Project Report of

IOT based Water Tank Monitoring System

PCS 307

Submitted by

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Semester III

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Department of Computer Science & Engineering
GRAPHIC ERA DEEMED TO BE UNIVERSITY, DEHRADUN

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Deemed to be University

CANDIDATE DECLARATION

I hereby certify that the work presented in this project report entitled "IOT based Water tank monitoring System" in partial fulfillment of the requirements for the award of the degree of Bachelors of technology is a bona fide work carried out by me during the period of September 2022 to February 2022 under the supervision of Mr. Piyush Agarwal, Department of Computer science and engineering, Graphic Era Deemed to be University, Dehradun, India.

This work has not been submitted elsewhere for the award of a degree/diploma/certificate.

Sagar Bisht

Name and Signature of Candidate

This is to certify that the above mentioned statement in the candidate's declaration is correct to the best of my knowledge.

Mr. Piyush Agarwal

Date: 26-february-2022

Name and Signature of Guide

Signature of Supervisor

Signature of External Examiner

Acknowledgement

Every project begins with an idea and materializes with concrete efforts. In the beginning I would like to thank the almighty God Who gave the strength and capabilities to work on this project and complete it successfully.

I would like to express my profound gratitude to **Mr. Piyush Agarwal, Assistant Professor, Department of Computer science and engineering,** for their immense support, valuable guidance during this project.

Sagar Bisht

Candidate Name and Signature

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CHAPTER 1
INTRODUCTION

1.1 Objective

The main aim of this system is to monitor the water level at rural areas so that they help in detecting the wastage of water and measures can be taken to avoid unnecessary overflowing of water in the areas where monitoring is a difficult task.

1.2 Overview

The topic of my project is IOT based Water tank Monitoring System. I intend to design a System which can monitor the level of water from a water tank and automatically on pump when water level is law..If we monitor the water level in tanks we ensure that the tank never overflows and hence no extra water loss would happen.

Water is one in all the foremost vital basic desires for all living beings. However sadly an enormous quantity of water is being wasted by uncontrolled use. The major losses happen either in homes or industries. So the system can be applied there to fill the void.

The system uses a NodeMCU microcontroller and a HC-SR04 Ultrasonic sensor to do the work. The sensor sends a pulse of ultrasonic waves and the waves after hitting the water source, again are reflected back towards the sensor. The NodeMCU microcontroller computes the time taken for the journey and also computes the distance. After that a pump is used to always help to maintain the water level between 30- 70 % so that the users can always have an adequate amount of water supply at their home.

1.3 Why this Project?

As the resources of water are continuously depleting, we need to keep a check on our usage so that no extra water goes unutilized. If we monitor the water level in tanks we ensure that the tank never overflows and hence no extra water loss would happen. Water is one in all the foremost vital basic desires for all living beings. However sadly an enormous quantity of water is being wasted by uncontrolled use. Moreover The water level data can be used for various purposes for better management of water sources. Monitoring water level from remote locations may be very useful when it is not possible to visit locations physically every time.

1.2 Methodology Used- Big Bang Model

This project follows the Big Ban model. This model is ideal for small projects with one or two developers working together and is also useful for academic or practice projects. Easy to manage and

no formal procedures are required, Few resources required. Most important It is a good learning aid for newcomers or students. Database and design changed as per requirement .

It is recommended to go for the Big Bang model only due to the following cases i.e.

1. Developing a project for learning purposes or experiment purposes.
2. No clarity on the requirements from the user side.
3. When newer requirements need to be implemented immediately.
4. Changing requirements based on the current developing product outcome.
5. No strict guideline on product release or delivery date.

Fig 1.1 *Big Bang Model*

CHAPTER 2
TOOLS USED

2.1 HARDWARE USED

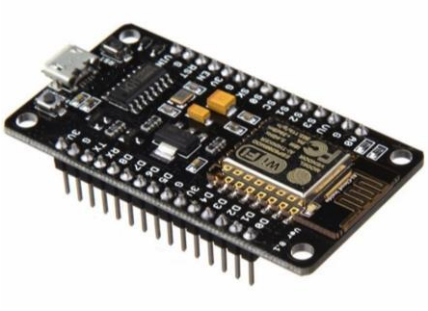
2.1.1 Ultrasonic Sensor

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns.Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound

Fig 2.1.1: Ultrasonic Sensor

2.1.2 NodeMCU

ESP8266 is a highly integrated chip designed for the needs of a new connected world. It offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. It is Arduino compatible, works great with the latest Arduino IDE/Mongoose IoT Micropython. NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. ***Fig 2.1.2*** *ESP8266 NodeMCU*



2.1.3 Single Channel Relay

A relay is an electrically operated switch. A single channel relay has three Channels through the help of which it does the switching control. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit.

