

Project Report

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Subject Name: Internet of Things

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Aim: To design and implement an IoT-based water level indicator using NodeMCU and an ultrasonic sensor to monitor tank levels in real time.

To prevent water wastage by sending alert messages through the Blynk app when the tank is full.

Objectives:

1. To continuously monitor the water level in a tank using an ultrasonic sensor connected to NodeMCU.
2. To display real-time water level data on the Blynk mobile application.
3. To send an alert notification to the user's phone when the water tank reaches the full level, preventing overflow and wastage.
4. To create a low-cost, efficient, and user-friendly IoT system for smart water management.

Components Required:

| Sno | Name of Component | Qty. |
|-----|-------------------|------|
| 1. | NodeMCU (ESP8266) | 1 |
| 2. | Ultrasonic sensor | 1 |

| | | |
|----|-----------------|-----|
| 3. | Jumper wires | 7-8 |
| 4. | Micro USB cable | 1 |

Details of Components:

1. NodeMCU:

The NodeMCU board is a low-cost, open-source IoT platform widely recognized for its user-friendly approach to building Internet-connected projects. Based on the ESP8266 Wi-Fi chip, it combines a microcontroller with Wi-Fi capabilities, enabling developers to create connected devices with ease.

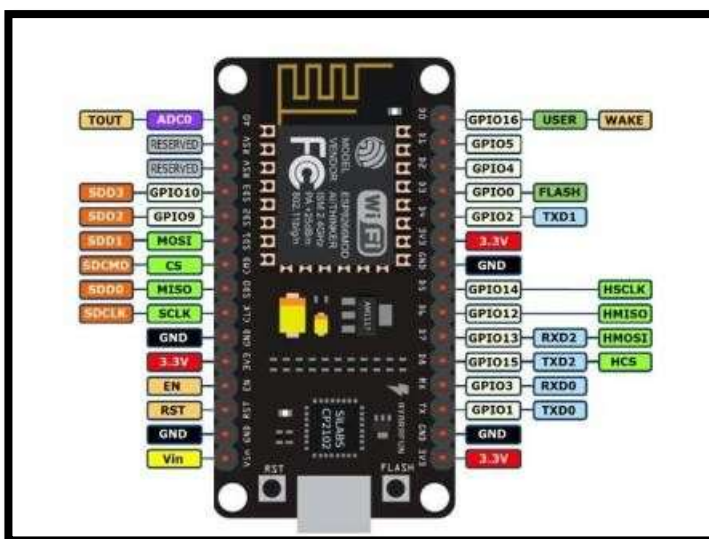


Figure 1 : NodeMCU Board

2. Ultrasonic sensor:

The ultrasonic sensor is used to measure the distance between the water surface and the sensor by emitting ultrasonic waves and calculating the time taken for the echo to return. It typically has four pins — VCC, Trig, Echo, and GND. The Trig pin sends the ultrasonic pulse, and the Echo pin receives the reflected signal. The NodeMCU processes this data to determine the water level. This sensor is accurate, affordable, and ideal for non-contact liquid level measurement.



Figure 2 Ultrasonic Sensor

3. Jumper Wires :

Jumper wires are used to connect the ultrasonic sensor with the NodeMCU for signal and power transmission. They provide an easy and flexible way to build the circuit without soldering.



Figure 3 Jumper Wires

Block Diagram of Designed Model:

