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Realization of IoT Water Monitoring System using Node MCU ESP8266 Microcontroller and Blynk Application

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ABSTRACT:

The overflow of water is one of the issues that most families face. This research presents a new approach for monitoring and managing water flow. Though water is a crucial component of life, it has been observed that when it comes to water management, people have a tendency to turn on the motor when their taps run dry and turn off the motor when the overhead tank begins to overflow. This leads to unnecessary water waste and, under certain circumstances, water shortages during times of crisis. As a result, the main goal of the suggested method is to monitor the water level in the tank when it rises or falls below the consumer level. This can be done using the Blynk App on a mobile phone. The complete program run through the Arduino IDE. As a result, using this Blynk application, one does not need to climb to the top of a building to check the water level, deal with overflowing water, or deal with the potential of an air blockage in the pipe due to a lack of water in the tank. To determine the water level, this study uses an ultrasonic sensor connected to an NodeMCU ESP 8266 module. When the water level falls below a certain level, the percentage of water is displayed on the Blynk app. If the tank is going to be filled, the percentage will be high to prevent a water overflow that could otherwise occur. As a result, this project will make sure that monitoring the water will be easier as it can be monitored using Blynk application on the phone.

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I. INTRODUCTION

Water is one of the world's most important resources, as well as a basic requirement for all living things. Nowadays, developing countries lack a proper solution to water waste and overflow. As a result, conservation is one of the world's top priorities. Water scarcity may be a major issue for most countries. As a result, water overflow becomes one of the most significant contributors to water scarcity in our country. Water waste and overflowing are major issues facing the world today. Wastage is caused by an ineffective water monitoring system. This will have an impact on daily living because there will be less water to drink or cook with, leading to an unhealthy lifestyle. Time management is critical, especially in today's frantic world. For example, to check the water level in the tank, the user must ascend. As a result, checking the water level can save a significant amount of time[1]–[4].

Human civilization is transitioning to the digital era, and everyone is surrounded by technology and uses it extensively in their daily lives. The key is automation. Monitoring the water level allows us to be aware of current, ongoing, and emerging issues related to water scarcity. Currently, most researchers using Internet of Things (IoT) technology for water monitoring with different type of sensors especially for water quality [1], [2], [5]–[7]. For example, in [8], the creation of a system based on the ThingSpeak application focuses on water quality monitoring, including pH, turbidity, and temperature. However, only the pH parameter has been thoroughly examined in [9]. Water quality, including conductivity and temperature, is monitored using ZigBee and Global System for Mobile Communication (GSM) technologies [10]. Meanwhile, an RFID system and wireless sensor network have been installed to monitor pH and temperature [11]. The Raspberry Pie platform is then deployed as an Internet of Thing (IoT) cloud for water quality monitoring in [12].

As a result, this project presented a smart water monitoring system based on the IoT to examine the water level in the tank without putting ourselves in danger or wasting time climbing to test it. For data gathering, the system

incorporates the HC-SR04 Ultrasonic Sensor and the NodeMCU ESP8266 microcontroller. The water level is monitored via smartphone using the Bylnk app.

II. METHODOLOGY

Fig. 1 shows the general process of system development which consists of hardware (HC-SR04 ultrasonic sensor and NodeMCU ESP8266) and software elements (Arduino IDE and Blynk Application). An ultrasonic sensor is a device that uses ultrasonic sound waves to measure gaps in target objects and then turns the reflected sound into an electrical signal. The transmitter, which transmits the sound, and the receiver, which receives the sound after it has travelled to and from the target, are the two primary parts of a sensor. At 40 kHz, an ultrasonic sensor transmitter sends out ultrasound waves. The HC-SR04 can measure distances between 2 cm and 4 m energetically. For functioning, the HC-SR04 needs 5 volts and 15 mA of current.

