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Monitoring The Water Leakage System (MWLS) using an Ultrasonic Sensor

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Abstract: Water waste in the current scenario is simply due to overflowing tanks, which is unsustainable. Conventional water tanks cannot monitor or control the water level in the tank, resulting in significant water waste. Other technologies had some drawbacks in one way or another. The main goal of this project has been to eliminate these flaws while also providing an efficient and cost-effective solution. Our project uses IoT and Blynk applications to monitor and control water levels. Arduino is an open-source IoT platform that we are using. An HC-SR04 ultrasonic sensor is placed on the tank's surface to sense the water level and the distance between the sensor and the water level is measured and sent to the Blynk application via Arduino. We can manually monitor the tank by using an on/off button provided in the Blynk app. The Blynk app has a user interface that displays the tank layout and a manual operation button.

Keywords: Water Tank, HC-SR04 Ultrasonic Sensor, Iot

1. Introduction

Water is currently the most valuable resource on the planet [1]. The Concept of IoT is used in this project to define energy conservation in the water level monitoring system on the tank [2]. The main goal is to have sensors that detect water levels and warn the user if there is water above the most recent level in the tank. The ultrasonic sensor will be placed at the top tank, where we will calculate the water level, and if the water level drops, it means the water in the tank has run out, and the consumer will be notified. The most important aspect of this project is an ultrasonic sensor that will detect whether the water level in the tank is high, medium, or low. The sensor will be linked to the Arduino and transmitted to the ESP8266 [3]. The Blynk app is used to retrieve water level values or displays, and the data is delivered to the user via a mobile phone with the Blynk app installed [4].

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2. Materials and Methods

2.1 MWLS Block Diagram

The input of this project is an ultrasonic sensor, the control unit is Arduino Uno and the output is a water/motor pump, LCD module and Blynk application. Figure 1 shows the block diagram of this project.

Figure 1: Block diagram of MWLS

2.2 Methods

The term “Process Flow” refers to following the correct path when performing the task. It depicts a manual mode of operation for the device, as well as the flow of actions or tasks that must be completed in the correct order. This manual mode is included in this project for maintenance or other reason. The flowchart in this project will provide an overview of the steps involved in the manual procedure. Figure 2 depicts a flowchart for the process flow.

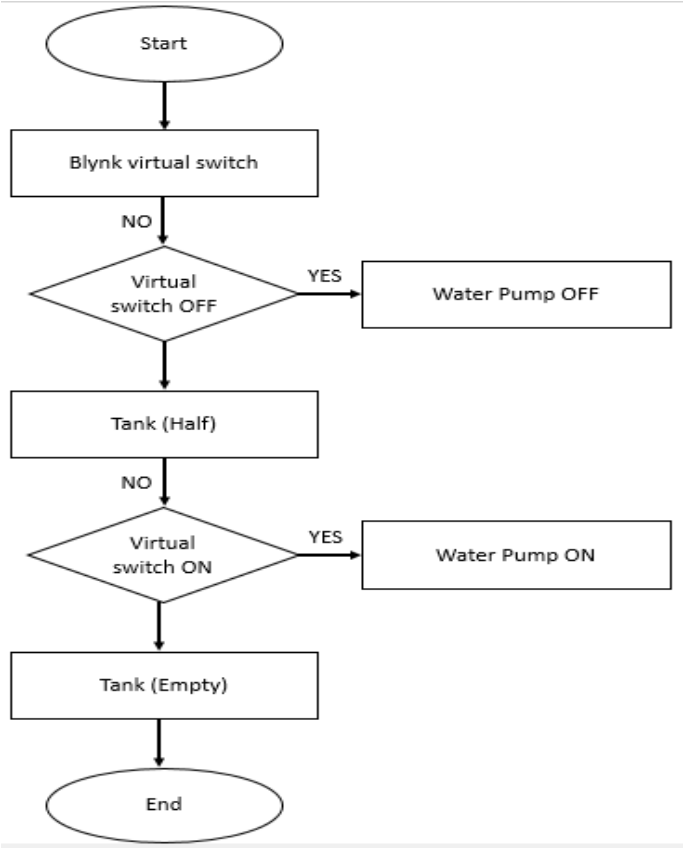

Figure 2: Process flowchart (Manual Mode)

2.3 Electronic Setup

The sensor connections are combined in this circuit diagram. Figure 3 shows the circuit electronic setup.

