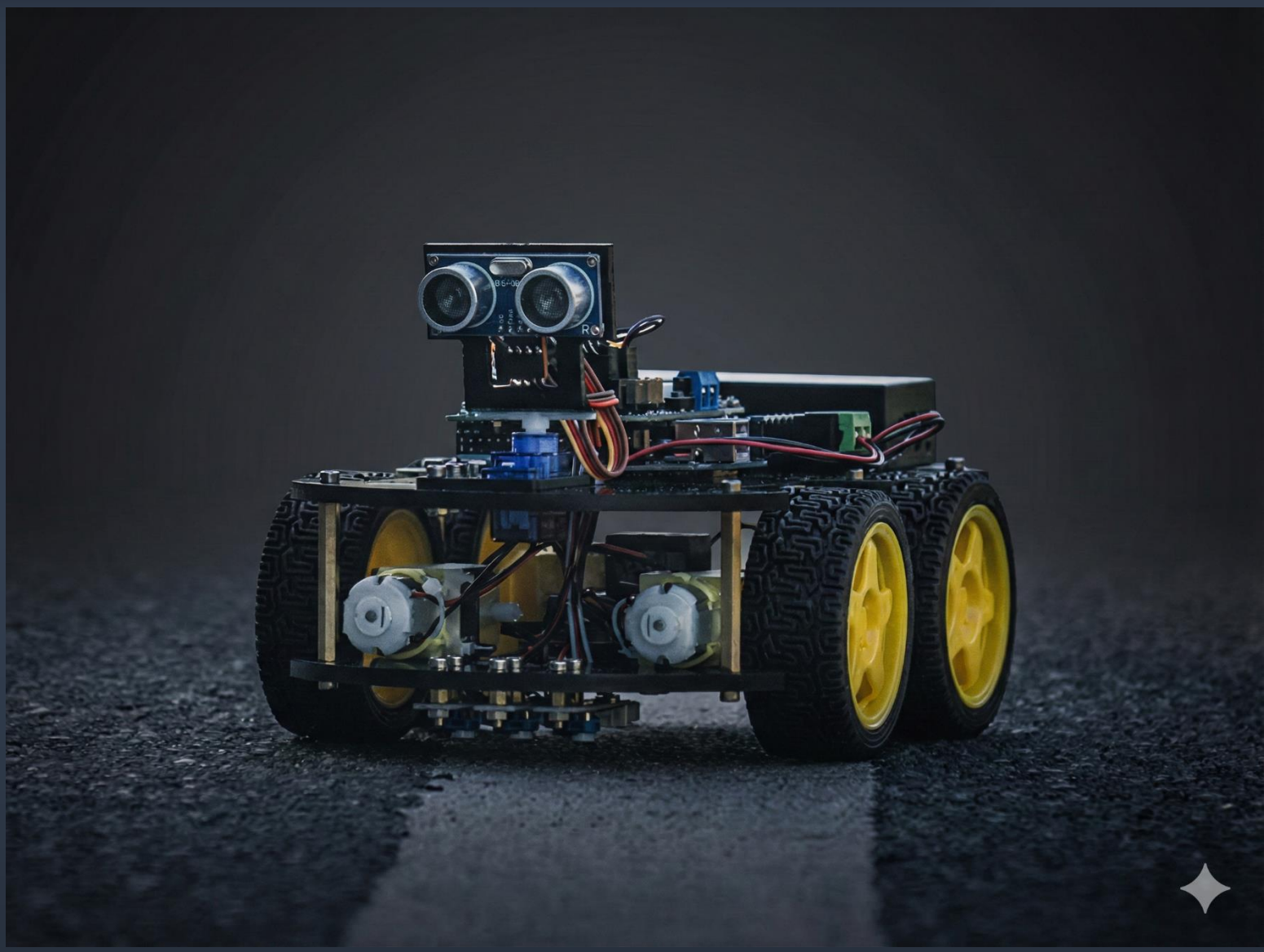
Line Following & Obstacle Avoiding Robot



INFORMATION TECHNOLOGY UNIVERSITY

ELECTRONICS WORKBENCH LAB PROJECT REPORT

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INTRODUCTION

Our project aims to build a line following obstacles avoiding robot. The robot shall perform pathfinding, following a certain path while avoiding any obstacles in the way.

