NAVODAYA INSTITUTE OF TECHNOLOGY, RAICHUR

DEPARMENT OF COMPUTER SCIENCE & ENGINEERING

IOT Lab

Program - 11

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11 Develop a water level depth detection system using Ultrasonic sensor.

🔧 Components Required

- Arduino Uno (or compatible)
- HC-SR04 Ultrasonic sensor
- Jumper wires
- Breadboard
- A container/tank filled with water (for testing)

⚡ Working Principle

- The **HC-SR04 sensor** sends ultrasonic pulses.
- The pulse reflects back when it hits the water surface.
- The sensor measures the **time taken** → converted into **distance**.
- If you know the **total height of the tank**, you can calculate the **water depth**:

$$\text{Water Depth} = \text{Tank Height} - \text{Measured Distance}$$

🔌 Circuit Connections

- **VCC → 5V (Arduino)**
- **GND → GND**
- **TRIG → D9**
- **ECHO → D10**

✎ Steps to Do the Experiment

1. Place the **Ultrasonic sensor** at the **top of the tank**, facing downward.
2. Connect the sensor to Arduino as per wiring.
3. Measure the **total height of the tank** (say, 30 cm).
4. Upload the program (below).
5. Open **Serial Monitor @ 9600 baud**.
6. Pour different levels of water and observe the **distance** & calculated **depth** displayed.
7. You can add an **LED or buzzer** alarm if the tank is full/empty.

🖥 Arduino Program: Water Level Depth Detection
// Water Level Detection using Ultrasonic Sensor (HC-SR04)

```
#define TRIG_PIN 9
#define ECHO_PIN 10
#define TANK_HEIGHT 30   // cm (adjust as per your container)

long duration;
float distance, waterDepth;

void setup() {
  Serial.begin(9600);
  pinMode(TRIG_PIN, OUTPUT);
  pinMode(ECHO_PIN, INPUT);
}

void loop() {
  // Send ultrasonic pulse
  digitalWrite(TRIG_PIN, LOW);
  delayMicroseconds(2);
  digitalWrite(TRIG_PIN, HIGH);
  delayMicroseconds(10);
  digitalWrite(TRIG_PIN, LOW);

  // Measure the time for echo
  duration = pulseIn(ECHO_PIN, HIGH);

  // Convert time to distance (speed of sound ~ 343 m/s)
  distance = duration * 0.034 / 2;  // cm

  // Calculate water depth
  waterDepth = TANK_HEIGHT - distance;

  // Display results
  Serial.print("Distance from sensor: ");
  Serial.print(distance);
  Serial.print(" cm | Water Depth: ");
  Serial.print(waterDepth);
  Serial.println(" cm");

  delay(1000);
}
```