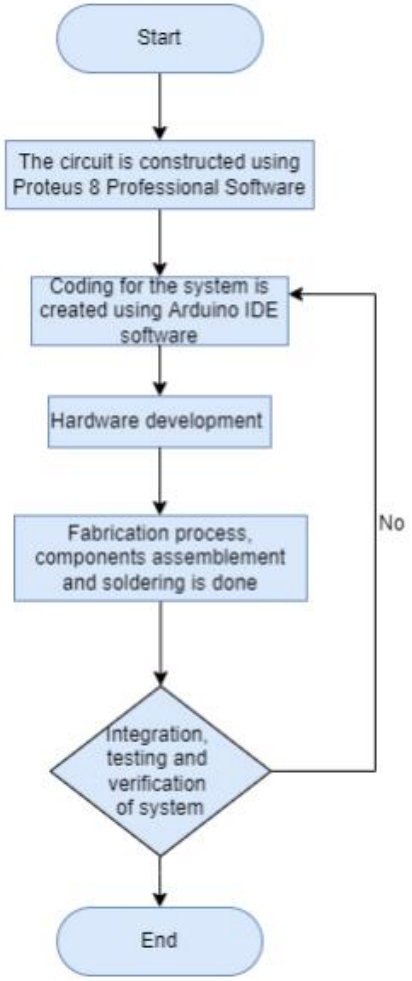

Fig.1 Flowchart of general process of system development.

NodeMCU is an open source platform built on the ESP8266 that allows things to be connected and data to be transferred over Wi-Fi. By offering some of the most crucial characteristics of microcontrollers, such as usability and programmability using the Arduino Integrated Development Environment (IDE). It also working in low power consumption and inexpensive cost. The NodeMCU needs to be linked to WiFi in order for the Bylnk app on the smartphone to be interfaced with. Using Blynk apps on the smartphone, the system may be monitored and managed when it's connected. The server, library, and Bylnk app make up the bylnk application. The Bylnk software enables the creation of project interfaces using a variety of widgets. The Bylnk server, which was launched on NodeMCU and is in charge of all communications between the smartphone and hardware, can easily handle thousands of devices. In the Bylnk library, all the most popular hardware platforms are accessible and capable of interacting with the server and processing all incoming and outgoing commands.
Proteus software was used to simulate the circuit prior to the system circuit fabrication. The system's circuit diagram is shown in Fig. 2. The NodeMCU's pins 10 and 15 are connected to the component TBLOCK-

representation M2's of the power supply, Vin. The HC-SR04 Ultrasonic Sensor's data connection is represented by the component TBLOCK-M4. The ground and Vcc were linked to the NodeMCU's ground pin. While the data wire for the trigger is linked to pin D5 of the NodeMCU, the data wire for the echo HC-SR04 Ultrasonic Sensor is attached to pin D6 of the NodeMCU. The overall block diagram of system is shown in Fig. 3. The NodeMCU ESP 8266 is coupled to the HC-SR04 ultrasonic sensor. The data is transferred over the Internet using the NodeMCU ESP 8266, which is connected to WiFi. The Blynk Application on the phone will display the data.

