Water Level Monitoring and Control System Using IoT

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Abstract. This system represents Wireless Water Level Monitoring and Controlling Using Node MCU. The main motto of this system is to measure the quantity of water at hand in the tank and gives a notification to the user. It also gives information about the water quality and the temperature of water present in the upper reservoir tank. If the level of water is low, it will stimulate the centrifugal water pump to fill the tank. If the water line is higher, it will shut the water pump down. Likewise, this proposed system controls the water quantity. Whenever the water temperature is high, it sends necessary notification to the user. If the water quality is poor, this system gives an indication to the user using Blynk IoT application. In order to measure the water level, the circuit contains ultrasonic sensor which measures the water quantity in respect of distance. To control the water pump, the controller is further connected with the relay module. All the necessary details will be collected and displayed in the OLED display as well as in the mobile application.

Keywords: Water level, temperature, Water quality, Blynk app, OLED display, Controller, Relay.

1 Introduction

Water is the major crisis nowadays. People are storing the water in a tank for daily usage. In most of the industries, homes as well as in farming lands are using tanks for storing the water. Usually, this stored water in the tank may fed by pumping the water using water pump. Whenever the pump is shut down by the user, the overhead tank is filled to overflowing and shut up when the tank is unoccupied. This process is performing in a way by noticing the overhead tank when it is over filled. So this may lead to material loss. It also leads to water scarcity. It can be averted when the overhead tank is monitored through the online platform. It can give necessary information about shutting up or down the water pump when needed. The normal method to turn ON or OFF the pump is very expensive for maintenance and security. By using automated system, the performance will be more accurate and time efficient. To turn On/Off the pump, ultrasonic sensor is used to continuously check the water quantity. To

ITSPWC 2022, May 14-15, Karur, India

DOI 10.4108/eai.14-5-2022.2318882

continuously check the temperature occupied inside the water tank, a temperature sensor is used. Sometimes water flow may be stopped due to blockage of water pipe. This may cause water quality poor. If any solid particles like household wastages, plastics may block the water flowing pipe. So it is mandatory to inspect the water quality whether it is good or bad. By the way of detecting the information, the system is highly securable and it steers clearing of water discharge in a good manner. This system is more efficient compared to the conventional method.

2 Problem statements

The existing problems in water level monitoring are:

1. When the water level in the lower reservoir is dried up, the water quantity will move towards the lower level of the pump. It will **damage the pump**.
2. The water is pushed from lakes, rivers and local ponds etc., where the dust particles like plastics, household wastes can block the pipe. It will damage the entire process. So it is necessary to check the **water quality** before starting the process.
3. Hot water producing inside the tank will damage the pump. It will decrease the pump efficiency.

3 Objectives

- To continuously monitor the water quantity in the overhead tank. This can be checked by using the ultrasonic sensor which will shut up or down the water pump.
- To measure the temperature in both lower and upper reservoir to avoid damage to the water pump.
- To check and control the water quality when the centrifugal water pump is permitted to deliver the water.

4 Components

In this suggested system, the components used are:

- Temperature sensor.
- Turbidity sensor
- Ultrasonic sensor
- Water pump
- DC adapter
- Node MCU
- OLED

- Relay

4.1 Node MCU

An open source platform which is used for both software and hardware development. This platform is very cost effective System-on-a-Chip called the ESP8266. It consists of 17 general purpose input or output pins. These GPIO pins are used for configuring turn ON or turn OFF or to bring high impedance. These pins are also used for I2C, IR remote control etc. Using the Node MCU, all the sensors in this suggested system is monitored in a good way.

4.2 Temperature sensor

In this system, LM35 is the temperature sensor used. Its temperature range measures from -55 degree Celsius to 150 degree Celsius. This sensor has three terminals which produces voltage in analog form. This output voltage is directly proportional to the temperature. If the temperature increases, the output voltage increases. The output analog voltage will be converted to digital voltage using analog to digital converter. It is used to measure the analog voltage from LM35 and this temperature is proportional to the output voltage.

4.3 Turbidity sensor

Turbidity sensor is used for measuring the water quality. The turbidity level can be measured by detecting the amount of light scattered through the liquid sample. *Nephelometric Turbidity Units* is owned to measure the units of turbidity and this represents global standard. By measuring the amount of light that is scattered through the solid particles containing in water, turbidity can be measured. If the quantity of total suspended solids (TSS) in water shows higher, the turbidity level of water also becomes higher. Also in rivers, ponds, streams and lakes, it can be owned. It is also used for laboratory measurements.

4.4 OLED

OLED (Organic Light Emitting Diodes) is placed over two conductors which consists of many thin films. It is a flat light emitting mechanism. A beaming light is introduced into the thin film when the electrical current is passed through the mechanism. OLEDs are very thinner as well as much effective compared to LCD. It does not need any backlight. With the help of this module and I2C communication protocol, a Node MCU can be communicated.