Fig 2.1.3: *Relay*

2.1.4 Water Pump

I use a 12 V DC water pump which helps to pump water from the source to the tank. A water pump is powered by a device called an impeller. The impeller is a bit like a turbine. It has many curved blades, which channel the water through the pump. The impeller spins very fast. The curved blades channel water into the eye, or center of the impeller, but that water flows along to the outside of the blades. Because the impeller moves fast, the centrifugal force compresses the water against the outside of the blade. This pressure causes the water to rocket forward in a high-speed jet out of the impeller. This speed creates pressure on the outlet side of the pump. pushing the water through the pipe. Smaller electric water pumps, such as the kinds used in homes, usually have small DC motors.

Fig 2.1.5: *12V Pump*

2.1.5 RGB LED

LED technology uses strip-mounted diodes which are able to emit a lot of light at a low energy consumption. An RGB LED bulb uses three diodes in **Red**, **Green** and **Blue**. These are mixed in different intensities to produce a variety of different colors. The process is based on additive color mixing, the same technique which is used in TV sets, computer monitors and flat screens. Light from one color source may overlay that of another, resulting in a new and brighter expression of color. Red over blue light provides a light violet.

Fig 2.1.5: *RGB LED*

3.2 PROGRAMMING LANGUAGE-PHP

PHP is an open-source, interpreted, and object-oriented scripting language that can be executed at the server-side. PHP is well suited for web development. Therefore, it is used to develop web applications (an application that executes on the server and generates the dynamic page.). I use PHP to create a REST API that will be used by our system to trigger insert query to the database.

REST (Representational State Transfer) is an API that defines a set of functions that programmers can use to send requests and receive responses using the HTTP protocol methods such as GET and POST.

3.3 ARDUINO IDE

Arduino IDE(Integrated Development Environment) is the software for Arduino. It is a text editor like a notepad with different features. It is used for writing code, compiling the code to check if any errors are there and uploading the code to the Arduino. It is a cross-platform software which is available for every Operating System like Windows, Linux, macOS.

CHAPTER 3
WORKING PRINCIPLE

3.1 Connection

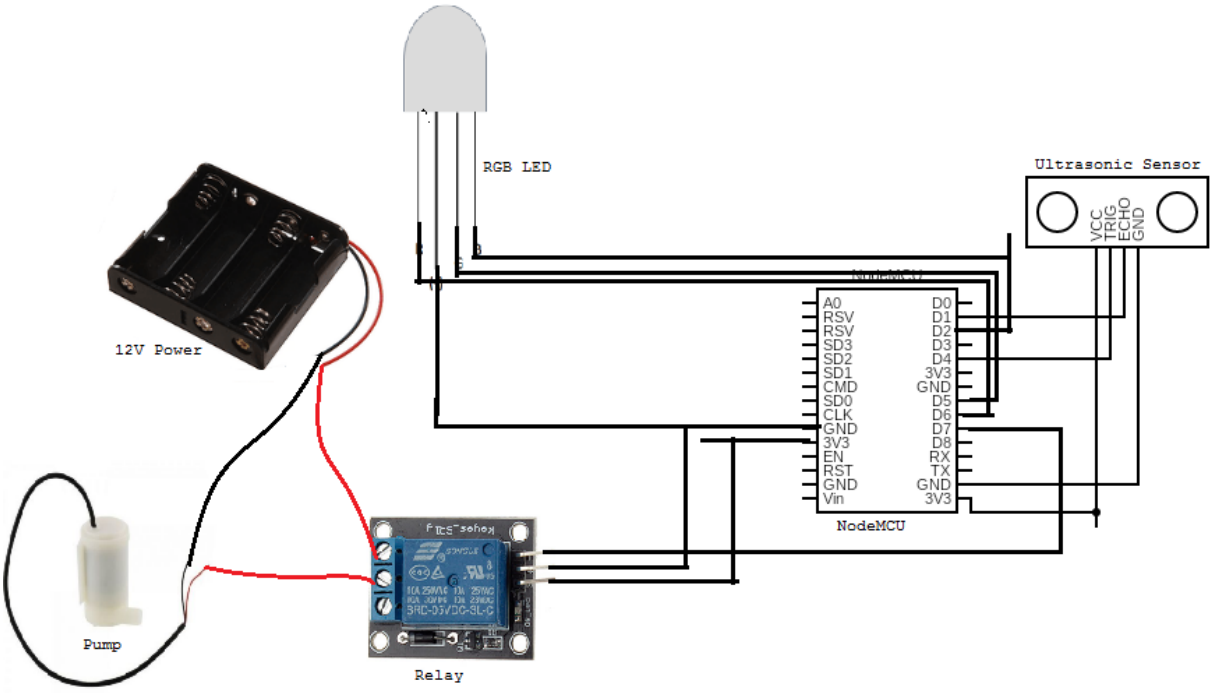


Fig 3.1: Connection Diagram

Ultrasonic sensor

Echo- D1
Trig- D4
Vcc- 3U3
Gnd- GND

RGB LED

Red- D6
GND- GND
Blue- D2
Green- D5

Pump

Connect **Positive(+ve) Pin(**red) with **COM pin** of relay & **Negative(-ve) Pin(**black) to **GND** of DC power Supply.

Relay

Connect **Vcc** to **3V3 , GND to GND** and **IN** pin of relay with **D7** pin of NodeMCU.

