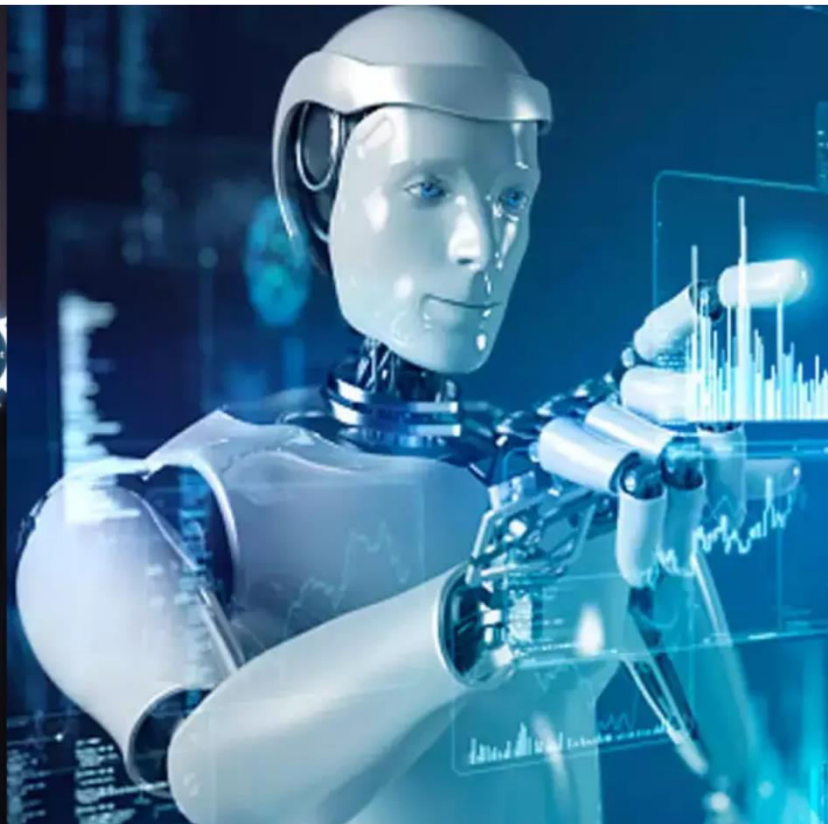




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IoT based Seasonal Water Level Monitoring and Control System for Dams and Irrigation

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ABSTRACT: The increasing demand for efficient water management in agriculture and dam systems necessitates the adoption of smart monitoring and control solutions. The project proposes an **IoT-based Seasonal Water Level Monitoring and Controlling System** designed to optimize water usage in dams and irrigation fields. The system integrates sensors, microcontrollers, and cloud-based analytics to automate water distribution while ensuring real-time monitoring. The system uses an ESP8266 microcontroller as its main part, which connects to a water level sensor to check the water levels in the dam. When the water level hits a certain point, a submersible pump turns on to remove extra water and send it to a storage tank in the fields. At the same time, a soil moisture sensor keeps track of how wet the soil is in the field. When the moisture level falls below what is ideal, a backup pump starts working to water the field, making sure that water is used effectively. All sensor information, including **water level, soil moisture, and pump status**, is sent to the **Thing Speak cloud platform**. This allows you to monitor everything remotely using a web or mobile app. Farmers and officials get instant updates, helping them take quick action and save water. The system keeps records of past information for seasonal study, which aids in predicting water use.

KEYWORDS: sensors collect data → ESP8266 processes and analyzes it → actuators (pumps) are triggered as needed → data is stored and visualized on the cloud → users receive notifications

I. INTRODUCTION

Water is one of the foremost imperative assets for horticulture, however its administration remains a critical challenge in numerous parts of the world. Regular varieties in precipitation, coupled with wasteful water conveyance frameworks, regularly lead to either water shortage or wastage. In dam and water system frameworks, the need of real-time observing and mechanized control components worsens these issues, coming about in diminished agrarian efficiency and expanded dangers of flooding or dry spell.

The approach of the ****Internet of Things (IoT)**** has opened unused conceivable outcomes for shrewdly water administration. By joining sensors, microcontrollers, and cloud-based analytics, IoT empowers real-time checking and computerized control of water assets. This venture proposes an ****IoT-based Regular Water Level Checking and Controlling Framework**** outlined to upgrade the proficiency of dam operations and agrarian water system. The framework utilizes an ****ESP8266 microcontroller**** to gather information from ****water level sensors**** in dams and ****soil dampness sensors**** in areas. Based on predefined limits, it mechanizes water discharge and water system forms, guaranteeing ideal water utilization.

II. PROBLEM STATEMENT

Traditional water management systems for dams and agricultural irrigation face several critical challenges:

1. **Manual Monitoring Dependency**- Current systems rely on periodic manual checks, leading to delayed responses to water level fluctuations.

- Lack of real-time data increases risks of overflow (flooding) or water shortage.

2. **Inefficient Water Distribution**- Farmers often over-irrigate or under-irrigate due to the absence of soil moisture feedback.

- No automated linkage between dam water release and field-level demand.

3. **Water Wastage** - Excess water released from dams is not stored/utilized effectively.

- No predictive analysis for seasonal water requirements.