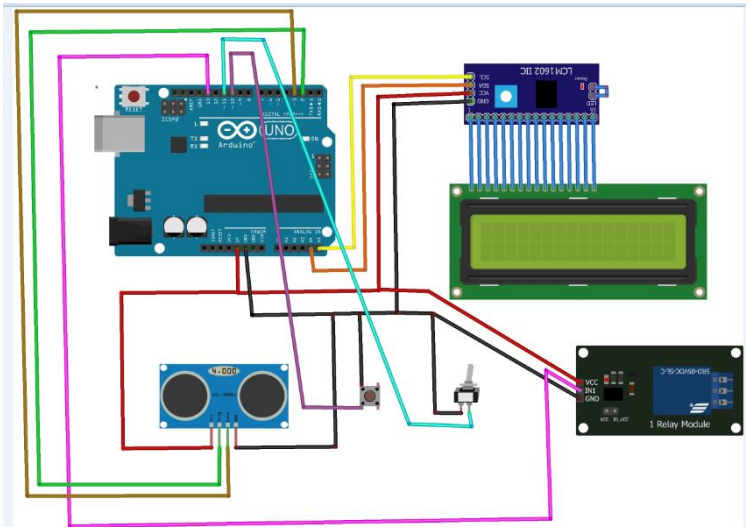

Figure 3: Circuit electronic setup

3. Results and Discussion

3.1 Analysis of Electronic Setup

The output of this project is to monitor the water level in the tank at a high, medium and low levels. For example, when the water in the tank is low then the pump will work and fill the tank until the water level is high. When the water level is high, the pump will stop. Therefore, the data will show on the LCD and in the Blynk software. Figure 4 shows the electronic setup of this project.

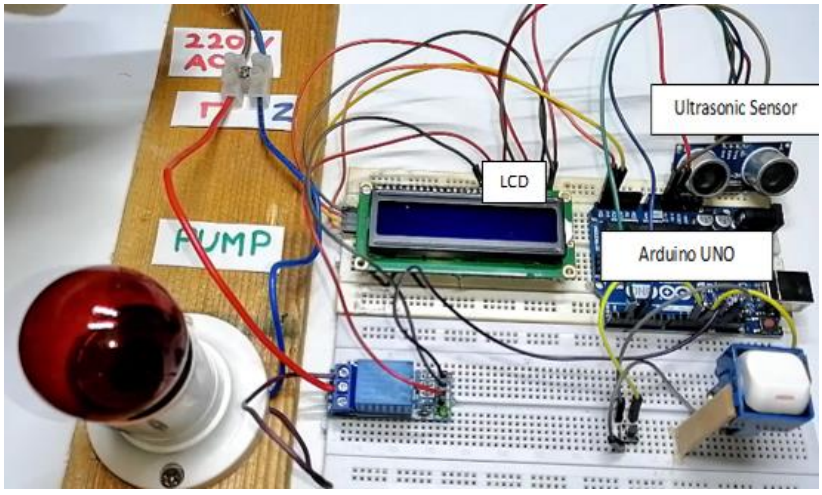

Figure 4: Electronic setup

3.2 Operational of Ultrasonic Sensor

Ultrasonic sensors and water pumps will do their job when the supply has been given to it and once connected to the internet and Arduino UNO then all the data will be given to the software Blynk and displayed on LCD. Table 1 shows the working water pump according to the water level in the container and Figure 5 shows the arrangement of the ultrasonic sensor.

Table 1: Working water pump according to water level

Depth of water, cm / %	Working of water pump
20cm @ 100%	Water pump OFF
10cm @ 50%	Water pump OFF
5cm @ 5%	Water pump ON

