

Microcontroller based Industrial Applications

1. Problem Statement

Floods caused by excessive water in dams pose a serious threat to life and property. Manual monitoring of dam water levels is prone to delay and human error. Therefore, an automatic real-time system is needed to sense water levels and issue alerts when dangerous levels are reached.

2. Scope of the Solution

This project demonstrates a prototype of a real-time dam water level alert system. It continuously measures water levels using an ultrasonic sensor and provides feedback via:

- LCD screen,
- Buzzer,
- LEDs (Green for safe, Red for danger).

This system is simple, low-cost, and scalable for larger dam management applications.

3. Required Components

- Arduino Uno
- Ultrasonic Sensor (HC-SR04)
- Buzzer
- Red LED
- Green LED
- LCD Display (16x2)
- 10k Potentiometer
- Resistors (220Ω)
- Breadboard

Software/IDE:

- TinkerCad

4. Circuit Diagram

► Description:

- HC-SR04 ultrasonic sensor detects water level (distance to surface).
- LCD displays water level.
- Red/Green LEDs indicate danger/safe state.
- Buzzer sounds if water level exceeds threshold.

► Arduino Code:

```
#include <LiquidCrystal.h>
```

```
const int trigPin = 9;
```

```
const int echoPin = 10;
```

```
const int buzzerPin = 8;
```

```
const int redLedPin = 7;
```

```
const int greenLedPin = 6;
```

```
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
```

```
const float WATER_LEVEL_THRESHOLD_CM = 90.0;
```

```
void setup() {
```

```
    Serial.begin(9600);
```

```
    pinMode(trigPin, OUTPUT);
```

```
    pinMode(echoPin, INPUT);
```

```
    pinMode(buzzerPin, OUTPUT);
```

```
    pinMode(redLedPin, OUTPUT);
```

```
    pinMode(greenLedPin, OUTPUT);
```

```
    lcd.begin(16, 2);
```

```
    lcd.setCursor(0, 0);
```

```
    lcd.print("Dam Water Level");
```

```
    lcd.setCursor(0, 1);
```

```
    lcd.print("Alert System");
```

```
    delay(2000);  
    lcd.clear();  
    lcd.setCursor(0, 0);  
    lcd.print("Project done by");  
    lcd.setCursor(0, 1);  
    lcd.print("DASARI HARSHA");  
    delay(2000);  
    lcd.clear();  
}
```

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

```
    long duration = pulseIn(echoPin, HIGH);  
    float distanceCm = duration * 0.0343 / 2;
```

```
    lcd.clear();
```

```
    if (distanceCm > WATER_LEVEL_THRESHOLD_CM) {  
        digitalWrite(redLedPin, HIGH);  
        digitalWrite(greenLedPin, LOW);  
        digitalWrite(buzzerPin, HIGH);  
        lcd.setCursor(0, 0);  
        lcd.print("Water Level:HIGH");  
        lcd.setCursor(0, 1);  
        lcd.print("Level: ");  
        lcd.print(distanceCm);  
        lcd.print(" cm");  
    } else {
```

```
digitalWrite(redLedPin, LOW);  
digitalWrite(greenLedPin, HIGH);  
digitalWrite(buzzerPin, LOW);  
lcd.setCursor(0, 0);  
lcd.print("Water Level: OK");  
lcd.setCursor(0, 1);  
lcd.print("Level: ");  
lcd.print(distanceCm);  
lcd.print(" cm");  
}
```

```
Serial.print("Distance: ");  
Serial.print(distanceCm);  
Serial.println(" cm");
```

```
delay(1000);  
}
```

► **Demo Video Link:**

https://drive.google.com/file/d/1r4LJQlJk_P7ev_k3iXh21bqr3ler2g8I/view?usp=drive_link

► **Tinkercad Circuit Link:**

https://drive.google.com/file/d/1W78Q2OOh_BbaXyESAenYoddqk0qDWFzX/view?usp=sharing

► **Github link – includes all the files:**

<https://github.com/harshadasari2022/Dam-Water-level-Alert-System.git>

5. Results

- When the water level exceeds the threshold, the **red LED** turns ON, the **buzzer** activates, and the **LCD displays "Water Level: HIGH"**
- When the water level is below the threshold, the **green LED** turns ON, the **buzzer** remains OFF, and the **LCD displays "Water Level: OK"**

- The system accurately simulates a real-time dam water level monitoring and alert mechanism and performs as expected in the TinkerCad simulation.

6.Conclusion

This project demonstrates the use of ultrasonic sensors and microcontrollers for real-time water level monitoring and alert generation.

It is highly applicable in:

- Dam safety systems
- Flood monitoring and early warning setups
- Water resource management

It can be extended in real-world environments by integrating GSM, Wi-Fi, or IoT modules to send remote alerts to authorities, automate sluice gates, or trigger emergency protocols.

7. Submitted By

Name: DASARI HARSHA VARDHAN[contact – harshadasari821@gmail.com]

Batch: VIT_22BEC0855

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