

# IOT-BASED LOW-COST SMART WATER LEVEL MONITORING AND MOTOR CONTROL SYSTEM FOR DOMESTIC APPLICATION

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**Abstract** - This research paper presents the design and development of an IoT-based project which focuses on low-cost smart water level monitoring along with a motor control system for domestic houses. The system that we have designed focuses on the digital approach of how we can implement a water monitoring and management system that uses our mobile device for monitoring and manage that system. In the research project we use a NodeMCU to establish system connection to user mobile through the Blynk application, through the application the user will be able to remotely check the water level, also the user can perform motor (ON/OFF) operation using the application. The application will also provide notification when the water level reaches critical stages i.e., "low or high". This research provides a lost cost water management and tracking solution that is both efficient and low-cost that can be used to monitor water level for overhead tank and also remotely control motor operation in domestic households.

**Key Words:** Low Cost, Efficient, , NodeMCU, IoT, Water Monitoring, Motor Control

## 1. INTRODUCTION

Water is one of the most important and valuable resource in the world and is needed and will be needed also long as life exists on earth. We as humans used it in our everyday life from drinking it to washing our laundries from it in our everyday lives. It is estimated that about 71% of earth's Surface is covered in water and around 96.5% of that water is salt water. Which cannot be directly used to drink. This leaves only a small fraction of freshwater available for use, making efficient water management a very important topic.

Furthermore, in India the situation is more challenging the country with the highest population in the world currently and growing every year rapidly so in India the demand for water will naturally increase as well. With this huge population need for water and sustaining the available water becomes a significant concern. We have already seen metropolitan cities with high population density like Bengaluru and areas in the capital of the country Delhi is already facing water shortages and dry water reserves. This highlights the need for minimize water wastage and a water management system that track the water levels.

At the same time the country has seen rapid internet growth with an estimate around 55 to 65% of India's population uses internet which is around every 6 in 10 Indians use internet Around of which 95% access internet through their mobile phones. But still Indian domestic households use traditional manual system for things such as motor operations or water monitoring.

Overhead tanks in households at times might overflow at due to negligence, which result in motor being turned on for more time than it should which results in wastage of electricity and water overflow which is water wastage.

To address this issue this research proposes a low-cost Internet of Things (IoT)-based water monitoring and motor control system. This system allows a user to operate the water motor and get the current water level indications through remote access which will be the Blynk iot application through the internet.

It eliminates the use of physical operations of motor. The physical water level monitoring is no longer needed it can be seen through the Blynk iot application, so the water monitoring is also automated. If the water level gets critical it either when the water is too high in tank or too low it sends a notification to the user and also the motor turns itself off. Current researches in this field focuses on similar result that increases the efficiency and reduces water and power wastage but other existing researches bear a higher Cost to make a working model. The primary focus of this research is to provide a cost effective and efficient model that much lower in cost and can be easily adopted by households compared to others. . While the proposed model offers affordability and functionality, there remains scope for further improvements and enhancements.

## 2. METHODOLOGY

This project involves the following components that are used in implementing it.

I. **Esp8266 Node MCU microcontroller**- It is a microcontroller that is used to execute the given tasks that are programmed in it. It can be considered as the brain of the project. Esp8266 with the help of Arduino IDE and C++ programming language the instructions

that are to be given to it are prepared. Then a data transfer cable is used to transfer the written program to the microcontroller



Fig-1: image of esp8266 NodeMCU used in system

ii. **HC-SR04 Ultrasonic Sensor**-It is a 4pin ultrasonic sensor that is used to measure water levels. It emits sound waves and measures the time it takes for echo to return ,which is directly proportional to the distance to the water surface. The equation for calculating the distance is.

$$Distance (cm) = \frac{Time (\mu s) \times 0.0343}{2} [2]$$



Fig2:Image of HC-SR04 ultrasonic sensor used in system

iii. **Relay module**-The relay module acts as an electrical switch and controls the motor based on the water level.



Fig-3:Image of relay module used in system

iv. **Blynk App**-It is a mobile application that acts as remote to do operations of the motor and see the current water level through the app.

### 3. RESULTS & DISCUSSIONS

The project was successfully implemented and tested.

