Light-Following Robotic Car

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Embedded Systems Final Design Project, Fall 2024/2025
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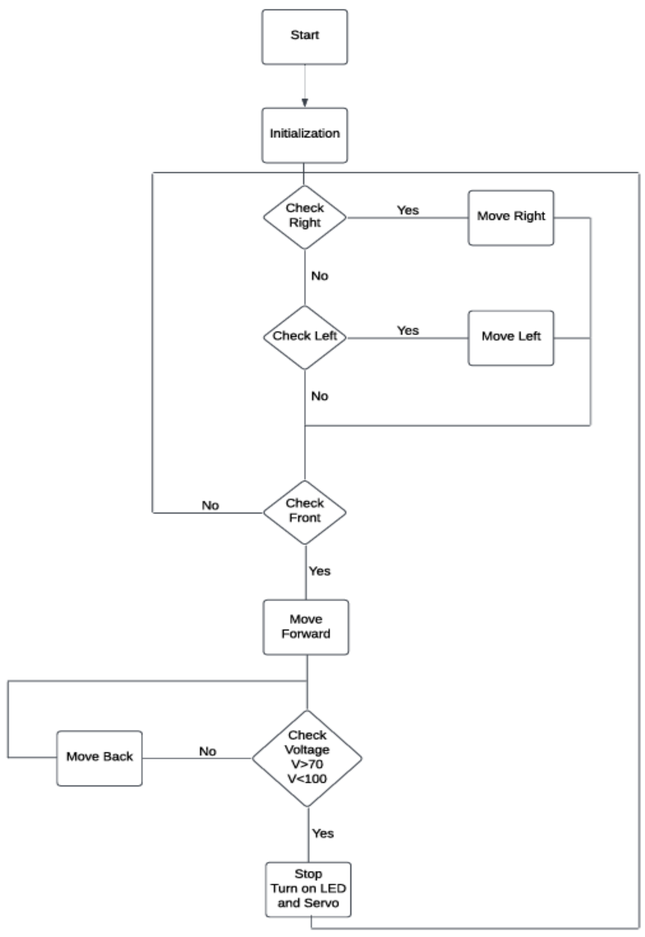
Introduction

The light-following robotic car is a system designed for autonomous navigation and obstacle avoidance. Utilizing LDR light sensors, the car tracks and moves toward a light source while ensuring safe operation through an ultrasonic sensor that detects obstacles in its path. The car halts upon detecting an obstacle and intelligently navigates around it by executing predefined right and left movements. By integrating a PIC16F877A microcontroller with servo motors, an H-Bridge motor driver, and a robust power supply system, this project highlights the practical applications of embedded systems in autonomous vehicles and automation.

Design

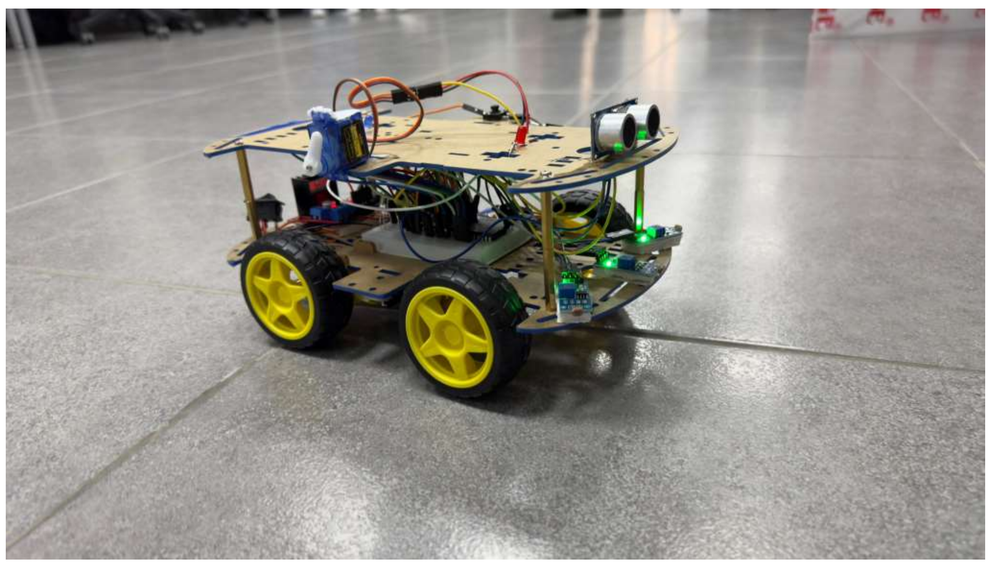
The project aims to develop an autonomous car capable of detecting and following a light source while avoiding obstacles in its path. This is achieved by integrating light-dependent resistors (LDRs) to detect light intensity and ultrasonic sensors to measure distances from nearby obstacles. A microcontroller processes the input data and sends signals to the motors to adjust the car's movement accordingly.



