Object Avoiding Robot

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Abstract

This paper presents the design and implementation of a Bluetooth-controlled obstacle avoiding robot using an ultrasonic sensor and Arduino microcontroller. The robot detects obstacles in its path autonomously while also allowing remote control through an Android application developed using MIT App Inventor. The integration of Bluetooth control with obstacle detection provides enhanced flexibility and safety in navigation. Experimental results demonstrate reliable performance in various indoor environments [1], [2], [4].

I. INTRODUCTION

Autonomous mobile robots have gained significant importance in education and research. Obstacle avoidance ensures safe navigation in unknown environments. Adding Bluetooth control via MIT App Inventor allows users to override autonomous navigation and remotely control the robot, which is particularly useful for demonstration and educational purposes [2], [3]. This project uses an Arduino microcontroller interfaced with an ultrasonic sensor for obstacle detection and a Bluetooth module for Android app communication.

II. Literature Review

Several studies have explored mobile robotics with autonomous and remote control features. Ultrasonic sensors are widely used for short-range obstacle detection due to their low cost and high reliability [4]. Bluetooth modules like HC-05 allow wireless communication between a mobile device and Arduino, enabling manual control [5]. Combining autonomous navigation with Bluetooth control provides both safety and flexibility in robot operation [1], [6].

III . System Design

A. Hardware components

- *Arduino uno R3*
- *Motor driver l298N + Dc motors*
- *Bluetooth Module (HC-05)[5]*
- *Sg 900 servo motor*
- *Buck resistor*
- *Power supply (battery)*
- *Chasis with wheels*

B. Software Components

- *Arduino IDE for programming*
- *MIT App Inventor for Android app*
- *C++ logic for sensor reading, motor control, and Bluetooth command handling*

IV. Methodology

1. *Connect ultrasonic sensor pins to Arduino input pins.*
2. *Connect motor driver and DC motors to Arduino output pins.*
3. *Connect Bluetooth module pins (TX/RX) to Arduino for serial communication [5].*
4. *Program Arduino to:*

    - *Continuously check for obstacles via ultrasonic sensor*
    - *Listen to Bluetooth commands from MIT App Inventor*
    - *Move motors based on sensor input and app commands*

5. *Develop MIT App Inventor app with buttons for Forward, Backward, Left, Right, and Stop.*
6. *Test robot in indoor environments for obstacle avoidance and Bluetooth control functionality [2], [3], [4].*

V . Working Principle

The ultrasonic sensor continuously measures distance from obstacles.

If an obstacle is detected within a predefined threshold, the Arduino autonomously navigates around it.

The Bluetooth module receives commands from the Android app, allowing manual control of forward, backward, left, and right movements.

The robot gives priority to obstacle avoidance to prevent collisions, even when receiving manual commands [1], [5].

VI. Results and Discussion

The robot successfully navigated indoor tracks with obstacles while responding to remote commands from the Android app. The ultrasonic sensor provided accurate distance measurements, and the Arduino processed inputs effectively. Bluetooth commands were received reliably up to 10 meters. Combining autonomous obstacle avoidance with manual Bluetooth control improved safety and flexibility. Threshold adjustments optimized performance for both autonomous and manual modes [1], [4], [5].

VII. Conclusion

This project demonstrates a Bluetooth-controlled obstacle avoiding robot using Arduino and ultrasonic sensors. Integration with MIT App Inventor enables easy Android-based control, while ultrasonic sensors ensure autonomous obstacle avoidance. The system is cost-effective, reliable, and suitable for educational and research purposes. Future work could include integrating multiple sensors for 360° obstacle detection and implementing AI-based path planning [2], [6]

References

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