4.5 Ultrasonic sensor

An ultrasonic sensor is owned for the measurement of the distance covered by the objects. By transmitting and receiving the ultrasonic pulses, the distance is measured by backing up the relay information. This sensor works by the way of leaving out the sound wave frequency which is above the human hearing range of frequency. This high frequency sound wave is used to measure the echo produced to measure the distance. It consists of transducer and receiver. To receive and send the data, the transducer is used which behaves like a microphone. This sensor uses only one transducer to transfer the data in the form of echo. By the way of detecting the time required between transducer and receiver, the distance of any object is dignified.

4.6 Relay

The ULN2003A is a highly active relay driver. This relay driver consists of seven pins. Pin 1 to 7 is used for supervising the relays and they are connected from pin 10 to 16. If a microcontroller shows ‘0’, the relay will be turned OFF. If the microcontroller shows ‘1’, the relay will be turned OFF.

5 Methodologies

In this proposed system, all the components are connected to a controller which controls the entire circuit Here, MCU is used. The sensors detect the quantity of water contained in the upper reservoir tank, water quality and temperature of water in lower and upper reservoir. All the units will be displayed in the OLED display as well as in the mobile application through internet. The water pump is operated using relay module. If the water level is less than lower limit, the system will switch ON the pump. If the water quantity is excessive than upper limit, the system will switch OFF the pump. The system also detects the water quality whenever the water delivering pipe is obstructed due to solid particles. This proposed system checks the temperature to control the temperature in the lower and upper reservoir. High temperature can reduce the pump efficiency and may damage the valves. This system is cost effective.

The below constitutes the block diagram of the suggested system:

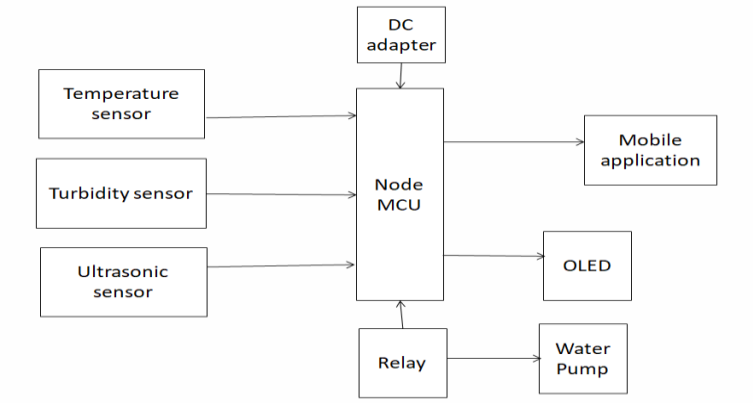

Fig. 1. Block diagram

6 Modeling and analysis

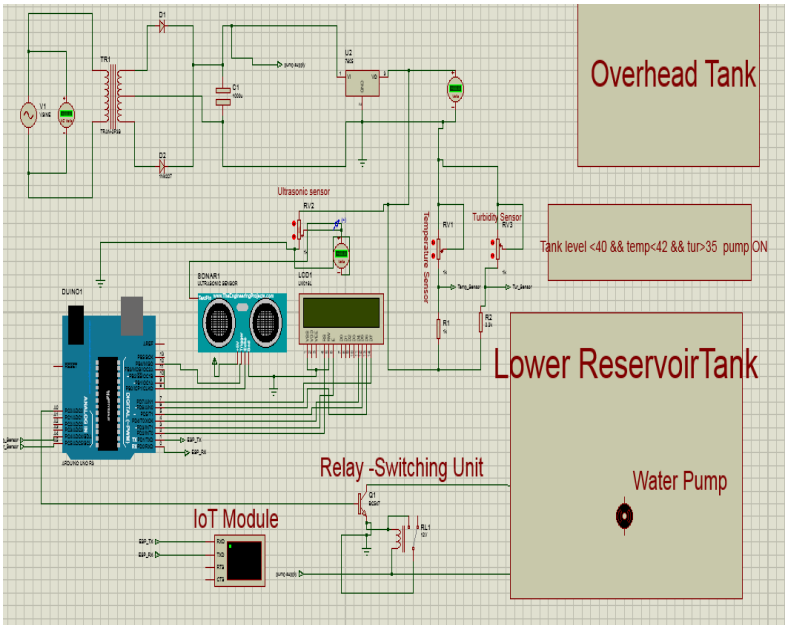

Fig. 2. Simulation model

This is a simulation schematic of this suggested system. The simulation was done by using the software called Proteus 8.

