

The objective of the project is to complete two tasks using the ELEGOO UNO R3 Smart Robot Car V4.0. The two tasks that must be completed are line tracking and obstacle avoidance in the form of a maze. The foundation of the robot car is the Arduino UNO microcontroller which is responsible for performing all the computing and processing of the instructions delivered into its system. It controls the wheel motors and their turning direction, the 40kHz ultrasonic sensor, and the bottom sensors. Using the feedback from the sensors, the Arduino can compute what the correct response to the output is. In order to process the feedback and initialize any commands, C programming was used. Once the code was completed and the robot was built, the project was initiated and the testing begun.

The tasks the car had to complete in order to be a success started with ensuring that the robot can escape a maze. Once the car completes the maze, it must come to a complete stop at the end to ensure it does not fall out of the maze. There are two objective points at point A and point B, which are marked in Figure 2, that must be completed by the robot to consider the attempt a success. As well, the car must collide with as few walls as possible, ideally 0, to ensure a smooth run. Finally, if the car is unable to complete the maze in under 120 seconds, the attempt is considered a failure and the robot must be removed from the maze.

In conclusion, the vehicle followed the maze as planned; however, the line tracking encountered errors. Initially, the vehicle would stop at a particular corner. After adjustment to the code, the vehicle was able to navigate the problematic corner, but it did not stop at the end of the line. The most important conclusion to be drawn from this is that extensive testing should be done on the specific experimental setup, as the vehicle performed well in different practice setups. Further, for future line tracking requirements, the sensitivity borders of the sensors should be calibrated to the sensors installed. Since the parts used are low-quality, a high degree of precision can not be expected, and must be compensated for in the programming. In regards to the maze, although the vehicle completed the maze successfully, it would often drift towards the right or left. A possible solution to correct this error to avoid collisions with the side walls when proceeding forward is to add a second ultrasonic sensor that measures the side distances and compares them. Using the comparison, the car can reorient itself as it proceeds forward in the maze. The above conclusions and recommendations provide greater insight into how microprocessor systems can be used in a real world scenario to improve daily life. More specifically, the use of microprocessor systems can improve transportation and automation to become autonomous and simple.