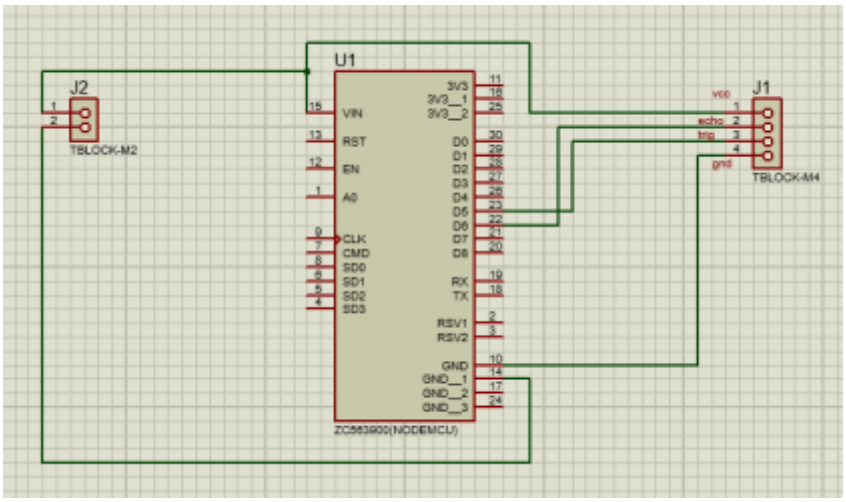

Fig. 2 Circuit in the Proteus software

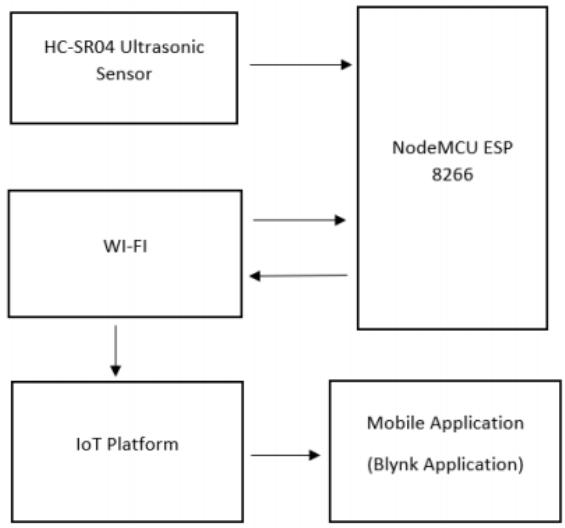

Fig. 3 Block diagram of system

III. RESULTS AND DISCUSSION

Fig. 4. shows the condition of Bylnk app when the water level is low or high. The HC-SR04 Ultrasonic sensor will keep track of the water level in the tank and alert the user if it drops. The Blynk app will display a low percentage of water if the water level is low or high. When the percentage is low, the colour red is displayed. However , green colour is displayed for high water level as shown in Fig. 5.