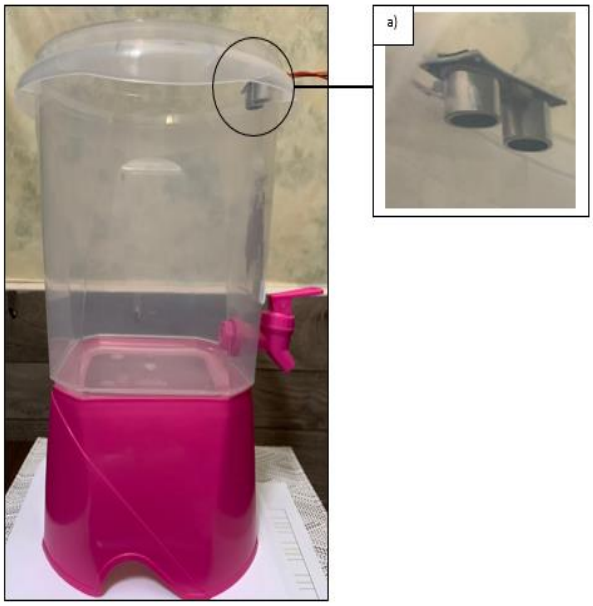

Figure 5: Arrangement of the ultrasonic sensor

3.3 Blynk Analysis

Using a mobile phone, the profiles for Monitoring the Water Leakage System Using an Ultrasonic Sensor were developed in the Blynk program. The application can also be downloaded from any app store on a mobile phone. The completed profile for this project is shown in Figure 6 [5]. The first side is for the percentage of water level, while the second side is for the tank. For monitoring purposes, a line chart was created. The grey column represents the percentage water level setting, whereas the blue column represents level water. This is a reading that can be monitored in real-time, or "live" [6]. It is really useful and simple to monitor for the user. Figure 6 shows the profile Blynk application.

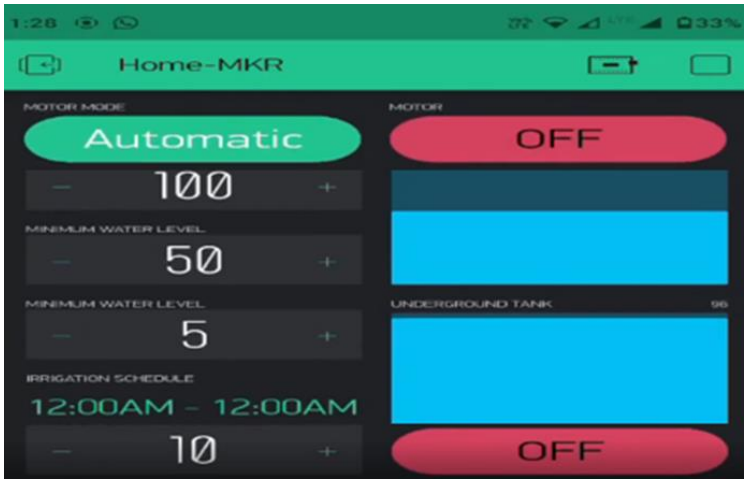

Figure 6: Profile Blynk application

The ultrasonic sensor is used to measure the MWLS. The sensor is critical, providing high accuracy readings to determine the level of water in the tank. Ultrasonic sensors work by releasing a sound wave that is too loud for humans to hear. The transducer on the sensor works as a microphone, receiving and transmitting ultrasonic sound. The experiment was carried out in two ways: the first was to measure the height and distance using a 20cm water tank, and the second was to monitor the water level using precision and data from the Blynk app.

In the first experiment, the reading of height or distance is based on the high of the water. In this experiment, Figure 7 shows the high water level.

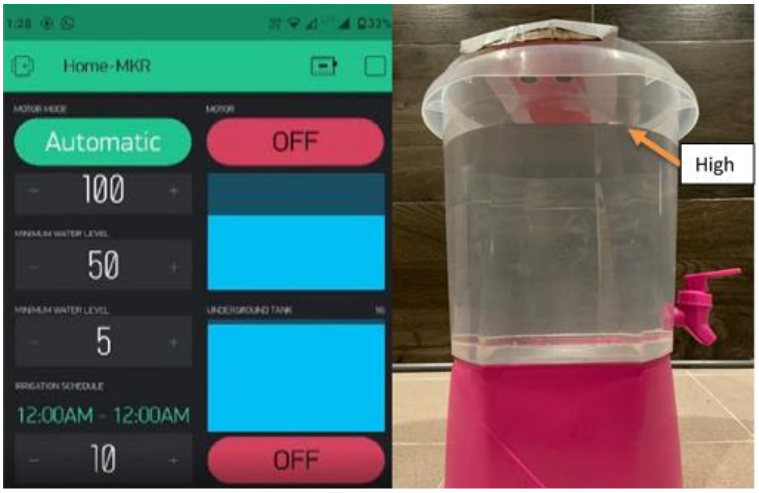

Figure 7: High water level

Figure 8 shows that the notification water pump or motor pump on.

