Object avoidance robot using Arduino

The IOT Academy

Aim:-

To design and implement an object-avoiding robot using Arduino Uno, ultrasonic sensor (HC-SR04), motor driver (L298N), and two DC motors.

Material Required:-

Component	Quantity
Arduino Uno	1
Ultrasonic Sensor (HC-SR04)	1
L298N Motor Driver Module	1
DC Motors with wheels	2
Robot Chassis	1
Castor Wheel	1
9V or 12V Battery + Clip	2
Jumper Wires	As required
Breadboard (optional)	1
Arduino USB Cable	1

Pin Connections:

Ultrasonic Sensor HC-SR04:

- **VCC** → Arduino 5V
- **GND** → Arduino GND
- **TRIG** → Arduino Digital Pin **9**
- **ECHO** → Arduino Digital Pin **10**

L298N Motor Driver:

- **IN1** → Arduino Pin **5**
- **IN2** → Arduino Pin **4**
- **IN3** → Arduino Pin **3**
- **IN4** → Arduino Pin **2**
- **ENA, ENB** → 5V (for full speed) or connected to PWM pins (optional)

- **OUT1/OUT2** → Left Motor
- **OUT3/OUT4** → Right Motor
- **12V** → Battery Positive Terminal
- **GND** → Battery Negative Terminal AND Arduino GND
- **5V (L298N onboard)** → Arduino **Vin** (if jumper is present)

Procedure:

1. Assemble the robot chassis with DC motors, wheels, and castor wheel.
2. Fix the Arduino UNO, L298N Motor Driver, and Ultrasonic Sensor to the chassis.
3. Connect motors to the motor driver output pins.
4. Connect the Arduino and motor driver input pins as per above connections.
5. Power the L298N from a 9V/12V battery through the `12V` terminal.
6. Power the Arduino UNO via Vin pin using 5V output from L298N (jumper must be set).
7. Upload the following code to the Arduino.

Arduino Code:-

```
#define trigPin 9
#define echoPin 10


#define IN1 5
#define IN2 4
#define IN3 3
#define IN4 2


long duration;
int distance;
```

```
void setup() {
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  pinMode(IN1, OUTPUT);
  pinMode(IN2, OUTPUT);
  pinMode(IN3, OUTPUT);
  pinMode(IN4, OUTPUT);
  Serial.begin(9600);
}

void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  duration = pulseIn(echoPin, HIGH);
  distance = duration * 0.034 / 2;

  Serial.print("Distance: ");
  Serial.println(distance);

  if (distance < 20) {
    moveBackward();
    delay(300);
    turnRight();
```

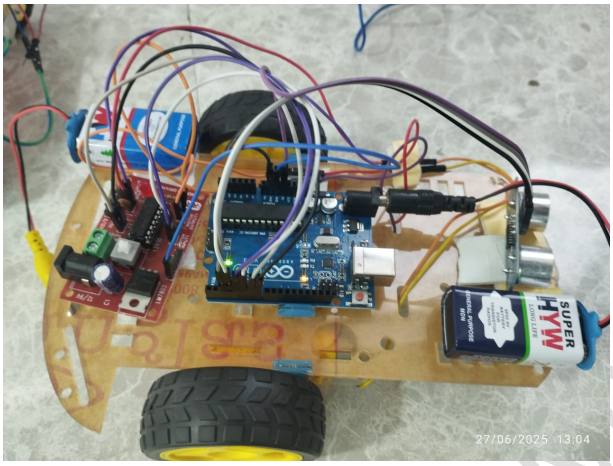
```
    delay(400);
  } else {
    moveForward();
  }
  delay(100);
}

void moveForward() {
  digitalWrite(IN1, HIGH);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, HIGH);
  digitalWrite(IN4, LOW);
}

void moveBackward() {
  digitalWrite(IN1, LOW);
  digitalWrite(IN2, HIGH);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, HIGH);
}

void turnRight() {
  digitalWrite(IN1, HIGH);
  digitalWrite(IN2, LOW);
  digitalWrite(IN3, LOW);
  digitalWrite(IN4, HIGH);
}
```

Photo :-



Result:

The robot successfully moves forward and avoids obstacles by sensing the distance using the ultrasonic sensor. When an obstacle is detected within 20 cm, it reverses and turns to find a clear path.

Conclusion:

This project demonstrates the construction and programming of a basic obstacle-avoiding robot using an Arduino Uno without any voltage regulator. The robot uses real-time distance sensing and simple motor control logic to avoid collisions.