7 Results and discussion

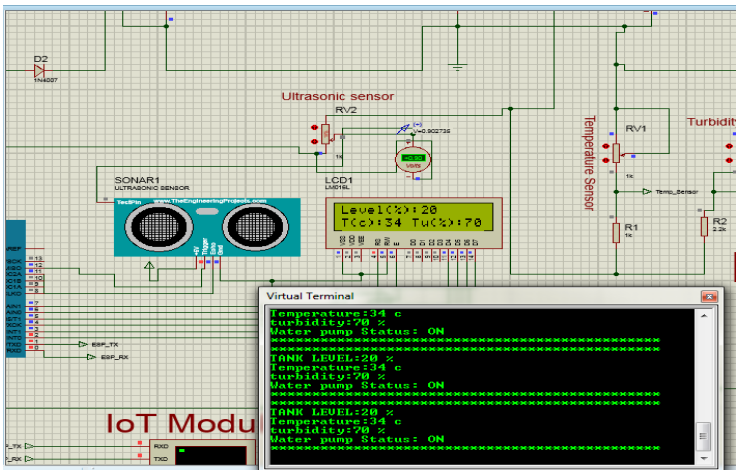

Fig . 3. Simulation output 1

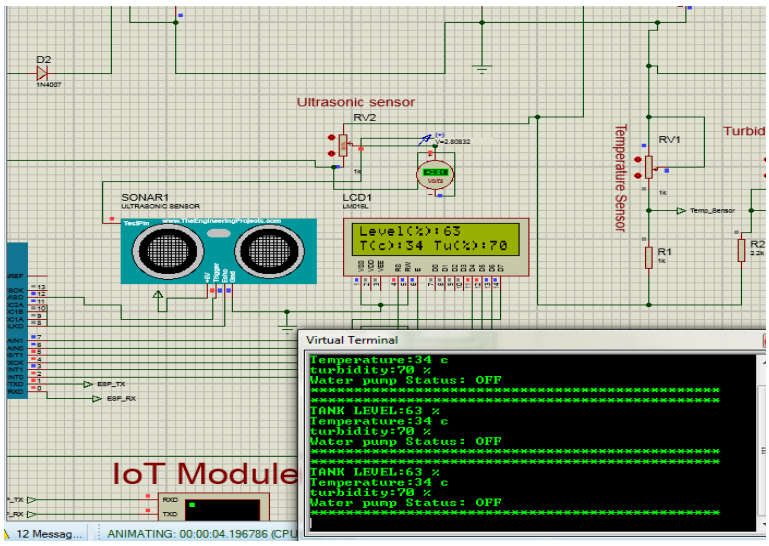

Fig. 4. Simulation output 2

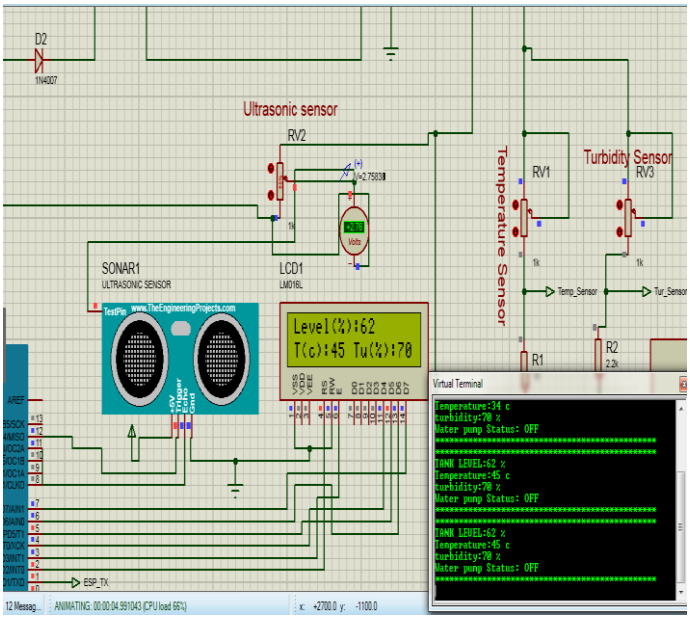

Fig. 5. Simulation output 3

The above shows the simulation output of this proposed system. Whenever the temperature or turbidity is above the critical level, the water pump is turned OFF and vice versa.

Acknowledgements.

Our gratitude passes on to Dr. V. KUMAR CHINNAIYAN, M.E., Ph.D., Professor, Head of the Department, Electrical and Electronics Engineering, for his valuable support and encouragement during this project. We are grateful to Ms. B. LALITHA M.E., (Sr.G), Assistant professor, Department of Electrical and Electronics Engineering, the Project Supervisor for her timely suggestions and constant encouragement and support that led to the accomplishment of the project.

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