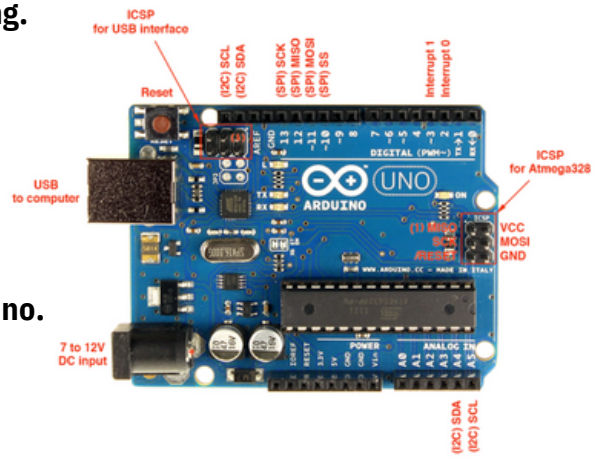
Obstacle Avoiding Robot Using Arduino

Introduction:

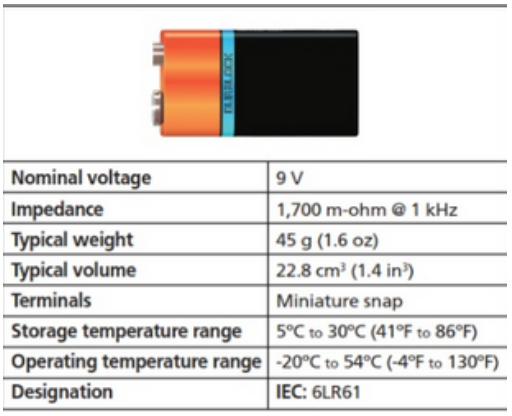
The obstacle-avoiding robot is an autonomous robotic project designed to navigate around obstacles without human intervention. By integrating an ultrasonic sensor with an Arduino Uno microcontroller, this robot can detect objects in its path and change direction to avoid collisions. This project provides an excellent platform for understanding robotics and sensor interfacing.



Objectives:

1. **Build an autonomous robot capable of avoiding obstacles.**
2. **Demonstrate the integration of sensors and actuators using Arduino.**
3. **Provide hands-on experience in motor control and programming.**

Components:



Nominal voltage	9 V
Impedance	1,700 m-ohm @ 1 kHz
Typical weight	45 g (1.6 oz)
Typical volume	22.8 cm³ (1.4 in³)
Terminals	Miniature snap
Storage temperature range	5°C to 30°C (41°F to 86°F)
Operating temperature range	-20°C to 54°C (-4°F to 130°F)
Designation	IEC: 6LR61

- Arduino Uno: Acts as the central processing unit.

- Ultrasonic Sensor (HC-SR04): Measures distance to obstacles.

- L298N Motor Driver: Controls the direction and speed of the motors.

- 2 DC Motors: Drive the robot's wheels.

- 9V Battery: Powers the Arduino Uno.

- AA Battery Pack: Provides power to the motors.

- Connecting Wires: Used to assemble the circuit.

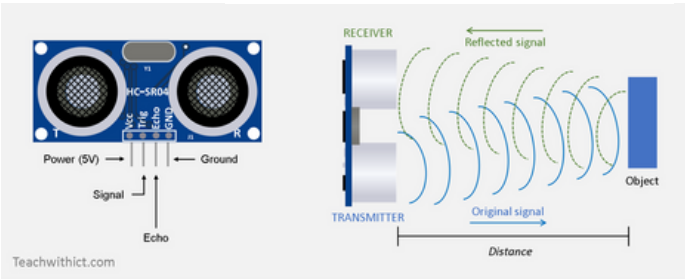
Circuit Diagram and Connections:

The robot's wiring is based on the following connections:

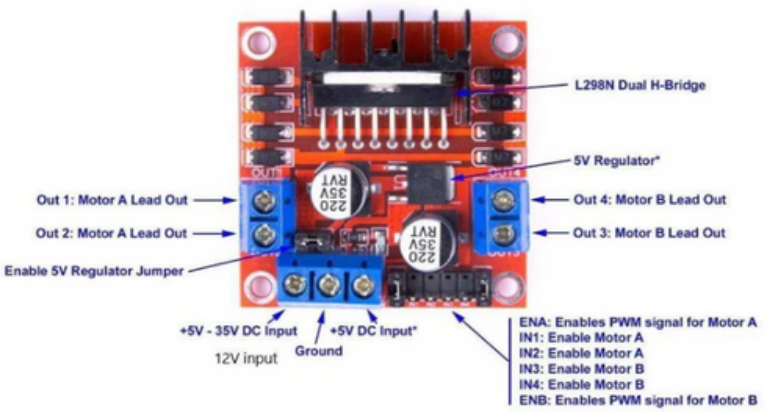
1. Ultrasonic Sensor:

- VCC to Arduino 5V

- **Trigger to Arduino Pin 4**
- **Echo to Arduino Pin 2**
- **ENA to Arduino Pin 5**



- ENB to Arduino Pin 6
- Left Motors Forward to Arduino Pin 8
- Left Motors Backward to Arduino Pin 9
- Right Motors Forward to Arduino Pin 10
- Right Motors Backward to Arduino Pin 11The code calculates the distance in centimeters using the formula:
- distance = duration * 0.034 / 2,
- where duration is the time recorded in microseconds, 0.034 is the speed of sound in cm/µs, and dividing by 2 accounts for the round trip.



Code Explanation:

The robot's functionality is defined by the Arduino code. Key sections include:

1. Initialization: Pins for the ultrasonic sensor and motor driver are set as inputs/outputs.
2. Obstacle Detection: The ultrasonic sensor calculates the distance to obstacles.
3. Decision Making: Based on the distance, the robot moves forward or changes direction.
4. Motor Control: The L298N module adjusts motor direction and speed using PWM signals.

If the measured distance is greater than or equal to 20 cm, the robot moves forward by activating both motors in the forward direction.

If the distance is less than 20 cm, the robot turns by reversing one motor while keeping the other in the forward direction. This avoids the obstacle.

Applications:

- Autonomous Vehicles: Use similar logic for collision avoidance.
- Robotics Education: Ideal for beginners to learn sensor integration.
- Home Automation: Adapt for robotic vacuum cleaners or lawn mowers.

Conclusion:

The obstacle-avoiding robot is a practical demonstration of autonomous robotics. It combines sensor data processing with motor actuation to achieve efficient navigation. This project serves as a gateway to more complex robotics and IoT applications.