3.2 Working

The Ultrasonic Sensor emits an ultrasound of 40000 hz which travels through the air and it will bounce back after strike from water or tank base.NodeMCU consider the travel time and speed of the sound and calculate the distance.

If the distance is greater than 20 percent, the D7 pin will be high and the pump will start. If the distance is less than or equal to 20 percent then the D7 pin will become low and the pump will stop. Every 5 seconds, NodeMCU will trigger an API and update the distance in the database. Since updating data may take a long time if there is a network problem, NodeMCU will make the D7 pin low and the pump will be in an inactive state.

(“https://www.sagarbisht.com/WaterLevelMonitor/api/fireData.php?PumpState=1&SystemState=1&WaterLevel="+(String)level”).

CHAPTER 4
RESULT & CONCLUSION

4.1 Result

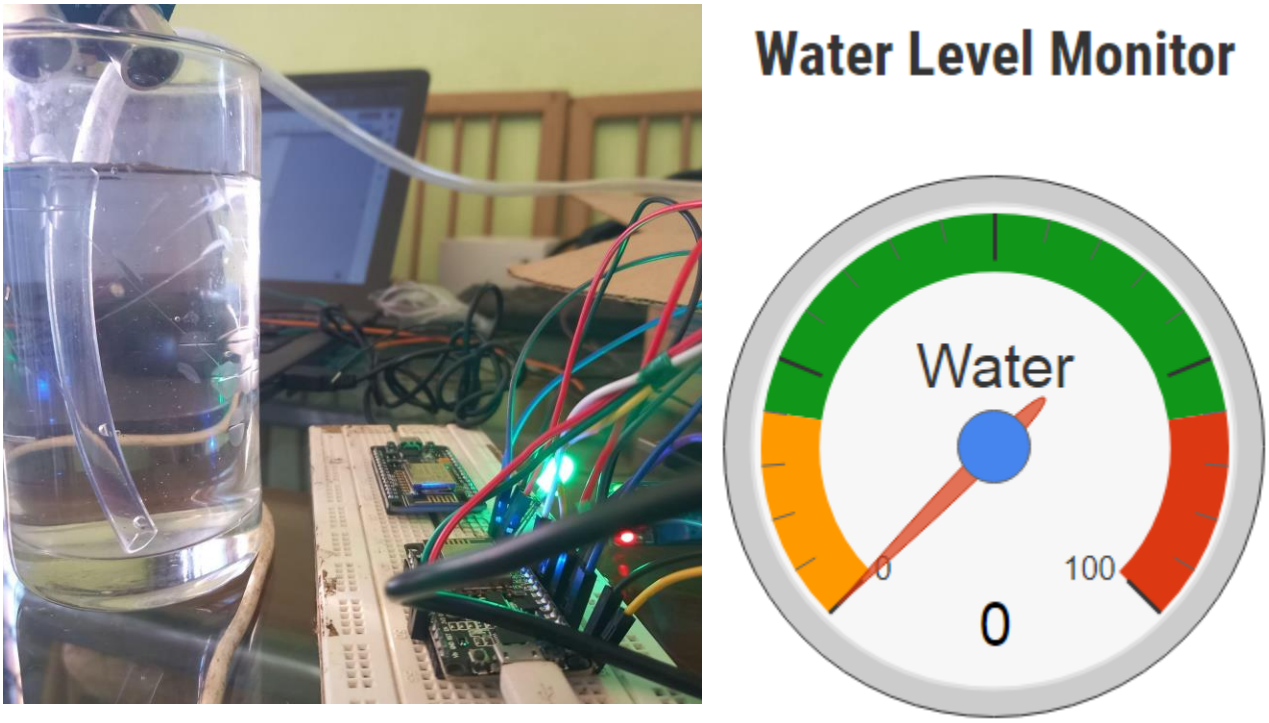


Fig 4.1 *: Snapshot of Web app and Water level System*

4.2 Conclusion

The project enables us to observe the level of water from a distant location and helps us to track it and protect it from overflowing and thereby enabling the user to ensure that no extra water gets used and there is no excess loss of water. We know that the major place where water gets wasted is industries and homes. So using this proposed system will help to minimize the water loss to a large extent. If the user knows about the water level in real-time he/she has the power to maintain the water loss to an extent by maintaining the water at a sustainable height, i.e. between 30-70% of the height of the original tank to ensure no overflowing.

REFERENCES

1. Arduino NodeMCU tutorials
   https://www.tutorialspoint.com/arduino/index.htm

2. Water level Monitor Report
   https://www.rcciit.org/students_projects/projects/aeie/2019/GR11.pdf

3. Automatic Water Level Indicator and Pump Controller using Arduino from
   https://www.robotsthenextspeciesonearth.comipiblog-page 14.htnil

4. Distance Measurement Using HC-SR04 via NodeMCU from
   Inrww.instructables.comfidiDistance-Measurement-Using-HC-SR04-Via-NodeMCUi

5. WebApplication URL
   https://www.sagarbisht.com/WaterLevelMonitor/