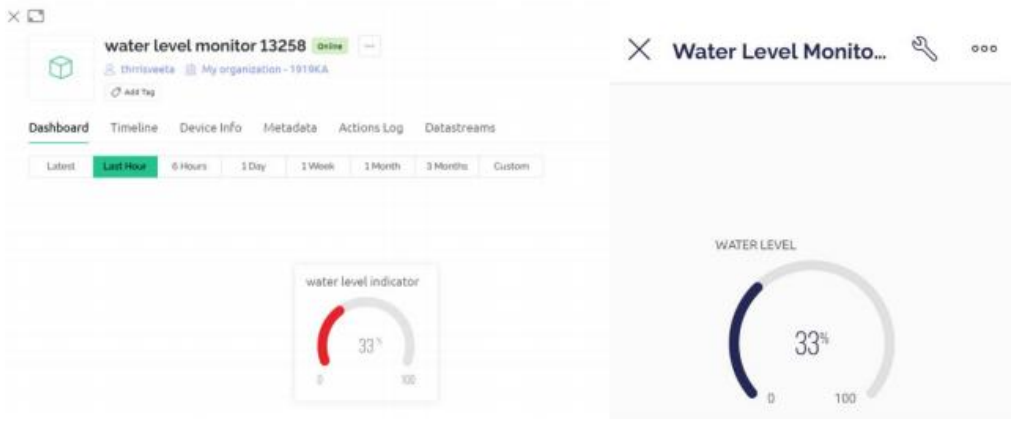

Fig. 4Low water level monitoring using Bylnk app

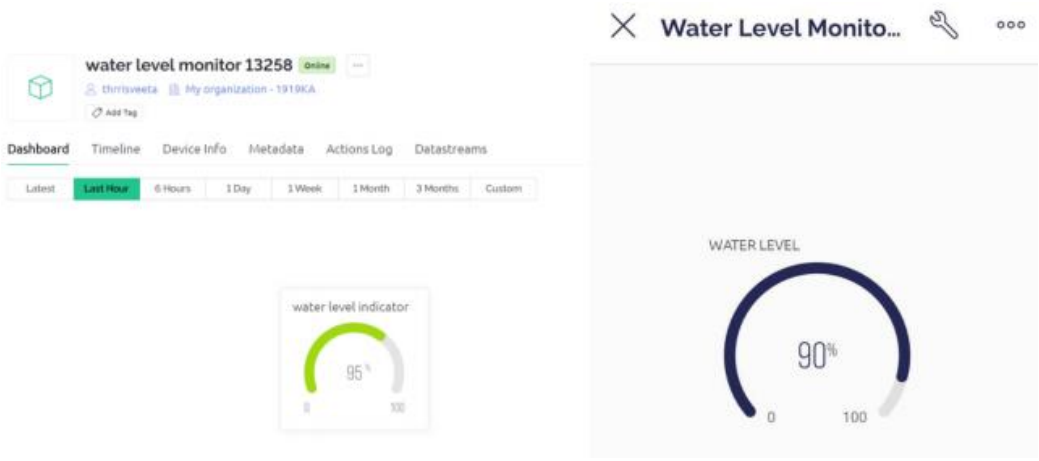

Fig. 4High water level monitoring using Bylnk app

Fig. 5 shows the prototype of system which shown the position of sensor. All the component are in the top of mini tank. The fabricated of PCB circuit is shown in Fig 6. The circuit is based on the simulated circuit in the Proteus software.

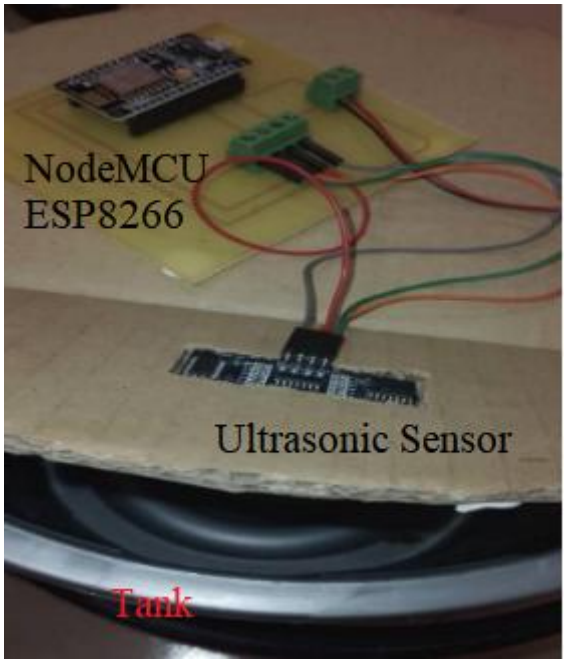

Fig. 5 Prototype of system

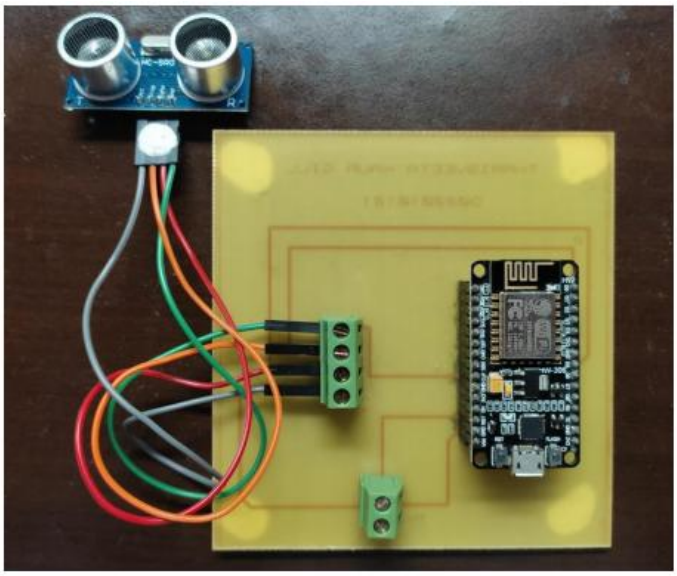

Fig. 6 Fabrication of PCB layout

IV. CONCLUSION

The project of smart water monitoring system based IoT was successfully realize based on NodeMCU ESP8266 microcontroller, HC-SR04 ultrasonic sensor and Bylnk application. The low cost system can avoid unnecessary water waste. It help us to monitor the current, ongoing and emerging problem of tank continuously. For the future work, the system will be improve through using turbidity element for water quality monitoring system.

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