



ARDUINO-BASED RADAR SYSTEM FOR OBJECT DETECTION

1Manila Gupta, 2Khan Zaara, 3Shukla Anshika, 4Jha Sakshi, 5Saifee Humaira

1Assistant Professor, 2-5Students

Department of Computer Engineering,
Rizvi College of Engineering, Mumbai University, India

Abstract:

This research paper presents an Arduino-based radar system designed for real-time object detection. The system utilizes an ultrasonic sensor mounted on a servo motor to scan the environment and detect objects at varying distances. The collected data is processed through the Arduino microcontroller and visualized using Processing software. The study explores the feasibility of low-cost radar alternatives and their applications in security systems, obstacle detection, and autonomous navigation. The results demonstrate the system's ability to detect objects with reasonable accuracy, offering insights into improvements for future implementations.

Keywords:

Arduino, Ultrasonic Sensor, Radar System, Object Detection, Servo Motor

1. Introduction

Radar systems play a crucial role in object detection and navigation across various fields, including military, automotive, and surveillance applications. However, traditional radar systems are often expensive and complex. This study aims to develop a low-cost radar system using Arduino and an ultrasonic sensor, providing an accessible alternative for students, hobbyists, and researchers.

The proposed system scans the surrounding environment using an ultrasonic sensor mounted on a rotating servo motor, sending signals to detect objects and measure their distance. The information is processed and displayed graphically in real time, making it useful for applications such as obstacle avoidance and security monitoring. This paper details the design, implementation, and performance analysis of the system.

2. Methodology

2.1 Components Used

- Arduino Uno – Microcontroller for processing sensor data.
- HC-SR04 Ultrasonic Sensor – Measures distance by sending ultrasonic waves and receiving echoes.
- SG90 Servo Motor – Rotates the ultrasonic sensor to scan the surroundings.
- Processing IDE – Visualizes detected objects in a radar-like interface.
- Power Supply – 5V power source for Arduino.

2.2 Working Principle

1. The ultrasonic sensor emits an ultrasonic pulse.
2. The pulse reflects off objects and returns to the sensor.
3. The time taken for the echo to return is measured to calculate the distance.
4. The servo motor rotates the sensor at fixed intervals to scan the environment.
5. The collected data is processed and displayed as a radar-like visualization.

3. Results and Discussion

The system was tested in different environments to evaluate its performance. The results indicate that the radar successfully detects objects. However, detection efficiency is affected by surface texture and angle of the object. The radar provides real-time object tracking and can be integrated into robotic systems for obstacle avoidance. Improvements such as integrating AI-based object classification and increasing scan speed can enhance system performance.

4. Conclusion

This paper demonstrates the feasibility of an Arduino-based radar system for object detection applications. The system is cost-effective, easy to implement, and offers real-time visualization of detected objects. Future improvements may include higher-resolution sensors, AI integration for object classification, and wireless data transmission for remote monitoring. This project serves as a foundation for further research into low-cost radar technologies.

5. References

Deepu G, Deeksha Upadhyaya, Abhiram M P, Praveen K Aradhya, Srujan. (2024). RADAR SYSTEM USING ARDUINO. International Journal of Novel Research and Development (IJNRD).
Arduino Documentation: <https://www.arduino.cc/>