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OBSTACLES AVOIDING ROBOT

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ABSTRACT
The obstacle-avoiding robot is an autonomous system designed to navigate its surroundings by detecting and avoiding obstacles using an ultrasonic sensor. It is controlled by an Arduino Uno, which processes sensor data and adjusts the robot's movement accordingly through servo motors and a motor driver. When an obstacle is detected, the robot automatically changes direction to avoid collisions. Additional features include a buzzer that activates when the robot stops, an LDR-based lighting system, and rear red LEDs that illuminate when halted. This project demonstrates automation and has applications in areas such as surveillance, assistance robotics, and industrial automation.

Keywords:
Obstacle Avoidance, Autonomous Robot, Arduino Uno, Ultrasonic Sensor, Servo Motors, Motor Driver, Automation, Surveillance, Assistance Robotics, Industrial Automation

INTRODUCTION

Embedded systems are specialized computing systems designed to perform specific tasks, often with real-time processing requirements. Unlike general-purpose computers, they are integrated into devices to control functions efficiently. These systems vary in complexity, from simple microcontroller-based designs to advanced multi-unit configurations used in industrial automation, healthcare, and consumer electronics. Due to their dedicated nature, they offer optimized performance, cost-effectiveness, and reliability. Some embedded systems support limited programmability, while others operate on fixed software stored in memory. They are widely applied in automotive systems, home appliances, medical devices, and industrial machinery

LITERATURE SURVEY

Numerous studies have investigated the development of obstacle-avoiding robots utilizing ultrasonic sensors and microcontrollers. These robots detect obstacles and adjust their path accordingly, enabling efficient navigation. Arduino-based automation has become increasingly popular due to its ease of programming and strong open-source community support, making it a preferred choice for robotic applications.
Enhancements such as buzzers, LED indicators, and LDR sensors further improve the functionality and adaptability of these robots. These additional features enhance their practical use, making them suitable for applications in surveillance, assistive robotics, and industrial automation

METHODOLOGY

1. Microcontroller:

Arduino Uno – Serves as the main processing unit, handling sensor inputs and controlling motor functions.

2. Sensors:

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Ultrasonic Sensors (HC-SR04) – Detects obstacles by measuring distance using sound waves.
Infrared Sensors – Identifies nearby objects for short-range detection.

3. Motors & Motor Drivers:

DC Motors – Facilitates the movement of the robot.
Motor Driver Module (L298N or L293D) – Regulates motor speed and direction.
Servo Motors – Moves the ultrasonic sensor for enhanced obstacle detection coverage.

4. Power Supply:

Rechargeable Lithium-ion or Lead-acid Battery – Powers the entire robotic system.

5. Chassis & Wheels:

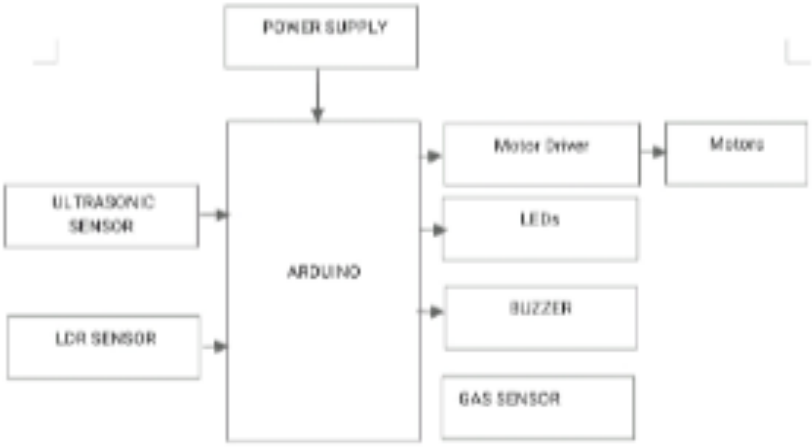
Robot Frame – Provides structural support for all components.
Differential Drive (4-Wheel System) – Ensures controlled motion and turning capabilities.

6. Obstacle Detection Mechanisms:

Ultrasonic Sensor-Based Detection – Measures object distances and changes direction upon encountering obstacles.
Infrared Sensor-Based Detection – Detects objects at close range and adjusts movement accordingly.