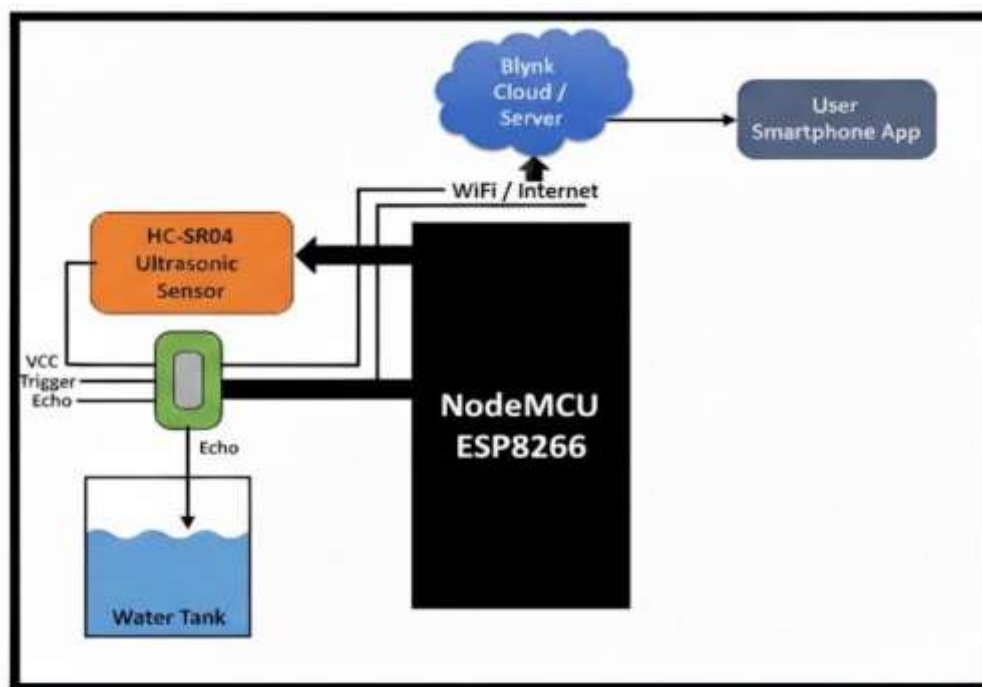


Figure 4 : Block Diagram of Model

Explanation of Block Diagram-

The block diagram illustrates the working of the **IoT-based Water Level Indicator System** using **NodeMCU (ESP8266)**, an **ultrasonic sensor**, and the **Blynk cloud platform**.

- The **HC-SR04 Ultrasonic Sensor** is placed at the top of the water tank to measure the distance between the sensor and the water surface. It sends ultrasonic pulses that reflect back from the water surface, and the sensor calculates the water level based on the time taken for the echo to return.
- The sensor is connected to the **NodeMCU ESP8266**, which processes the data received from the sensor. The NodeMCU acts as the central control unit of the system.
- The **NodeMCU** is connected to the **Wi-Fi network**, allowing it to communicate with the **Blynk Cloud Server**.
- The measured water level data is transmitted through the internet to the **Blynk App** on the user's smartphone.
- When the water tank reaches a predefined full level, the **Blynk App** sends an **alert notification** to the user's phone, preventing overflow and water wastage.

This setup provides a **real-time water monitoring system** that is low-cost, wireless, and easy to use, helping to conserve water efficiently.



Working of the designed model



The designed model works on the principle of measuring the distance between the **ultrasonic sensor** and the **water surface** to determine the water level in the tank. The **HC-SR04 ultrasonic sensor** sends ultrasonic waves toward the water surface, and when these waves reflect, the sensor measures the time taken for the echo to return. Based on this time, the **NodeMCU (ESP8266)** calculates the water level.

- The **NodeMCU** is programmed using the **Arduino IDE** and connected to a **Wi-Fi network**, enabling real-time communication with the **Blynk cloud server**. The calculated water level data is sent to the **Blynk mobile app**, where the user can monitor the current status of the water tank.
- When the water level reaches the maximum limit, the system automatically triggers an **alert notification** on the user's smartphone through the Blynk app, indicating that the tank is full. This helps the user stop the water pump in time, thus **preventing water overflow and wastage**.
- Overall, the system provides a **smart, efficient, and automated water level monitoring solution** using IoT technology.

