OBSTACLE AVOIDING ROBOT USING ARDUINO

PROTOTYE

CERTIFICATE OF PARTICIPATION

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES (A)

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CERTIFICATE

OF PARTICIPATION

This certificate is presented to

Mr. /Ms. S. HARSHA VARDHAN

from ANITS for his/her active participation during 2-Day National level Tech-Fest ELEKTRA-2K24 in technical event **PAPER PRESENTATION / HARDWARE EXPO / CODE CRAFT** entitled Obstacle Avoiding Robot organized by Department of ECE in association with ACES & IETE student forum, ANITS, Sangivalasa during 1st - 2nd March, 2024.

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OBSTACLE AVOIDING ROBOT USING ARDUINO UNO

INTRODUCTION:

The **Obstacle Avoiding Robot** is an intelligent robotic system designed to autonomously detect and avoid obstacles in its path. It utilizes the **Arduino microcontroller** as its core processor, combining principles of embedded systems, sensor integration, and real-time motor control. The robot is particularly useful in dynamic environments where autonomous navigation is critical.

OBJECTIVE:

The main goal of this project is to:

- Design a robot that can **navigate autonomously**.
- Use **ultrasonic sensors** to detect obstacles.
- Implement **Arduino-based logic** for real-time decision making.
- Develop a reliable **motor control system** for smooth movement.

This robot lays the foundation for more advanced autonomous systems in industrial, surveillance, and personal assistant applications.

HARDWARE COMPONENTS:

- **Arduino UNO**: Acts as the control unit to process sensor input and control motor output.
- **Ultrasonic Sensor (HC-SR04)**: Measures distance to obstacles by sending and receiving ultrasonic waves.
- **L298N Motor Driver Module**: Controls the direction and speed of the motors.
- **DC Motors and Wheels**: Enable the movement of the robot.
- **Battery (9V/12V)**: Powers the system.

WORKING PRINCIPLE:

The **ultrasonic sensor** continuously measures the distance between the robot and objects in front of it. If the distance is above a certain threshold (e.g., 20 cm), the robot moves forward. When it detects an obstacle within this range, it stops, turns left or right based on predefined logic, and continues moving.

This behavior is achieved by programming the Arduino to:

1. Trigger the ultrasonic sensor.
2. Read the echo time and calculate distance.
3. Use if-else conditions to make decisions.
4. Send commands to the motor driver accordingly.

SOFTWARE AND PROGRAMMING :

- **IDE Used**: Arduino IDE
- **Programming Language**: C/C++

The code includes functions for:

- Initializing pins.
- Reading ultrasonic distance.
- Making decisions based on the environment.
- Controlling motor direction and speed.

CODE SNIPPET:

```
#define MOTOR1_ENABLE 3

#define MOTOR1_IN1 4

#define MOTOR1_IN2 5

#define MOTOR2_ENABLE 9

#define MOTOR2_IN1 7

#define MOTOR2_IN2 8

void setup() {

pinMode(MOTOR1_ENABLE, OUTPUT);

pinMode(MOTOR1_IN1, OUTPUT);

pinMode(MOTOR1_IN2, OUTPUT);

pinMode(MOTOR2_ENABLE, OUTPUT);

pinMode(MOTOR2_IN1, OUTPUT);

pinMode(MOTOR2_IN2, OUTPUT);

}

void loop() {

digitalWrite(MOTOR1_IN1, HIGH);
```

```
digitalWrite(MOTOR1_IN2, LOW);
analogWrite(MOTOR1_ENABLE, 200);
digitalWrite(MOTOR2_IN1, HIGH);
digitalWrite(MOTOR2_IN2, LOW);
analogWrite(MOTOR2_ENABLE, 200);
delay(2000);
digitalWrite(MOTOR1_ENABLE, LOW);
digitalWrite(MOTOR2_ENABLE, LOW);
delay(1000);
digitalWrite(MOTOR1_IN1, LOW);
digitalWrite(MOTOR1_IN2, HIGH);
analogWrite(MOTOR1_ENABLE, 200
digitalWrite(MOTOR2_IN1, LOW);
digitalWrite(MOTOR2_IN2, HIGH);
analogWrite(MOTOR2_ENABLE, 200);
delay(2000);
digitalWrite(MOTOR1_ENABLE, LOW);
digitalWrite(MOTOR2_ENABLE, LOW);
delay(1000);  // Pause for 1 second
}
```

TESTING AND RESULTS:

The robot was tested in various environments with different obstacle arrangements. The robot successfully detected obstacles and altered its path.

Key observations:

Detection range: Accurate up to 3 meters.

Reaction time: ~0.5 seconds.

Smooth motor operation with proper obstacle avoidance in real-time.

CONCLUSION:

This project successfully demonstrates the design and development of an autonomous obstacle-avoiding robot using Arduino. The integration of ultrasonic sensors and motor control with Arduino enables real-time decision-making and navigation. It showcases how embedded systems can be practically implemented in robotics.

FUTURE ENHANCEMENTS:

Sensor Upgrade: Add IR or LIDAR sensors for more accurate detection. **Advanced Control:** Use PID algorithms for smoother navigation. **Wireless Control**: Integrate Bluetooth or Wi-Fi for manual override. **Machine Learning:** Implement AI for learning obstacle patterns over time.

APPLICATION:

- Indoor automation (Vacuum robots)
- Industrial automated carts.
- Search and rescue robots in disaster zones.
- Smart wheel chair navigation systems.

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