1. Introduction

People living in multi-storied buildings often have to face the trouble of running up and down the stairs while filling the water tank at the top of their building- check the water level and hurry down the stairs to turn off the water pump. Moreover, sometimes people are in hurry to get to work and forget to turn off the water pump and it creates a lot of problem until and unless they have other people in the house to kill the machine for them. Deployment of Water Level Monitoring and Motor Controlling System can overcome these problems with ease.

Technology has advanced a lot in the recent years, and thanks to this, people have access to many things on the tip of their fingers. Internet has penetrated a huge area of human settlement. These two innovations have made the life of human beings a lot easier and comfortable. Smartphones are a burning example that makes use of these innovations and with that humans have the world at the palm of their hands. Water Level Monitoring and Motor Controlling System also makes use of Smartphones, internet and IOT technology.

1.1 Aims and Objectives

The aim of the project is to overcome the problem of a person having to physically monitor the water level of the tank and turn the water pump off.

In order to achieve the aim, the objective of the project should be following:

i) Display water level in mobile device
ii) Alert critical water level situation (about to fill or empty)
iii) Control water pump remotely

1.2 Deliverables

When the water level is close to the cover of the water tank or is nearly empty, the user an alert was created with the help of buzzer. This can also be done by sending alert message in the mobile device so that the water pump machine can be killed remotely or can be turned on when the water tank is nearly empty.

2. Literature Review

2.1 History of Water Level Monitoring and Motor Controlling System

With new technologies evolving day by day, both IOT based and non-IOT based Water Level Monitoring and Motor Controlling System are not new. Many of which can be easily found on internet. Many websites even provide tutorials on how to build such systems and for people not familiar with computers, they can easily buy or order online from any e-commercial websites. Various types of similar systems are:

a) Individual System

This is the most popular system which is easy to build watching a tutorial in YouTube. It can be built for domestic purpose or for commercial purpose as well.

b) Large System

This is an integrated system built for larger buildings. This system also comes in variants and can be customized according to need.

On the basis of technologies used and automation, they can be broadly categorized into following:

a) Bluetooth based

In this system, Bluetooth technology is the key. Every action (motor controlling, water level displaying etc.) is done through Bluetooth. This major drawback of the system is that the range of Bluetooth isn't very far. So, it doesn't work over a long distance more than 10 meters.

b) Remote monitoring via Wi-Fi

This system is built around Wi-Fi. If the microcontroller is Arduino, Wi-Fi module is added otherwise NodeMCU does the job. For this system to work, both the system and Blynk app should have internet connection.

c) Auto motor controlling

This system is programmed in such a way that when the water level hits upper critical level (when the water tank is near full), the water pump is automatically killed and when the water level hits the lower critical level (when the water tank is near empty), the water pump comes to life.

2.2 Research Work

i) This paper explains the need and benefits of water level monitoring and motor controlling system and using wireless technology using NodeMCU.

ii) This paper briefly explains the usage of NodeMCU for home automation. The software and hardware used are also specified.

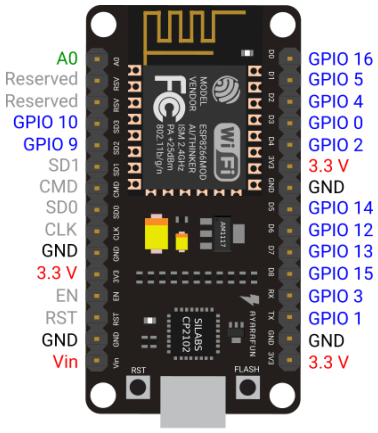
iii) A working prototype of Water Level Monitoring and Motor Controlling System is built and demonstrated. NodeMCU acts as the central microprocessor which receives data from ultrasonic sensor. Blynk app acts as the interface to read the water level and control the motor.

3. Hardware Requirement Specification

The ultrasonic sensor placed at the cover of the tank sends the water level to the NodeMCU which in turn, displays the water level in the Blynk app running on mobile devices. The app also provides an interface (a button) to turn the water pump on or off.

3.1 Hardware Requirements

i) NodeMCU (ESP8266MOD)



NodeMCU is an open-source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.

This is central unit of the system. The code is written and uploaded on this microcontroller.

ii) Ultrasonic Sensor (HC-SR04)

It is an electronic gadget that helps to calculate the distance of an objective item by producing ultrasonic sound waves, and converts the reflected sound into an electrical sign. Ultrasonic waves travel quicker than the speed of perceptible sound (i.e., the sound that people can hear). Ultrasonic sensors have two fundamental parts: the transmitter (which discharges the sound utilizing piezoelectric precious stones) and the recipient (which experiences the sound after it has ventured out to and from the objective).

