



# IOT Based Water Level Monitoring & Controlling System

<sup>1</sup>Nikita B Jape, <sup>2</sup>Ankita B Jape, <sup>3</sup>Priya S Jape, <sup>4</sup>Ishan N Ajmera, <sup>5</sup>Dhiraj UBhamre, <sup>6</sup>Prof. Rahul M. Dhokane,

<sup>1</sup>Student, <sup>2</sup>Student, <sup>3</sup>Student, <sup>4</sup>Student, <sup>5</sup>Student, <sup>6</sup>Professor

<sup>1</sup>Information Technology,

<sup>1</sup>Sir Visvesvarya Institute of Technology, Nashik, India

**Abstract:** In today's life water is very necessary. Looking toward the need of water, liters of water is wasted in daily life. To stop the wastage of water we are developing IOT based water level monitoring and controlling system which will save liters of water from wastage by automatically controlling the level of the water in the tank and prevent it from overflowing. Water level monitoring system solves this problem, it will give right information about water level and it will avoid wastage water in tank using Ultrasonic Sensor which will senses the liquid level and compare it with the depth of the tank. The system also uses Arduino Uno, Buzzer, LCD screen to display the level of water in the tank and the state of motor.

**Keywords – Arduino Uno, Ultrasonic Sensor, Liquid Crystal Display, Buzzer.**

## I. INTRODUCTION

Water is important and without water we can't live. So water wastage need to be controlled for our environment and for living beings. Many times we switch on motor and forget to turn off, because of this most of the water is wasted unknowingly. This leads to water scarcity. This system is designed to monitor the water level at rural areas so that they help in detecting the wastage of water and precautions can be taken to avoid overflowing of water where monitoring is a tough. This system monitors the water level in the tank and automatically switches ON the motor pump when tank is empty and motor pump is switched OFF as soon as the level of water reaches at adequate level. The status of motor is displayed on Liquid Crystal Display i.e. "MOTOR IS ON" or "MOTOR IS OFF" and with sound of buzzer so that user can get the information. This system eliminates the efforts of people for daily filling of the tank and checks for overflow. Hence, the level on water in a tank can be automatically controlled. This system can be used in Hotels, Industrial storage tank, Schools anywhere water levels need to be controlled.

## II. PURPOSE

In many houses there is unnecessary wastage of water due to overflow in overhead tanks. The working of water level monitoring & controlling system is very easy. A water level controller is a device that manages water levels in water tanks, pumps, and for filling any type of liquid in the tank. Basic function of a water level controller is to limit the water wastage & protect against unnecessary electricity usage. This is because level of water is controlled automatically, which limits the amount of electricity used. As a result less water and electricity is used to regulate a water supply.

## III. PROBLEM STATEMENT

Need of this system is to avoid wastage of water. Sometimes people forget to off the motor when the tank is full, because of that water get wasted. To avoid wastage of water this project came into picture. By using this water level controller system we can monitor water level and consumption of water.

## IV. LITERATURE SURVEY

An automatic water level controller is developed and implemented[1]. Arduino Uno is used to automate the process of water pump[1]. Water level detection in both source and overhead tanks, switch on/off the pump accordingly are the main controlling signals the circuit[1]. Liquid Crystal Display (LCD) is used to show the data on the screen[1]. Moreover, a microcontroller based automated water level sensing and controlling is proposed that covers both design and implementation issues[1].

Hani and Myaing (2011) developed a microcontroller-based water flow control system. In this system, automatic water flow control system is implemented, and can be used as process control system[1]. A sensing unit, photo interrupter, and slotted disk are used to produce pulse train for frequency input of the microcontroller[1]. The sensor signal is counted as frequency and converted to the flow rate by using software program in PIC[1]. This flow rate is compared to the set point value[1]. This PIC16F628 can control the water valve by using DC motor to vary the water flow rate based on this comparison[1].

Explained Agricultural land management practices are compatible with the preservation of water resources[3]. Hydrological diagnoses are needed in order to choose the alternative land uses, cultivation practices and their spatial arrangements[3].

Olambimpe, (2010) worked on the design and construction of an automatic water pump control with level indicator[4]. The design consists automatic control, with digital circuitry, for switching ON and OFF the pump, and an indicator to notify the user about the level of water in the overhead tank[4]. Another feature of the design was the use of an alarming circuit to alert the user whenever there is absence of water in the underground tank[4].