- Water motor was able to transfer water from its water source to the water tank and was operable through Blynk
- Water level in the tank was accurately detectable
- The ultrasonic sensor accurately measured the water level and gave output on the blynk app

- The Blynk application provided notification after water levels are critical
- Motor turned off when water level reaches critical stages
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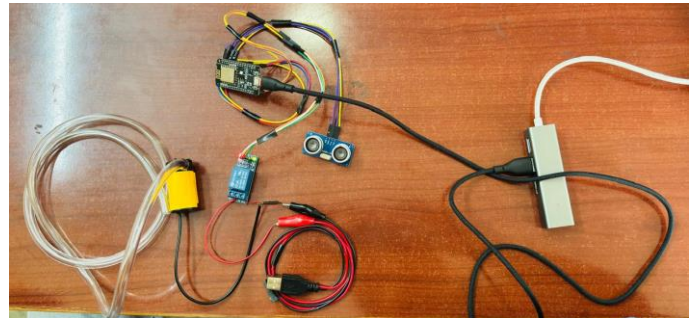


Fig-4:Experimental setup of system

Fig-4 image shows the prototype version of implementing the system

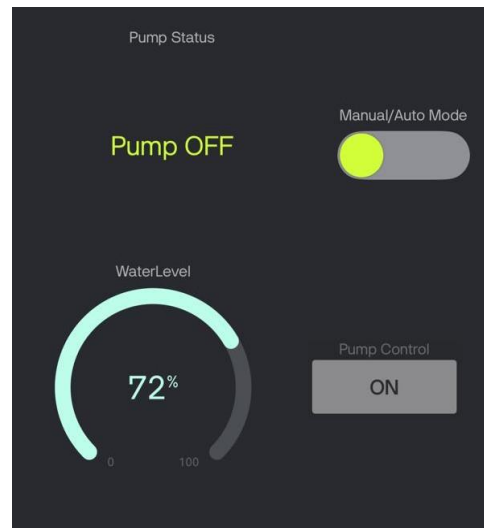


Fig-5:Current water level indication through Blynk app

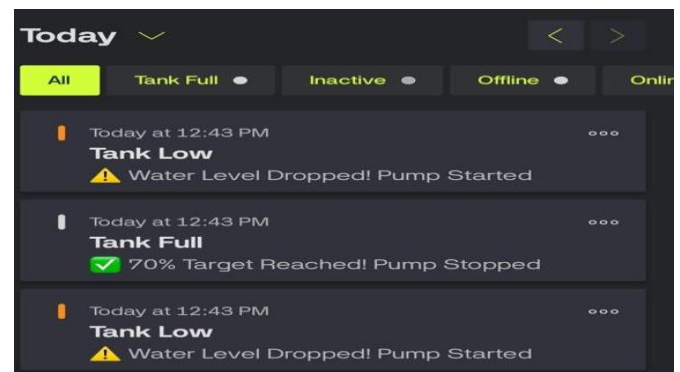


Fig-6:Notification of critical water levels in Blynk app

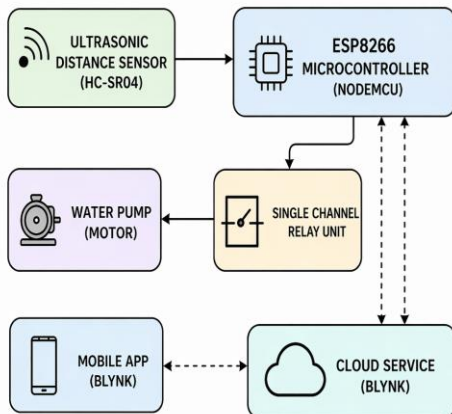


Fig-7:A block diagram of the system(adapted from[2])

Table-1: Status of water level based on the Blynk app(adapted from [2])

Sl.no.	Device status	Motor pump status	Water level	Status of the water level in Blynk
1	Online	On	0% to >70%	Water level starts increasing
2	Online	On	<70	Water level stops increasing
3	Online	Not working	The same	Not available

Table-1 demonstrates the working of the water pump and its corresponding water level status from the blynk app. It also highlights the motor stopping and starting at critical levels.

#### 4. CONCLUSIONS

This project has successfully designed and implemented the prototype of a smart low cost and efficient solution to the problems presented. The prototype provides accurate water level monitoring and also provides remote water motor operating through blynk application improving user convenience and reduce manual efforts.

The prototype displayed a reliable and consistent performance during testing, making it suitable for household and small-scale applications. It offers a practical solution to prevent water overflow and wastage, contributing to better resource management and efficiency.

However, for large-scale implementation, further improvements are required, such as enhanced sensor durability, better network stability, and more robust system integration.

Overall, the proposed system presents a cost-effective and scalable approach toward smart water management using IoT technology

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