To get the distance between the sensor and the article, the sensor quantifies the time it takes between the discharge of the sound by the transmitter to its contact with the collector. The recipe for this figuring is D = ½ T x C (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second). For instance, if a researcher set up a ultrasonic sensor focused on a case and it required 0.025 seconds for the sound to skip back, the distance between the ultrasonic sensor and the case would be D = 0.5 x 0.025 x 343 or about 4.29 meters.

iii) Relay Module

The relay module is an electrically operated switch that can be turned on or off deciding to let current flow through or not. So, this is used to control the water pump.

4. Software Requirement Specification

i) Blynk App

Blynk is application that permits fast structure of interfaces for controlling and checking hardware projects from iOS and Android gadgets. Subsequent to downloading the Blynk application, an undertaking dashboard can be made and buttons, sliders, charts, and different gadgets can be arranged onto the screen. Utilizing the gadgets, pins can be turned here and there. Additionally, information from sensors can be shown on the screen.

In this project, this app acts as the interface to display the water level of the tank and also the water pump motor can be controlled remotely.

5. Block Diagram

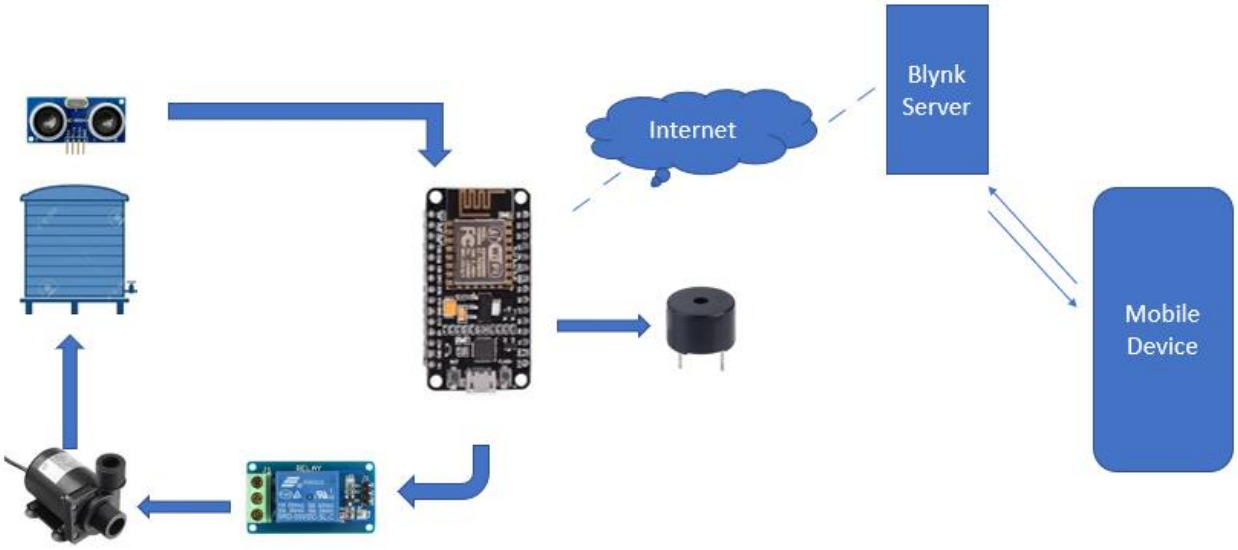


Figure: Block diagram showing major hardware components

6. Circuit Diagram

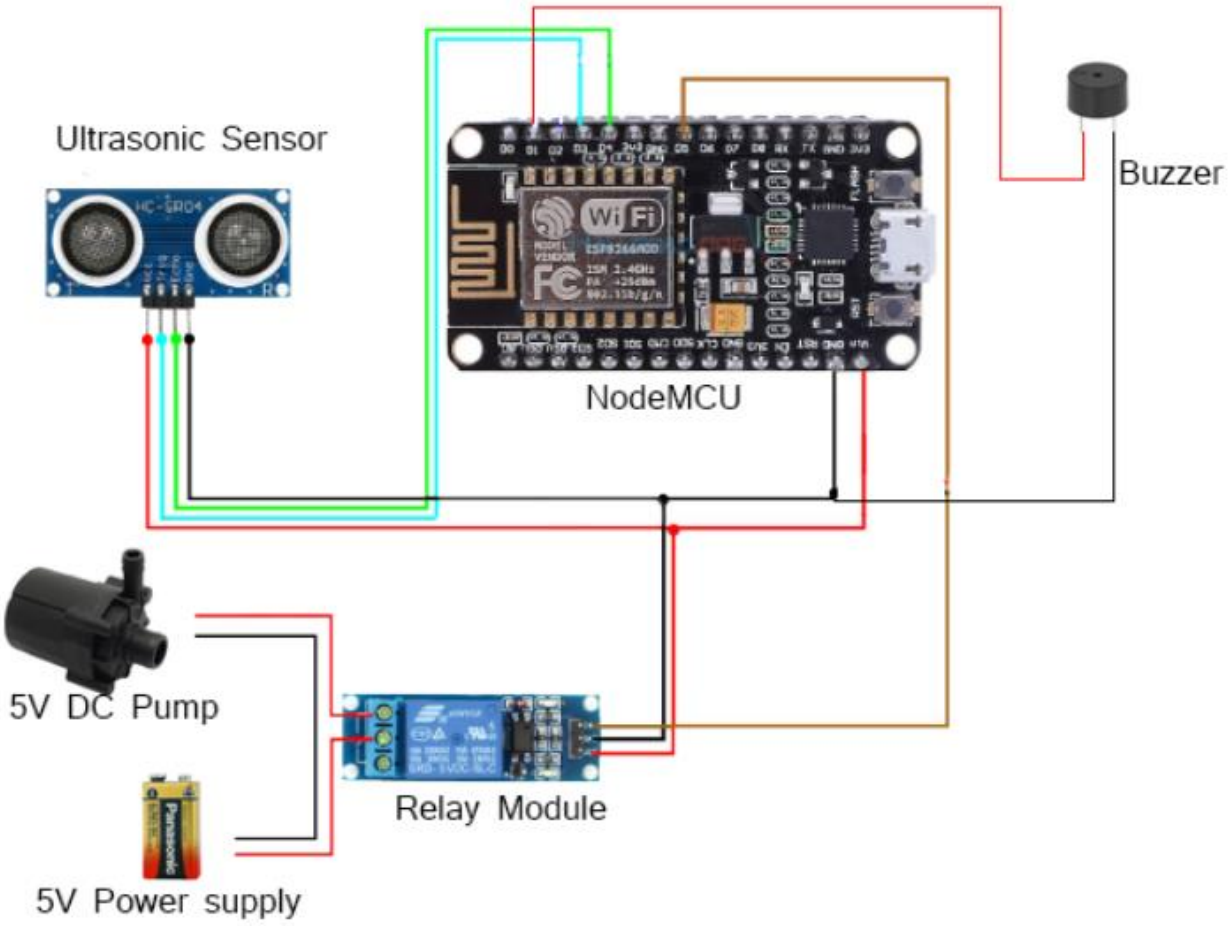


Figure: Block diagram showing major hardware components

Conclusion

The Internet has changed the components of life including virtual connection. IOT can possibly add new dimensions empowering more astute items interchanges. This project demonstrates a simple water level monitoring system with motor controlling system integrated.