IMPLEMENTATION

Figure: Block Diagram of Humanity and Temperature Monitor



- The ultrasonic sensor continuously scans for obstacles.
- When an obstacle is detected, the Arduino processes the data.
- The robot changes direction to avoid the obstacle.
- The buzzer sounds whenever the robot stops.
- The LDR sensor controls lights based on ambient conditions.
- When the robot stops, rear red LEDs turn on for visual indication.
- **Ultrasonic Sensor:** Detects obstacles and measures distance.
- **Servo Motor:** Rotates the ultrasonic sensor for better scanning.
- **Motor Driver:** Controls the motors for movement.
- **Motors:** Drive the robot forward, backward, and turn directions.
- **Buzzer:** Alerts when the robot stops.
- **LDR Sensor**: Detects ambient light and turns on lights when necessary.
- **Red LEDs:** Turn on at the back when the robot stops.

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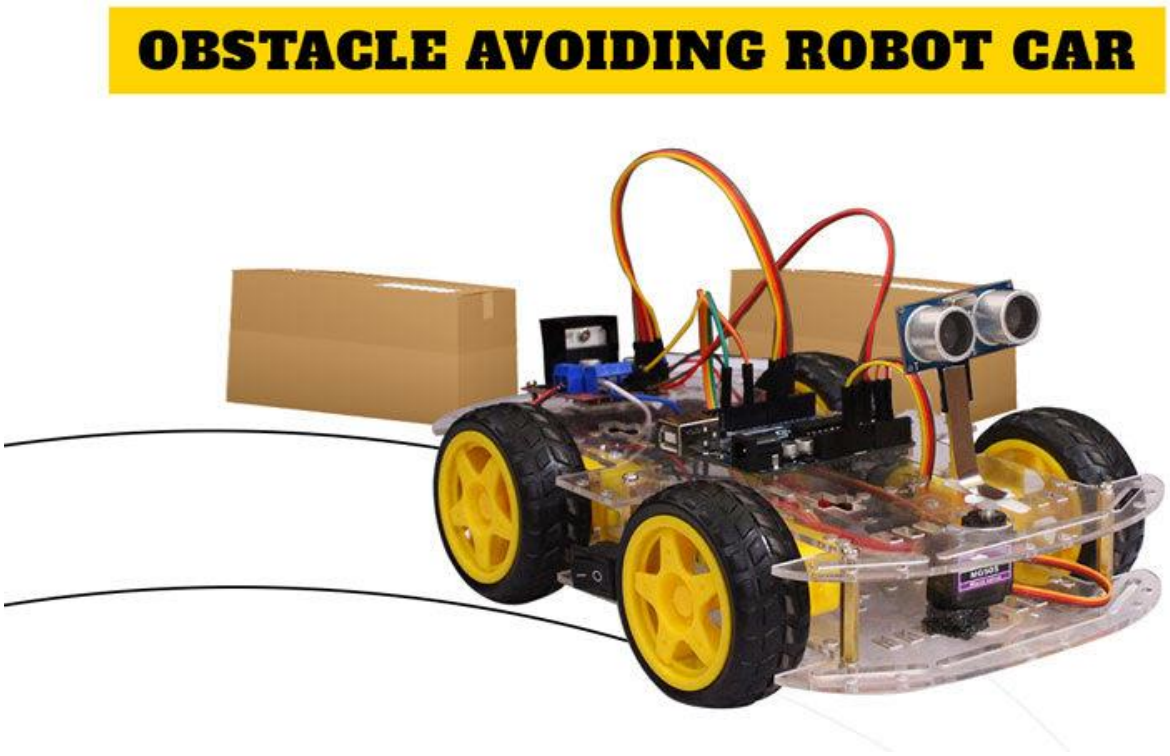
RESULTS AND PERFORMANCE EVALUATION



FUTURE SCOPE

The system can be further enhanced by:

- Integration with AI for enhanced decision-making.
- Adding a camera for visual recognition and tracking.
- Implementing IoT for remote monitoring and control.
- Solar power integration for sustainable operation.
- Improved obstacle detection with additional sensors like infrared.

CONCLUSION

The obstacle-avoiding robot provides an efficient, autonomous solution for navigation and obstacle detection. By integrating additional features like buzzers, LEDs, and LDR-based light control, this system enhances safety and usability. Future developments can expand its capabilities, making it applicable in more advanced automation fields.

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