The system is divided into three main designs: electrical, software, and mechanical. The electrical design focuses on connecting and configuring all components such as sensors, motors, and the microcontroller. The software design ensures the car responds correctly to environmental changes by using real-time data to make decisions. The mechanical design involves a robust chassis and strategic placement of components, allowing efficient functionality and maneuverability.

Results

The car's behavior was precise and consistent, with seamless integration between the electrical components, software logic, and mechanical design. The use of LDR sensors for light detection and an ultrasonic sensor for obstacle avoidance ensured high reliability and responsiveness.

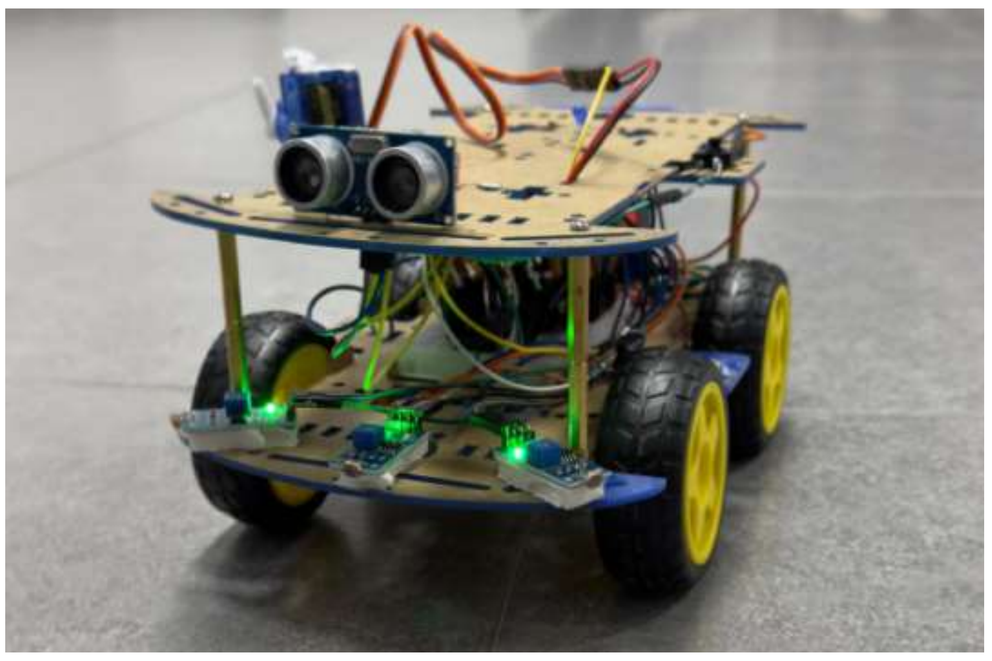


The light-following car successfully achieved its objectives of following a light source and avoiding obstacles. During testing, the car demonstrated the ability to:

•Track the strongest light source, even in varying light conditions.

•Stop and avoid obstacles by adjusting its direction to the right or left, based on real-time ultrasonic sensor readings.

•Resume light tracking smoothly after navigating around obstacles.



Overall, the project highlights the potential of embedded systems in autonomous navigation and serves as a prototype for more advanced robotics applications.

Conclusion

The light-following car with obstacle avoidance demonstrates the practical application of embedded systems in autonomous navigation. By integrating LDR sensors, an ultrasonic sensor, and a PIC16F877A microcontroller, the project achieves a cost-effective yet efficient design capable of real-time decision-making. This project serves as a stepping stone for more advanced systems, showcasing how sensor fusion and programming can solve real-world challenges. It has potential applications in robotics, automation, and smart mobility solutions, providing a foundation for future exploration in autonomous vehicle technologies. The success of this project highlights the importance of interdisciplinary collaboration between hardware, software, and mechanical design, proving that embedded systems are a cornerstone for innovation in modern engineering.