Maze-solving memory-driven car

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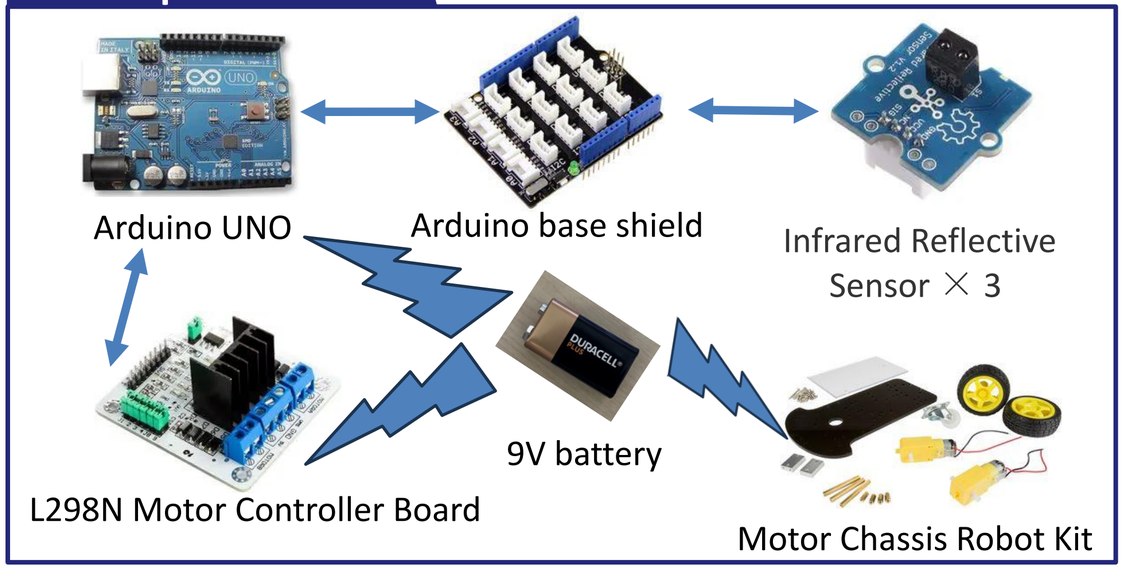
Introduction

The goal of this project is to create a car that can autonomously solve a single-line maze. The main functions of the car are carried out through infrared sensors and an Arduino UNO. The infrared signal is processed and executed using the programming in the Arduino UNO. With the algorithm coded into the Arduino UNO, the car will recognize the path of the maze, adjust its movement, and successfully solve the maze.