EXPLANATION

The lab instructor shall prepare lanes represented by black strips. Our robot must follow these intended pathways and avoid all obstacles placed by the lab instructor. The lab instructor will test our robot's reliability and practicality.

SOLUTION:

We shall utilize microcontrollers in addition with sensors that will detect incoming objects and pathways along with motors to move the robot.

COMPONENTS:

The components we used are:

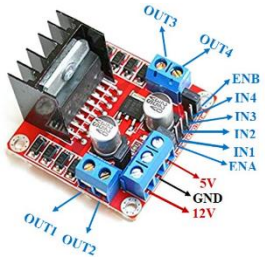
- Arduino UNO R3
- Motor Driver
- Robot Car Chassis
- TT Gear Motors
- Infrared Sensors
- Ultrasonic Sensors

ARDUINO UNO R3:

- The Arduino UNO R3 is a microcontroller that will be our brain and processing power for the project. It can perform the logic that we integrate into it via coding. We could code the Arduino in C++ using the Arduino IDE which includes all of the Arduino related libraries.
- All of the components, such as the sensors and the motors— will be connected to the pins of the Arduino which would be used to collect data from the sensors and also send logic to the motor driver.
- We will attach it underneath the car chassis.

L298 DRIVER:

- This motor driver is essential as it consists of an H-Bridge circuit which allows our motors to function under different polarities which allows the reversal of the motors.
- The driver also amplifies the low output signals of the Arduino into higher output signals for the motors.
- It will be connected to the upper side of the chassis.



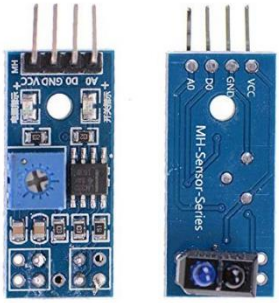
TT GEAR MOTORS:

- These are low power and low torque DC motors which would work really great with our circuit as we are utilizing three motors at a time, two for the wheels and one for the ultrasonic sensor, so our driver would handle it just fine.

POWER:

- We will provide the circuit with three 18650 Lithium Ion cells which would provide approximately 3.7V x 3 = 11.1V to the circuit. Which is sufficient for the 12V input of the motor driver and the 5V Vcc for the Arduino.
- We will attach it on the upper side of the chassis.

LINE SENSOR:



- One of the sensors we used are a line sensor which is basically an infrared colour sensor which could compare dark and lighter objects (would be able to differentiate between the dark strips of the pathways).
- We will attach three of them in front of the vehicle all facing the ground.
- This orientation will help us detect if the robot should drift left, right or stay straight.
- Their pins connect to 5V, GND and Arduino's logic pins.