Future works can involve sending notification alert to mobile devices on critical water level rather than setting off the buzzer because the sound of the buzzer is pretty annoying and it may not be heard every time. Also, water temperature control system can be integrated in the future if needed.

References

https://www.irjet.net/archives/V4/i12/IRJET-V4I12333.pdf

https://create.arduino.cc/projecthub/sridhar-babu/iot-based-tank-water-monitoring-system-6b7658

https://www.iotdesignpro.com/projects/iot-based-water-level-indicator-using-ultrasonic-sensor

https://makezine.com/2015/07/06/control-arduino-your-smartphone-via-blynk/

Water Level Monitoring and Motor Controlling System

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Abstract

Mainly in the urban areas, most of the houses have one or more water tank for the purpose of storing water at their roof top. With the help of a pump, water is pumped up from the ground to the top and it is distributed all over the house. One of the hurdles of this entire process is to monitor water level in the tank and turn the machine off; this is the sole motivation for this project, to deploy an IOT based system and be able to monitor water level in the tank and control the water pump remotely.

Water Level Monitoring and Motor Controlling System is an innovative and integrated system that will enable users to view the water level in their mobile devices and turn the motor on or off when the water level reaches certain situation. In order to demonstrate this, the system requires for Ultrasonic Sensor placed over the cover of water tank to measure the distance of water level from the cover, NodeMCU as a micro-controller, Blynk App to monitor water level and control water pump. A buzzer can be optionally added to alert the user when water level reaches critical level. Therefore, this system helps in monitoring the water level of water tank kept at the top floor from any place with internet connection via Blynk app. There will be no need to run up and down the stairs to check the water level and turn the water off.

Contents