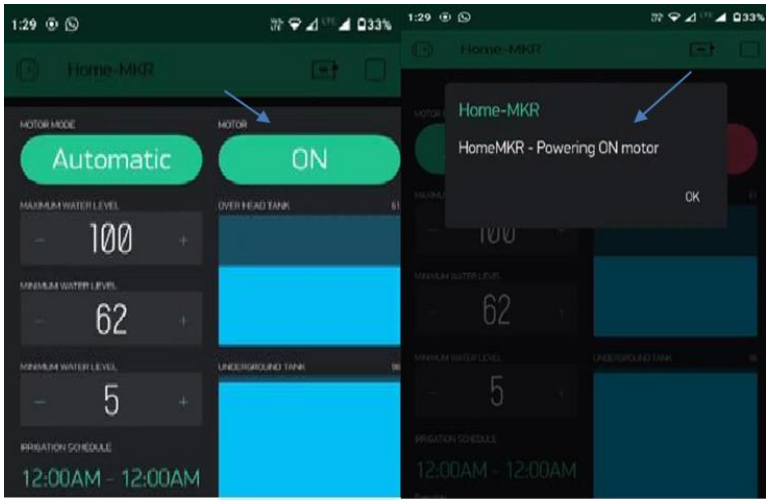

Figure 8: Notification water pump is on

In addition, Figure 9 shows the notification display for the water pump or motor pump off after being modified at the height of the water level.

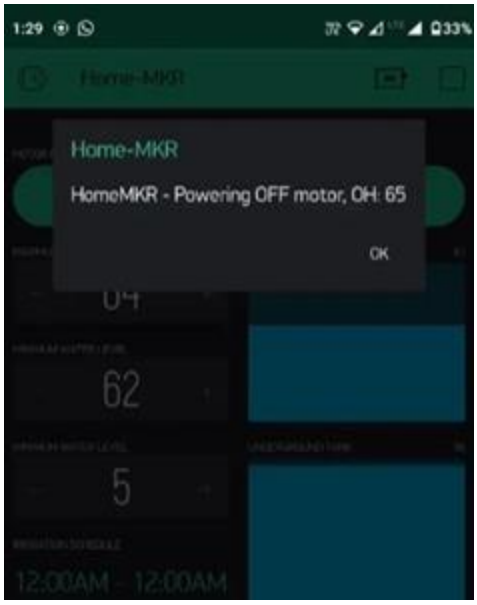

Figure 9 Notification water pump off

3.4 Data Obtained from the Project

The data available in this project can be divided into 1 hour, 6 hours and 1 day. With this, we can estimate how much water is used. Figure 10 (a), (b) and (c) below show the data [5]. Figure 10 (a) demonstrates the water level used is about ± 65% for 1 hour. From this data, the line visualizes the reading result as the system is online. Figure 10 (b) shows the water level used is around 80% up to 95% for 6 hours. From this data, the line also visualizes the reading result as the system is online. It took a few moments for the sensor to be taken into action. Meanwhile, Figure 10 (c) shows the water level used is almost to 100% for 1 day. From this data, we are able to know the amount of water level used by users per day. As per research, normally users will use water for their everyday consumption such as washing, cleaning and etc. The sensor measures the amount of water that has been consumed, and when the water level reaches the predetermined level, the system will turn on.

Figure 10(a): Data for 1 hour

Figure 10(b): Data for 6 hours

Figure 10(c): Data for 1 day

4. Conclusion

In conclusion, the Monitoring the Water Leakage System (MWLS) is well-designed, simple, and economical for both home and office users. This project can keep track of how much water is being used. Because it works automatically, this device can assist users in monitoring. First and foremost, the project's goal has been met as a prototype. Finally, the IoT implementation for the prototype was successful. This electronic system for monitoring the water level in the tank was created using Arduino UNO, ESP8266 module, Ultrasonic Sensor, and a water pump or motor pump. This project successfully built up the equipment to make the experiment or testing process easier with the aim of obtaining the desired results.

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