Project Report on

WATER LEVEL MONITORING AND PUMP CONTROL SYSTEM USING IoT

Submitted by

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Abstract

This project aims to design and implement a **Water Level Monitoring and Pump Control System** using the **NodeMCU (ESP8266)**, **ultrasonic sensor**, and **relay module**. The system continuously monitors the water level in a tank and automatically controls the water pump to maintain an optimal level. The data is also sent to the **ThingSpeak IoT platform** for remote monitoring through the internet. The project successfully demonstrates automation, efficient water usage, and IoT-based real-time monitoring.

Chapter 1

Components Used

- NodeMCU ESP8266 microcontroller
- Ultrasonic Sensor (HC-SR04)
- 5V Relay Module
- Submersible Water Pump
- Breadboard and jumper wires
- Power supply (5V adapter)

Chapter 2

Working Principle

The **ultrasonic sensor** measures the distance between the sensor and the water surface.

- When the water level is **below a certain limit (low level)**, the **relay turns ON** the pump to fill the tank.
- When the tank reaches the **maximum level**, the **relay turns OFF** the pump to avoid overflow.

The NodeMCU sends the measured water level data to **ThingSpeak** every few seconds for live monitoring on a web dashboard.

Chapter 3

Circuit Connection

- VCC of Ultrasonic Sensor → 3.3V of NodeMCU
- GND → GND
- TRIG → D5
- ECHO → D6
- Relay IN → D1
- Relay VCC → Vin (5V)
- Relay GND → GND

The pump is connected through the **relay output** to safely control the motor's power supply.

Chapter 4

Software Used

- Arduino IDE (for coding and uploading program)
- ThingSpeak IoT Platform (for data visualization)

Chapter 5

Program Overview

The code initializes the ultrasonic sensor and relay, measures distance using pulse timing, calculates the water level, and uploads the value to ThingSpeak. The pump operation is controlled automatically based on water level thresholds using conditional statements.

Chapter 6

Results and Observations

- The system successfully detected varying water levels.
- The relay-controlled pump responded accurately to low and high water levels.
- Real-time water level data was displayed on the ThingSpeak dashboard.
- The system automated tank filling efficiently, minimizing manual effort.

Chapter 7

Advantages

- Fully automatic water control
- IoT-based remote monitoring
- Efficient water usage
- Low-cost and easy to implement

Chapter 8

Applications

- Domestic water tank systems
- Agricultural irrigation systems
- Industrial water storage monitoring

Chapter 9

Conclusion

The **Water Level Monitoring and Pump Control System** was successfully designed, implemented, and tested. The project demonstrates the effective use of IoT and automation for real-time monitoring and efficient water management. The results proved that the system works reliably and can be scaled for larger applications.