WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Integrated Dam Automation System

Ms. Sanjana N[#1], Ms. Ranjitha M H[#2], Dr Divakara S S [*3]

[#1,#2] 8th Semester, Department of Electronics and Communication Engineering, Coorg Institute of Technology, Ponnampet, Karnataka, India

*[*3]Associate Professor HOD, Department of Electronics and Communication Engineering, Coorg Institute of Technology, Ponnampet, Karnataka, India*

ABSTRACT

This paper presents the implementation of an IoT-based dam automation system that autonomously manages gate operations based on water levels, monitors water quality, and sends real-time alerts to nearby farmers. By integrating ultrasonic sensors, TDS/pH modules, servo- controlled gates, and ESP32 microcontrollers, the system ensures efficient water management and proactive disaster prevention. Data is logged to cloud platforms for remote monitoring and future analysis. The proposed model increases safety, enhances irrigation planning, and reduces manual intervention.

Keywords—Dam automation, IoT, water level sensing, TDS monitoring, gate control, ESP32, Blynk, ThingSpeak, farmer alert system.

I. INTRODUCTION

Floods, droughts, and improper irrigation often result from inefficient dam management systems. Traditional manual gate operations are labor-intensive and delay critical responses. To address this, this paper proposes an automated dam gate system using Internet of Things (IoT) technologies. The system monitors water levels and quality, controls gates. automatically, and alerts farmers of potential water discharges via mobile notifications.

II. SYSTEM ARCHITECTURE

The proposed system is modular, comprising:

- Water Level Sensing Module
- Gate Automation Module
- IoT Communication Unit
- Water Quality Monitoring
- Alert Notification Subsystem
- Cloud Data Logging

III. HARDWARE COMPONENTS

Component	Specification
Microcontroller	ESP32 with Wi- Fi
Sensors	HC-SR04
	Ultrasonic, TDS, pH Sensors
Actuators	Servo Motor (MG995)
Display	16x2 LCD or OLED (optional)
Communication	Wi-Fi (via ESP32)
Power Backup	12V Battery,
	Solar Panel (optional)

IV. SOFTWARE IMPLEMENTATION

A. Water Level Detection

Ultrasonic sensors determine the distance to the water surface. Based on thresholds, the gate is controlled accordingly.

```
long duration = pulseIn(trigPin, HIGH); int level = duration * 0.034 / 2;
    if (level < 20) {
// Gate closed
} else if (level > 40) {
// Gate opened
    }
```

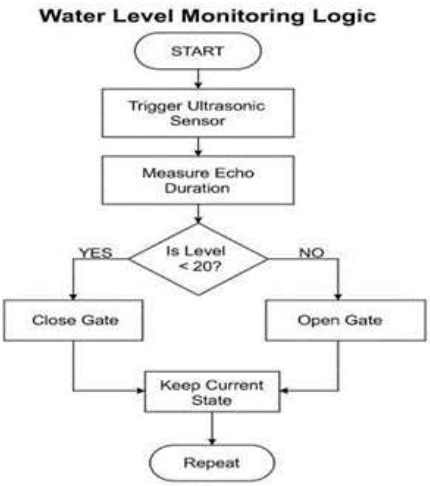

Fig. 1: Water Level Monitoring Logic Flowchart

B. Gate Automation

Using servo motors:gateServo.attach(9); gateServo.write(0); // Close

gateServo.write(90); // Open

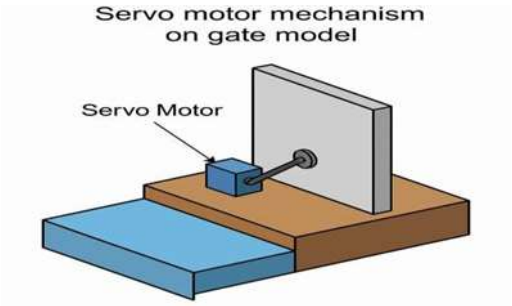

Fig.2: Servo Motor Mechanism on Gate Model

C. Farmer Alert via Blynk

ESP32 uses Blynk to send mobile alerts:

Blynk.virtualWrite(V0, "Warning: Water level critical!");

Fig. 3: Blynk Mobile App Interface for Alerts

D. Water Quality Monitoring

The TDS and pH levels are read from analog sensors. The TDS formula used is:

float voltage = analogRead(A0) * (5.0 / 1024.0);

float tds = (133.42 * pow(voltage, 3) -

255.86 * pow(voltage, 2) + 857.39 *voltage) *0.5;

Fig. 4: TDS Sensor Circuit Connection with ESP32

E. Cloud Data Logging

Using ThingSpeak:

http.begin("http://api.thingspeak.com/up date?api_key=KEY&field1=" + String(level));

http.GET();

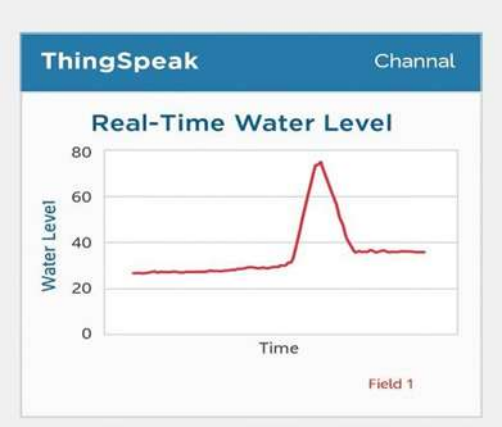

Fig. 5: ThingSpeak Graph for Real-Time Water Level

V. RESULTS

The system successfully:

- Automates gate control based on water levels.
- Alerts farmers via Blynk app when critical thresholds are met.
- Monitors and logs TDS data to ThingSpeak.
- Operates continuously with optional battery and solar backup.

VI. CONCLUSION

This paper presents a practical, scalable, and cost-effective IoT-based dam automation solution. It enhances the safety and efficiency of water management and provides timely alerts to stakeholders, reducing risk during heavy rainfall or overflow conditions. Future upgrades may include GSM integration and AI for predictive analytics.

REFERENCES

1. HC-SR04 Ultrasonic Datasheet.
2. ESP32 Technical Reference Manual.
3. Blynk Documentation - https://docs.blynk.io
4. ThingSpeak API Guide - https://thingspeak.com