Components



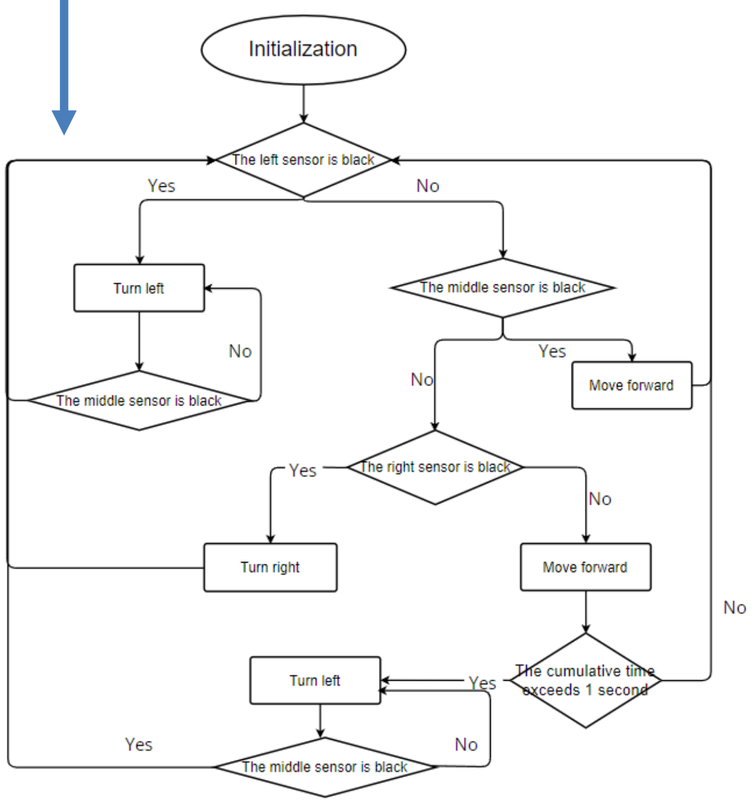
Methodology

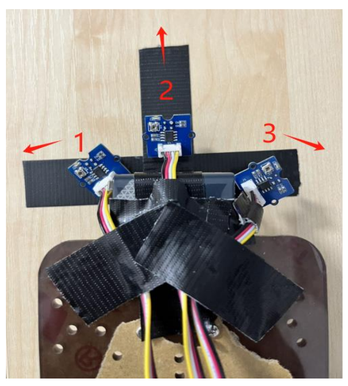
1. Figure out the use and operation of every component.
2. Connect the board and corresponding components to the power supply to test them individually.
3. Install the components onto the robot's chassis.
4. Write the code for the basic movement of the car.
5. Write the code for steering and use black tape to test to ensure it works.
6. Add functions so it can navigate crossroads and dead ends as well as modifying the code to consider the readings on all the sensors in relation to one another to determine the direction it will take.
7. Put the car into a simple line maze made of black tape on the floor, make it successfully reach the end and return to the start.

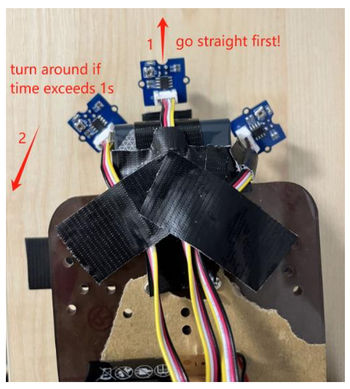
Coding

The coding part is based on Arduino IDE using C++.

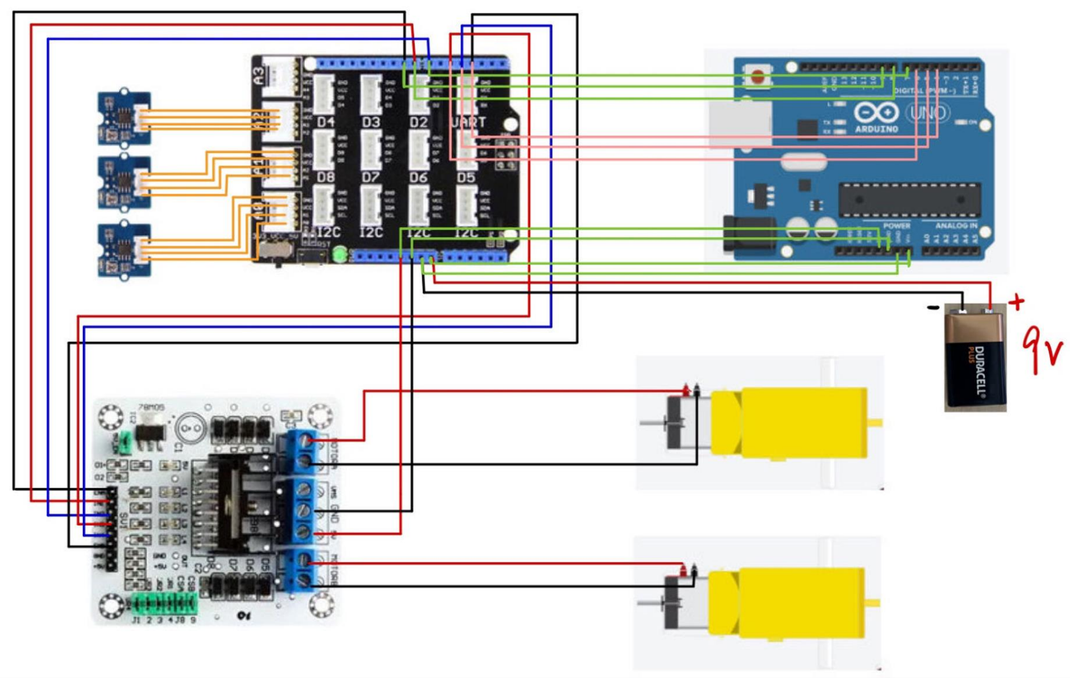
- The sensors output a large value of 1023 when detecting black otherwise it outputs a number smaller than 50.
- When it arrives at a crossroad it will first turn left, if possible, then go straight, finally right. Record it.
- When turning directions, the car won't stop until the middle sensor touches black, so it will stay on course.
- When the three sensors are white, the car will continue going straight unless the timer reaches 1s, which makes it turn left, or return to the black line.

