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ECE 428 Final Paper

Introduction:

To create this project there are several materials that need to be used:

- Arduino Uno
- Laser cut acrylic base
- Large breadboard
- Piezo buzzer
- LCD module with I2C serial interface adapter
- Ultrasonic Sensor – HC-SR04
- PIR sensor
- Wires (multiple, various lengths)
- 2 DC motors with wheels
- L298 motor driver
- 9V battery supply

Circuit:

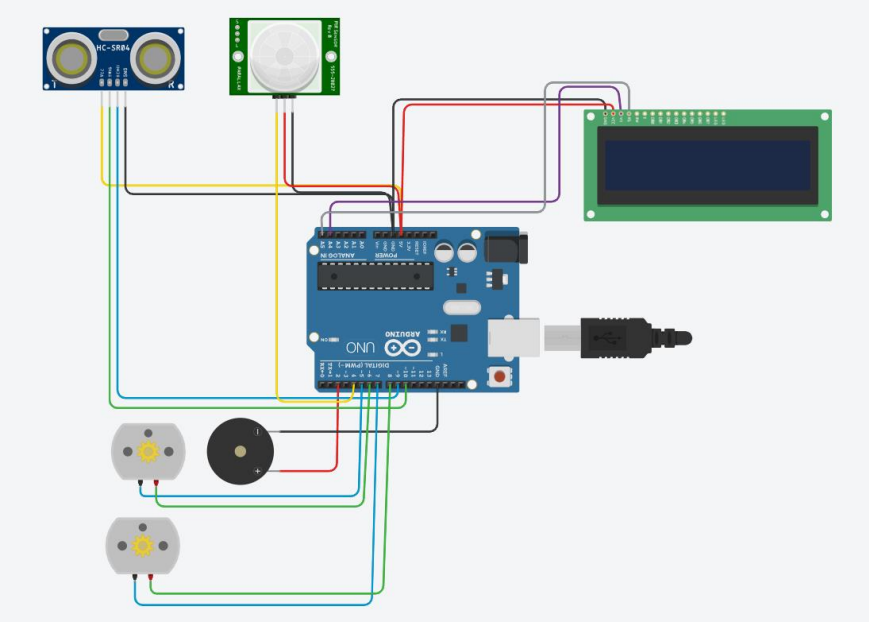

Figure 1. TinkerCAD mockup of circuit

In Figure 1, the mockup created on TinkerCAD for the circuit isn't one-hundred percent accurate due to it not including components such as the I2C adapter and L298N driver.

To wire up the circuit, here are the Arduino ports the components must be plugged into (not including GND):

- Ultrasonic sensor
    - VCC – 5V
    - Trig – Digital port 10
    - Echo – Digital port 9
- PIR sensor –
    - Output – Digital port 4
    - Power – 5V
- Piezo buzzer – Digital port 2
- LCD
    - SCL – Analog port A5
    - SDA – Analog port A4
    - VCC – 5V
- DC motors
    - Motor 1 – Digital port 5, digital port 6
    - Motor 2 – Digital port 7, digital port 8

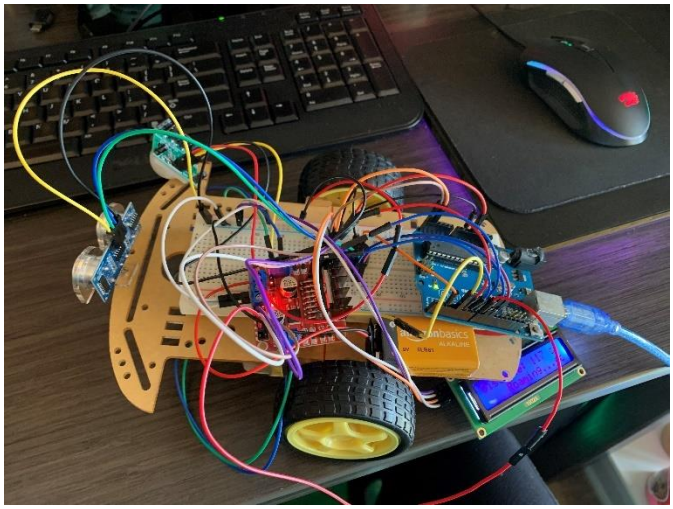

Figure 2. Wired up robot

Figure 2 shows the robot, however using shorter wires may give the circuit a cleaner look. The 9V battery supply is connected to the L298N motor driver.

Program Flowchart:

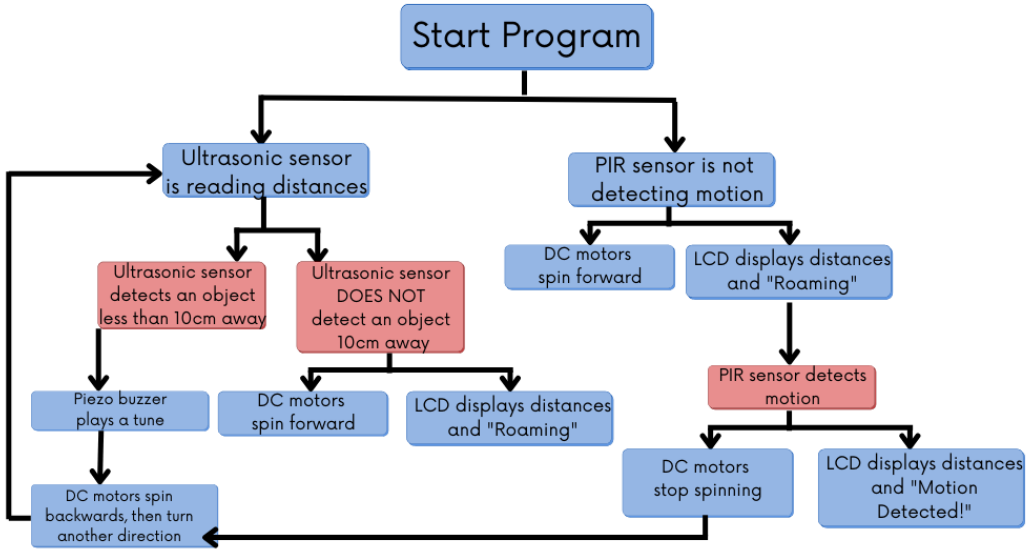

Figure 3. Program flowchart

The flowchart shows how the program functions. When this program begins, the ultrasonic sensor and PIR sensor are working in conjunction with the DC motors. The DC motors are moving froward. The ultrasonic sensor is reading distances and displaying them on the LCD module. When motion is detected by the PIR, a message saying, “Motion detected!” will be displayed on the LCD and the DC motors will stop. If an object is 10cm or less from the ultrasonic sensor, the Piezo buzzer will play a tune. The DC motors will then spin backwards, turn to the side, and the loop begins again.

Project Code:

This program was created using the Arduino IDE. The library LiquidCrystal_I2C from GitHub was used to interface the I2C module with the LCD. The “Wire.h” library was also used in the code.

I2C Library: https://github.com/fdebrabander/Arduino-LiquidCrystal-I2C-library

Future Plans:

In future development for this project, there are some ways the project can be improved. Firstly, different motors should be tested, such as servo motors or stepper motors. The DC motors were too complicated to implement and didn’t work for the project.

Secondly, if DC motors are to be used, farther testing should be done to ensure the motors work. Tests such as attaching the motor to a battery or testing the L298N using an oscilloscope may help diagnose the issue. Simply testing the motors with a basic program to control them is not enough.

Lastly, shorter wires will give the robot a cleaner appearance. Possibly creating a shell that stores the circuit will give a cleaner appearance.