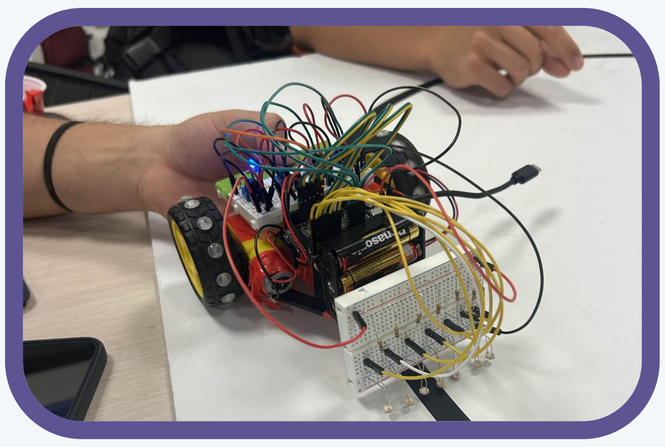


3D PRINT CHASSIS

- Our final chassis design was 3D printed
- Some modifications, such as decreasing the height of the light shield, were made after initial assembly of the components on the new chassis piece

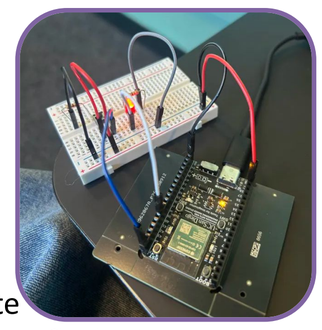
ROBOT ASSEMBLY

- This design was used to complete our seeding laps and calibrate the PID values
- The assembly was primarily held together by tape and breadboards are present as protoboard soldering was not yet used due to testing



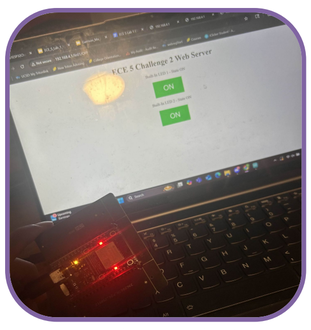
ECE 5 LABS

Lab 0: Microcontrollers



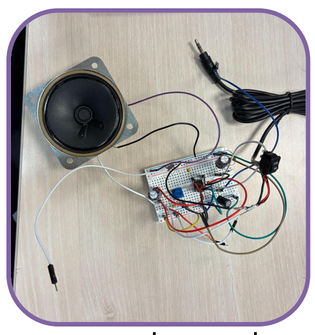
We created and tested circuits with the esp32, using code in the Arduino IDE to interact and communicate with the esp32. We flashed LEDs, read light values with photoresistors, and printed outputs in the serial monitor.

Lab 1: Communication



We expanded on our esp32 experience by creating a website using the board and Arduino IDE, which allowed users on the website to control two LEDs. Functions included flashing as well as different colors.

Lab 2: Analog Circuits



We were introduced to using a virtual bench to read signals from various filters such as high and low pass filters. Additionally, we created a speaker circuit using OpAmps, amplifying sound from a connected device and using potentiometers to alter volume.

Lab 3: Digital Signal Processing

We learned how to use Matlab to display and filter digital images. We learned how to take photoresistor inputs from a circuit and plot the data on a Matlab graph, allowing us to visualize changes in the photoresistor readings in a plot.

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