4. **Limited Remote Access** - Authorities/farmers cannot monitor conditions remotely, requiring physical inspections

III. DESIGN METHODOLOGY AND WORKING

The proposed IoT-based water monitoring and control system follows a structured design methodology to ensure efficient functionality and reliability. The system architecture is built around the **ESP8266 microcontroller**, which serves as the central processing unit, interfacing with multiple sensors and actuators. The **water level sensor** (ultrasonic or float type) is deployed in the dam to continuously measure water levels, while the **soil moisture sensor** is installed in agricultural fields to monitor hydration levels in real time. These sensors transmit data to the ESP8266, which processes the information and triggers appropriate actions based on predefined thresholds. For instance, if the dam water level exceeds a safe limit, the microcontroller activates a **submersible pump** to drain excess water into a storage tank. Similarly, if the soil moisture level drops below the optimal range, the system turns on an **irrigation pump** to supply water to the fields, ensuring precise and automated irrigation.

The system leverages **ThingSpeak**, an IoT cloud platform, for data logging and remote monitoring. Sensor readings, pump status, and alerts are uploaded to the cloud via Wi-Fi, enabling farmers and authorities to access real-time updates through a web or mobile interface. This cloud integration also facilitates historical data analysis, helping users track seasonal trends and make informed decisions.

The **working principle** of the system is cyclical: sensors collect data → ESP8266 processes and analyzes it → actuators (pumps) are triggered as needed → data is stored and visualized on the cloud → users receive notifications. By automating water management, the system eliminates manual intervention, reduces water wastage, and enhances agricultural productivity. The design prioritizes scalability, allowing future expansions such as integrating weather forecasts or adding more sensors for large-scale deployments

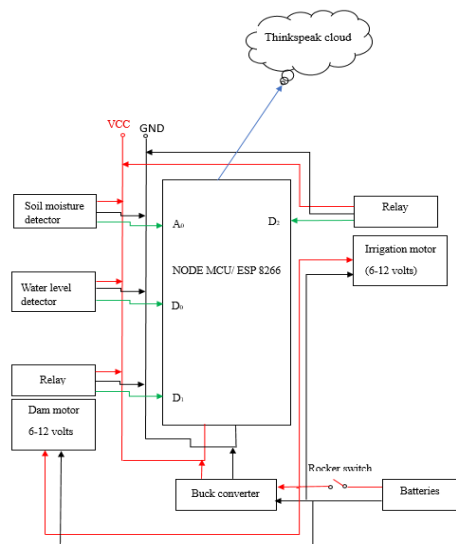


Fig 1: Block daigram

IV. COMPONENTS USED

1. ESP 8266:



Fig 2: ESP 8266

It makes it simple to create and test projects that connect to the Internet of Things (IoT). It uses the Lua programming language and works with GPIO, PWM, I2C, and other features. It offers networking features in a compact size

2. 2-CHANNEL RELAY:

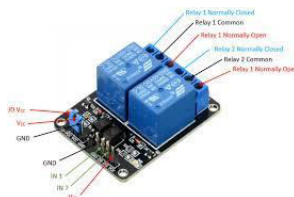


Fig 3: 2-Channel Relay

A 2-Channel Relay Module consists of two relays on a single board. Each relay acts as an electronically controlled switch that allows you to control high-power devices.

3. BUCK CONVERTER:

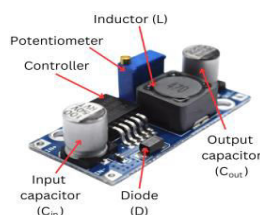


Fig 4: Buck Converter

A Buck Converter is a type of DC-DC (Direct Current to Direct Current) converter that steps down (reduces) a higher voltage to a lower, more suitable voltage level.

4. SOIL MOISTURE DETECTOR:



Fig 5: Soil Moisture Detector

A Soil Moisture Detector is a sensor used to measure the moisture content in the soil. This sensor is an essential component in agricultural automation and irrigation systems.

5. WATER LEVEL SENSOR:

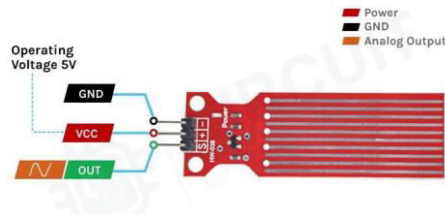


Fig 6: Water Level Sensor

A Water Level Detector is a device or sensor system designed to measure and monitor the water level in reservoirs, dams, tanks, canals, or irrigation systems.

6. R385 6-12V DC DIAPHRAGM



Fig 7: R385 6-12v DC Diaphragm

The R385 6-12V DC Diaphragm Mini Aquarium Water Pump is a great choice for moving different types of liquids. It has enough pressure to work with a nozzle for creating a spray system.

7. BATTERY:



Fig 8: Battery

It has a voltage rating of 3.7 volts and a capacity of 2600mAh. It is a small, strong battery cell that holds 2600 mAh of energy. You can easily add it to your project to meet the requirements of 3. Requires a 7-volt power supply with a large capacity.

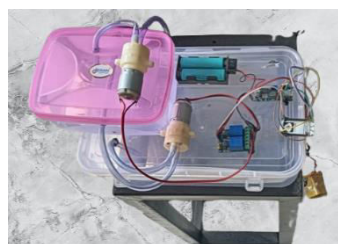


Fig 9: Implementation of the work

V. SOFTWARE REQUIREMENTS

Arduino IDE: Arduino Integrated Development Environment (IDE) is an open-source IDE that allows users to write code and upload it to any Arduino board. Arduino IDE is written in Java and is compatible with Windows, macOS and Linux operating.

VI. CONCLUSION

The IoT-Based Seasonal Water Level Monitoring and Control System for dams and irrigation is a cutting-edge solution that integrates modern technology with efficient water management. By leveraging IoT sensors, microcontrollers, and cloud computing, the system ensures real-time monitoring of water levels and soil moisture, which is crucial for optimizing water usage and improving agricultural productivity. This system enables automated water control, reducing reliance on manual labor and ensuring efficient irrigation based on seasonal thresholds.

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