Omolola, (2010) worked on the design and construction of a water level detector with pump control based on a microcontroller[5]. The project involved the use of a digital water level detector with the pump control and an instrument that indicates the level of water in a tank, using seven-segment display to indicate the level[5]. Like Olambimpe (2010), it has an alarm emits a continuous sound for 10s indicates the 100% level of tank[5].

Muhd Asran Bin Abdullah,2004-His theory gave how Human supervision is limited for several hours and the accuracy is almost not perfect. Sensors introduce a better solution in accurate level measurement and automatic processing of water levels limit[6]. The water level controller circuit does not allow the pump to start if the water level inside the sumps goes low, and switches off the pump even during the pumping period if the water level inside the sump sinks low while the process of pumping the water towards the overhead tank continues[6]. A positive voltage supply is placed at the bottom of the overhead tank, and a full-level probe is placed in the tank and the other end is connected to the base of the transistor through a resistor[6]. Whenever the water level rises to the maximum, then current flows through the base of the transistor and the collector voltage becomes low and is interfaced with the port[6]. The programming is done in the microcontroller and sends the data to the microcontroller and LED[6]. Indicates the level of water and the motor switches off automatically The tone system attached to the alarm system gives level information as 'tank is full' and 'tank is empty' so that a user can easily recognize the level of the water[6].

## V. WORKING

In this Internet of Things based water level controller system the level of water is controlled by using a microcontroller. Main components are ATmega328 microcontroller, sensor, motor, etc. The proposed system works making use of ultrasonic sensor to detect the level of water in a tank. As Ultrasonic sensor is placed at the top of the tank. To determine the distance of the water level, it transmits sound pulses that that reflect from the surface of the water and measures the time it takes for echo to return. The formula used is  $\text{Distance} = (\text{travel time} * \text{speed of sound})/2$ .

By using this method we get distance of water surface through ultrasonic sensor. Where the sensor senses the presence of water level and gives indication to microcontroller.

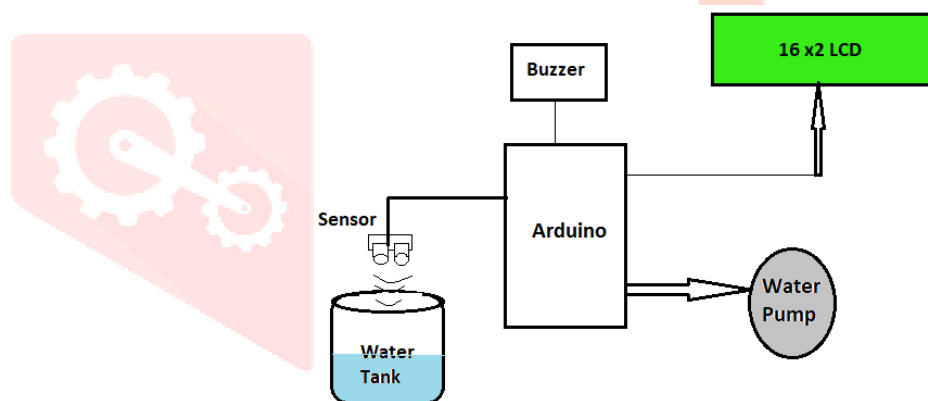


Figure 1- Block Diagram of water level monitoring & controlling system

The microcontroller produces the control signals to drive the motor pump. If the level of water is low in tank microcontroller gives control signal to start the motor and also microcontroller enables the LCD to display the message "MOTOR IS ON" and when the level of water reaches at adequate level, microcontroller gives instruction to stop the motor and display "MOTOR IS OFF" and gives a alarm when tank is full. Below is the circuit diagram of water level monitoring and controlling system.