Picture of Prototype:

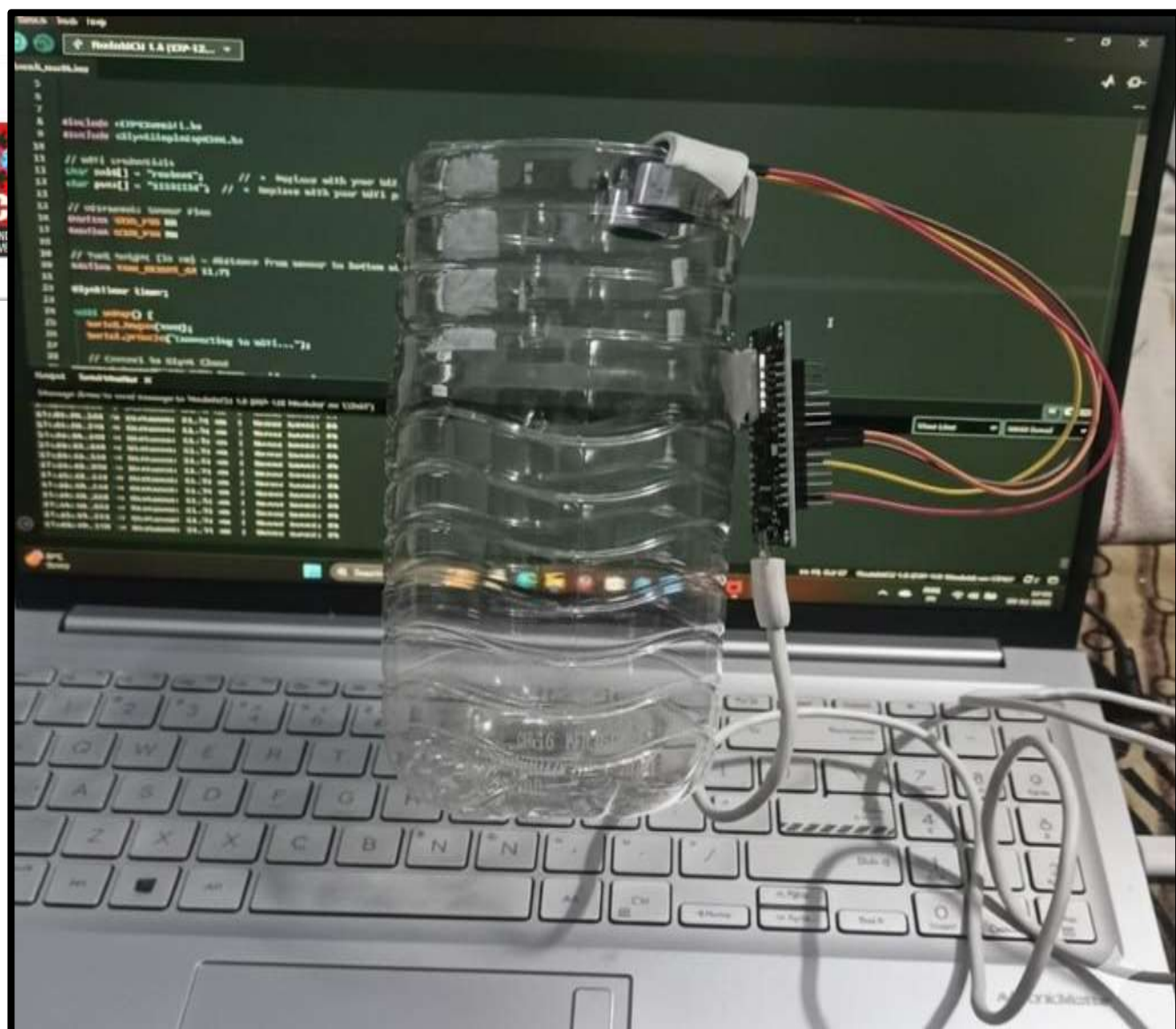


Figure 5 final model

Output of Designed Model/Prototype:

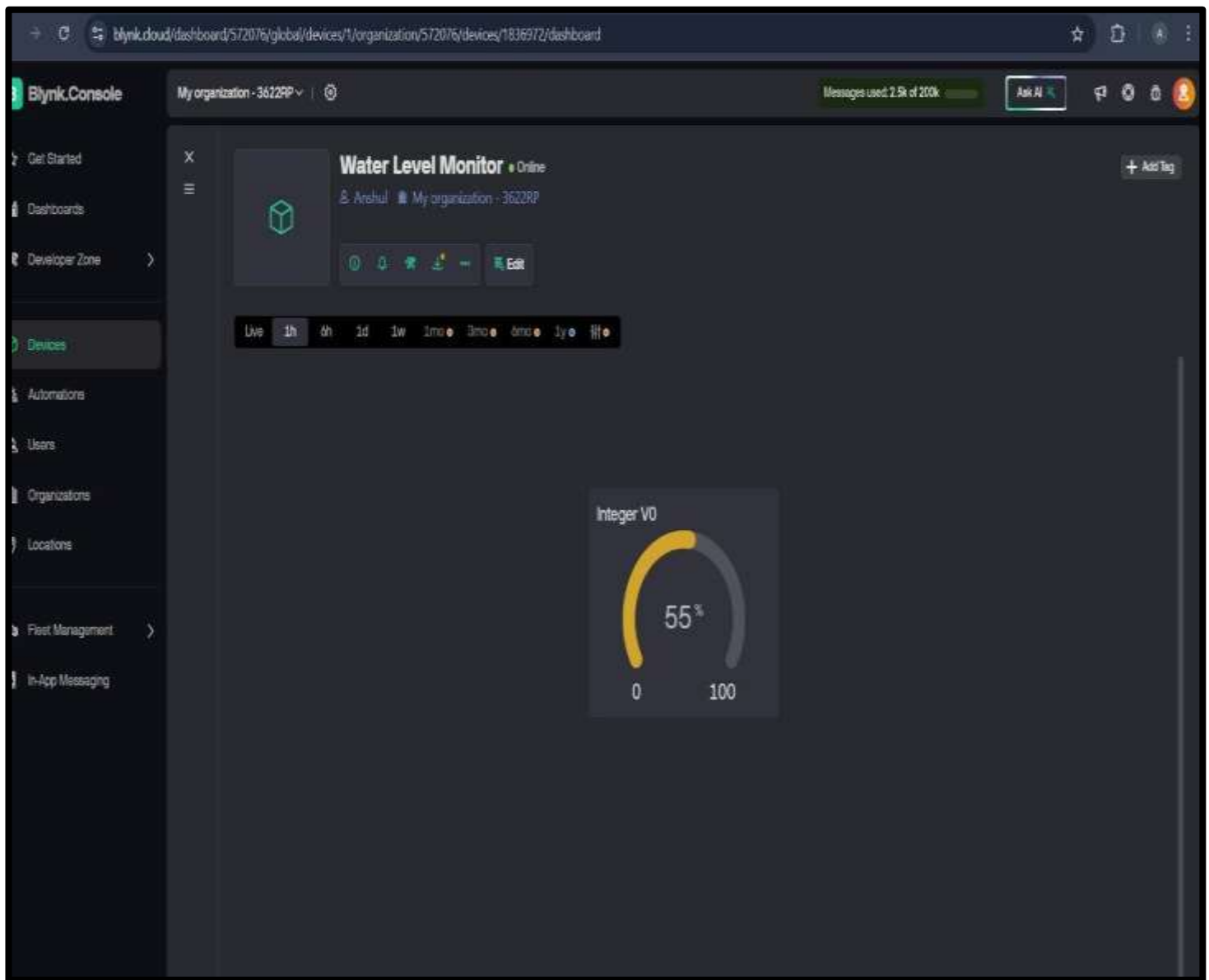


Figure 6 : Output on BLYNK Cloud

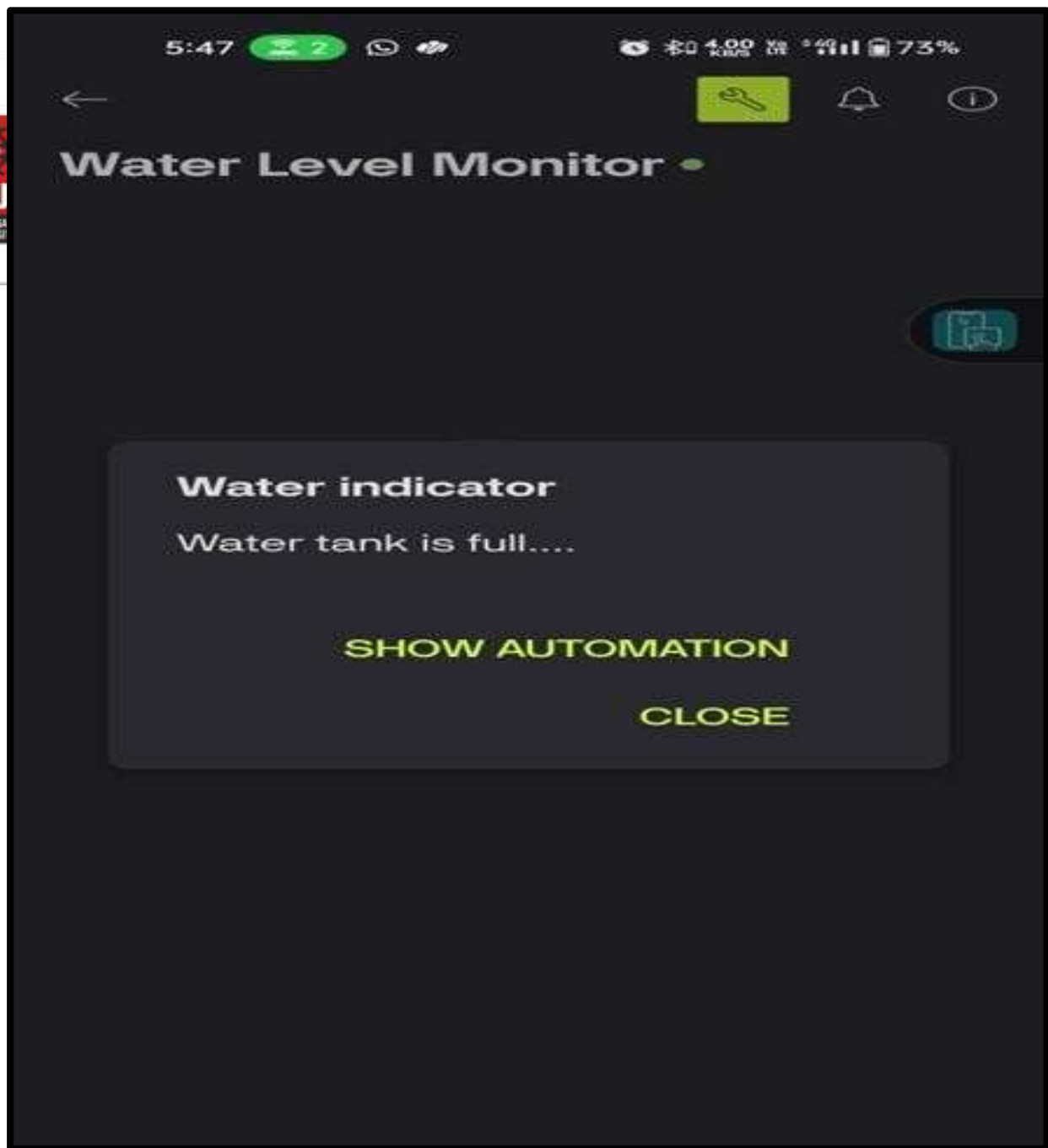


Figure 7 Mobile app notification

Learning outcomes (What I have learnt):

- Gained practical knowledge of **IoT systems** by integrating hardware components like NodeMCU and ultrasonic sensors.
- Learned how to use the **Arduino IDE** for programming and interfacing sensors with microcontrollers.

- Understood the working and application of **Blynk Cloud and mobile app** for real-time data monitoring and alerts.



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- Developed skills in **circuit design, sensor interfacing, and wireless communication** using Wi-Fi.
- Understood how IoT technology can be applied to **solve real-world problems**, such as preventing water wastage through smart monitoring.