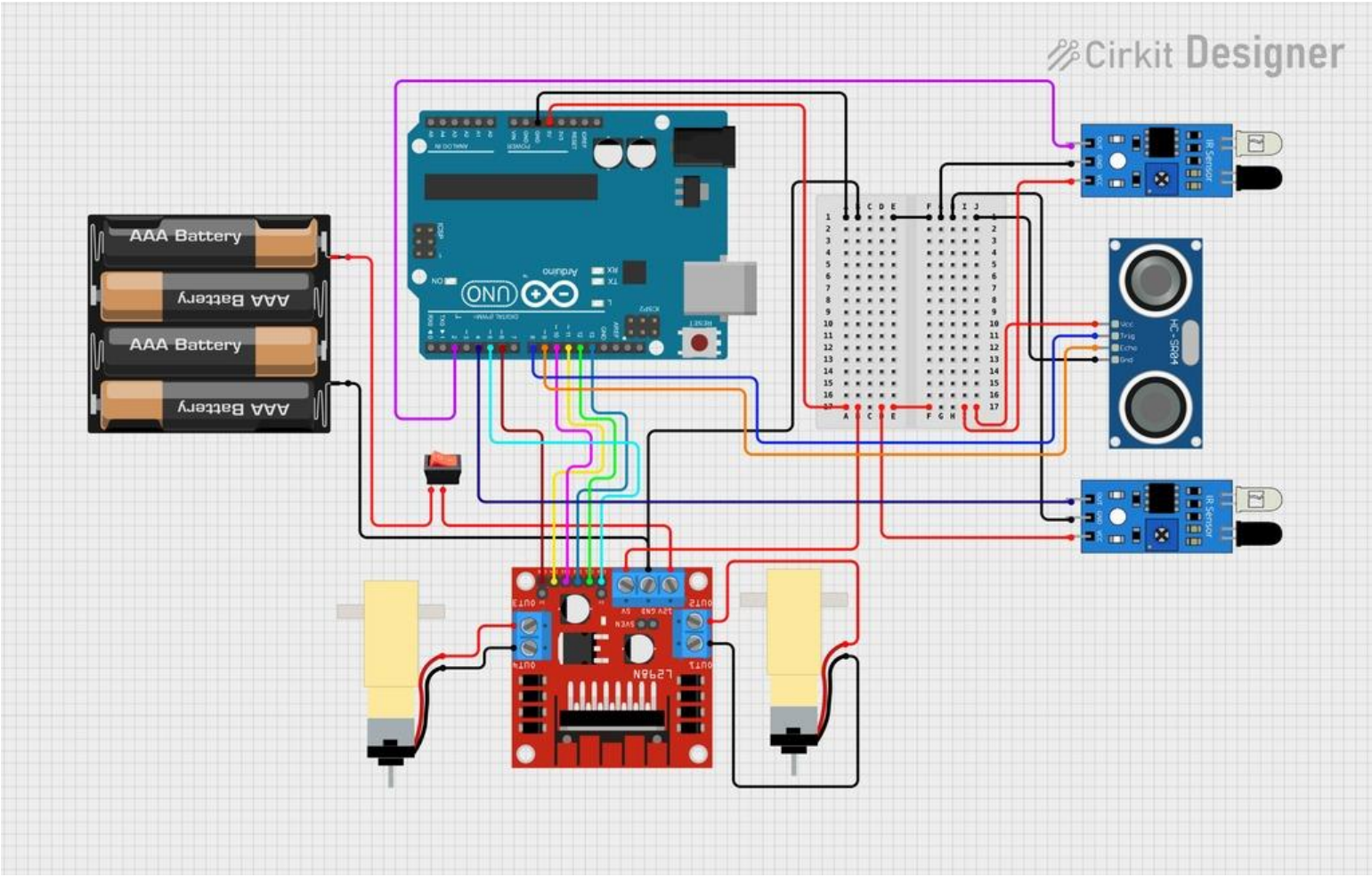
ULTRASONIC SENSOR:

- The other sensor we utilized is the ultrasound sensor which could provide us with the distance of anything facing the motor, this would help us detect obstacles on the way.
- For Example, it might check if the distance between the closest object it is facing is < 15cm, then it will stop the motors.
- Its connections are at 5V, GND and Trig and Echo pins of the Arduino.

THE CODE:

- From the Arduino IDE, our code will utilize what we have learned in the previous Arduino labs, such as taking inputs from sensors using AnalogRead and outputting signals to motors using AnalogWrite.
- We shall use modular functions, special functions for the different tasks such as, a function to move forward, back or even a function for if else block statements that will read the sensors.

REFERENCE CIRCUIT DIAGRAM:



PROCEDURE:

- After ensuring the right connections, providing Vcc and GND to all components and providing every component its signal pin from the Arduino, our connection is complete.
- For the battery, we supplied it to the motor driver through a SPSN switch which would then also be connected to supply then Arduino.
- After the connections are complete and attached to our car chassis, what remains is the code.
- After fleshing out the code and making it work properly, our circuit is complete.

EXPECTED FINAL RESULTS:

- We expect the circuit to function as the lab instructor anticipates, which would mean our connections to be perfectly neat and functional along with our code.
- The car should follow the entire line and hopefully reach the end.