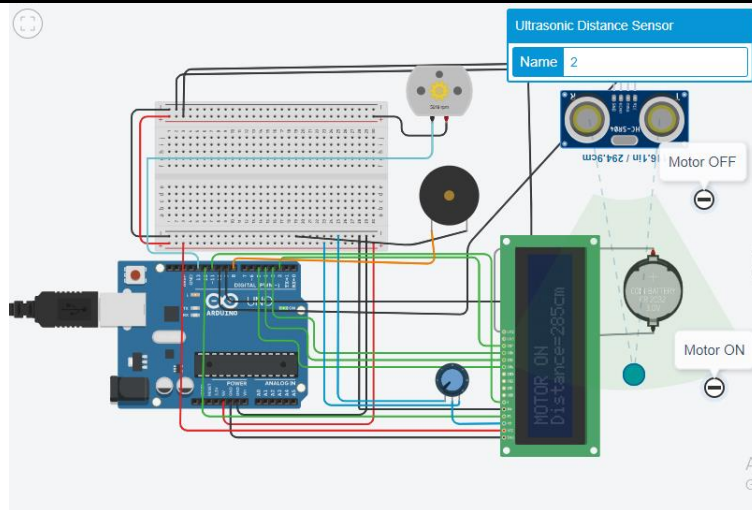


Figure 2- Circuit Diagram

**1.1 HARDWARE AND SOFTWARE USED**

**A. Arduino IDE**

The Arduino Integrated Development Environment (IDE) is a platform for Windows, macOS, Linux. It is easy to write code in C and C++. It is connected to arduino hardware and upload programs.

**B. Operating System**

An operating system (OS) is system software that manages computer hardware, software resources and provides common services for programs.

**C. Arduino Uno**

Arduino Uno is a microcontroller board based on ATmega328P. It consists of 14 digital I/O pins and 6 analog input pins, a USB connection, a power jack and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-Dc adapter or battery to get started



Figure 3- Arduino Uno

**D. Ultrasonic Sensor**

As the name indicates, ultrasonic sensor is used to measure distance by using ultrasonic waves. It has 4 pins. VCC and ground for switching the sensor on. Trigger pin to send the ultrasonic signal which are being received by echo pin. The arduino calculate the signals sending and receiving time and gives the result in distance by some calculation.



Figure 4- Ultrasonic Sensor

**E. Liquid Crystal Display**

An electronic device that is used to display data and the message s known as LCD 16x2. It is a 16-pin device that has 2 rows that can accommodate 16 characters each. LCD 16x2 can b used in 4-bit mode or 8-bit mode.



Figure 5- Liquid Crystal Display

**F. Buzzer**

It is an electronic used to give alarm sound as it is programmed.



Figure 6- Buzzer

**VI. ADVANTAGES**

- a. Electricity- Motor will only run for a fixed time, so the overuse of electricity will be saved and this will also reduce the electricity bills.
- b. Works Automatically- Another advantage is that these devices can work on their own. there is no need to operate this device manually.
- c. Save Money- A water level controller helps save money by limiting the excessive wastage of water and electricity.
- d. Requires no human effort- Every time it is not be possible for the userto keep an eye on water filling process in the tank and immediately switch the motor ON or OFF. By using this system, it reduces the human effort as it controls the motor automatically.
- e. Construction- The design of a water level controller is very simple as it requires few components. The circuit involved is also relatively simpler.

**VII. APPLICATIONS**

The use of water level controller includes the following applications:

- a. Automatic water level controller will automatically START the motor as soon as the water level falls below the predetermined level and switch OFF the motor as soon as tank is at adequate level.
- b. This can also be used to detect the level of water in dams.
- c. This application can be very useful in industries, Home, commercial complexes& agricultural fields. Industries which contain liquids like Oil industries, water refilling industries and many. This system is used for filling any type of liquid in the tank. Through this process, the tank is filled automatically and wastage of water is avoided.

**VIII. FUTURE SCOPE**

Water is very essential for all living being. But unfortunately excessive water is being wasted. We tried to overcome this problem by using water level controller system. Main aim of this project is to stop the unnecessary wastage of water and reduce the burden of the operator. In agricultural sector water level monitoring has good scope in future. There are many areas where we need to control the wastage of water. It could be agricultural fields, overhead tanks, etc. This project can be implemented in domestic areas, factories, work places with some modifications. It will also help in creating a smart city centered around the idea of water preservation.

**IX. CONCLUSION**

Whole system operates automatically, so it does not need any expert person to operate it. The system has scope for future development of city. We know that the major place where water gets wasted is industries and homes. This system can be also used to atomize the control of dams without human interface, so now we do not have to worry about overflow anymore.

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