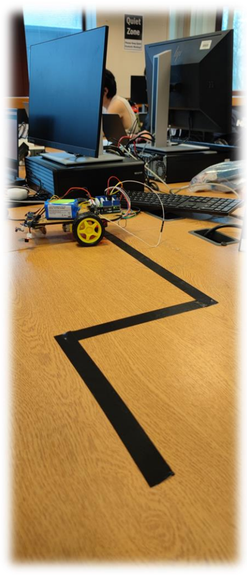


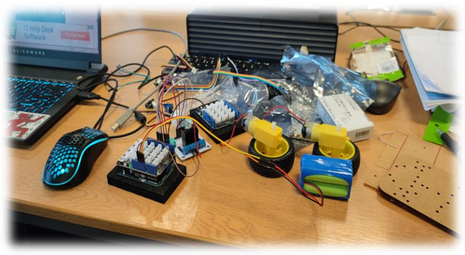


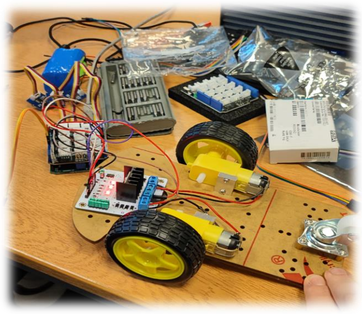


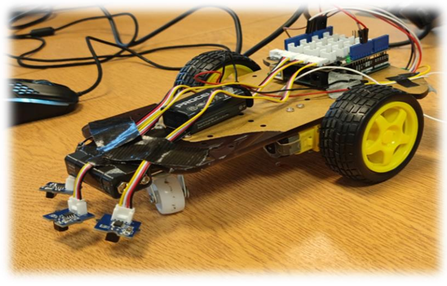
Circuit design & Pictures

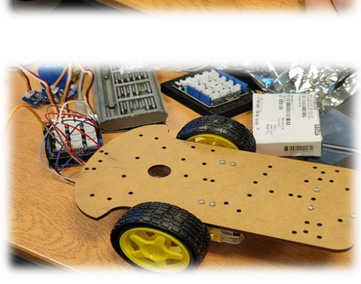












Conclusion & Future improvements

Conclusion:

- The car can perform basic motion functions, such as turning left, right and making a U-turn.
- The car can execute the motion logic of the left-hand rule.
- The car can perform slight corrections when it strays from the path to keep it going straight on the path.
- Due to component limitations, the car's actual performance deviates from its ideal functionality.

Future improvements:

- Adding more motors and wheels to give the car better movement capabilities, as well as additional stability.
- Having more sensitive infrared sensors would allow the car to make corrections and adjustments more accurately.
- The program will be optimized to enable the car to handle more complex routes successfully without any random error.