DESIGN AND IMPLEMENTATION OF WIRELESS BASED WATER LEVEL MONITORING SYSTEM USING ARDUINO AND BLUETOOTH

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Abstract:- *In this paper, we design a micro control based wireless water level monitoring system. It consists of an Arduino and Bluetooth module. The Arduino receives the level information from the sensors and tracks the water level with predefined level indicators. The Bluetooth module receives the command from Arduino and the same will be transferred to the registered mobile through Bluetooth. Moreover, we place a buzzer as an additional indicator. Finally, we demonstrate different water level settings, tracking and SMS & buzzer alerts. Thus, the proposed system monitors and controls the excess flow of water and saves power consumption.*

Index Terms: Arduino, Bluetooth module, sensors, Buzzer, Water pump, LCD.

1. INTRODUCTION

One of the major problems faced by most of the countries is the issue of water scarcity in the world. The scarcity is mainly due to the wastage of the water. There is a need to control the water wastage to save the environment and water resources. Water level monitoring system is one of the techniques to address the control of water wastage. It observes the level of water and provides the information to the registered users through wireless. In view of this, Bluetooth module based Water Level Monitoring system is an innovative idea that will inform the users about the level of liquid and will prevent it from overflowing.

The water level monitoring system is a automatic process to detect and indicate the level of water in the reservoirs, overhead tank or any other storage containers, etc. All the householders are storing the water in overhead tanks by using the motor pumps. When the water is stored in the tank, no one can identify the level of water and also, no one can know when the water tank will be filled. So, there is an overflow of water in the tank, which results wastage of energy and water. To resolve this type of problems by using implementation of water level monitors and control systems using wireless technology which will transmit the information to the smart phone and indicate the level of water in the overhead tanks. Similarly, the

water level monitoring and alarm circuits can be used in the factories, chemical plants, and electrical substations and also in other liquid storage systems.

Earlier, simple water level indicator conventional systems were used for monitoring the water level of overhead tanks is shown in figure 1. It uses three LEDs (LED1, LED2, and LED3) to indicate minimum, middle and maximum water levels in the tank. The sensor probes comprise A, B, C, and D, where A is the common probe and B, C, and D are common probe, minimum, middle, and maximum sensing levels, respectively. When water in the tank touches A and B sensors both, a small current passes from A to B through water and to the base of transistor T1 via resistor R1. As a result, transistor T1 conducts and LED1 will glow. Similarly, when water touches sensor C, LED2 will glow and it indicate that the water has reached the middle level. Finally, when water touches sensor D, LED3 will glow and it indicate that the maximum level of water. Therefore, all three LEDs glow when the tank is full. Hence, these type of conventional systems will provide only indication to the users and the user should present and control the motors manually, which is the main drawback of the conventional systems.
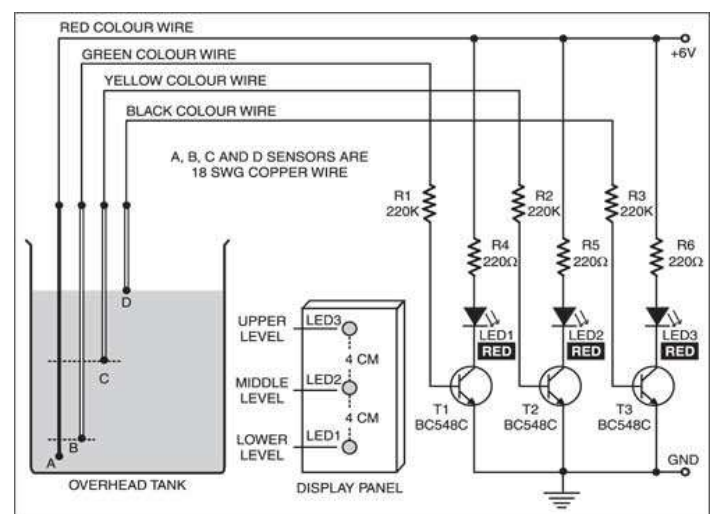

Figure 1: Existing Model Circuit Diagram

In this paper, we proposes a novel idea of collecting and sharing real-time information about water levels to an authorized central command center through wireless using Bluetooth protocol. Previously, the water level monitoring and control systems are addressed by the authors of [2-10]. ARM CORTEX based system is developed to know the level of water and control the flow of water [2]. This system monitors the water level in the field and automatically switches ON the motor when water level goes below the prescribed level. Author [3] achieves automation through sequential logic implemented using a flip flop. A seven segment display and a relay-based motor pump driving circuit are part of the integrated design [3]. The system used Arduino to automate the process of water pumping in a tank and has the ability to detect the water level in a tank, switch on or off the pump accordingly and display the status on the LCD screen. The system also monitoring the level of water in the sump tank [4]. A gate mechanism [5] is also attached to this system which is triggered when the water level reaches the brim of the storage system. The design present [6] an implementation wireless sensor network in the monitoring of system using GSM system. To detecting blockages and monitoring water level condition use level sensor. The design consists of GSM module is used to send the messages to central computer and monitors throughout the area. Ping sensor is used as a distance sensor for detecting water level by measuring distance between sensor and water surfaces [7]. The micro controller (PID) based water level monitoring [8] is used to indicate the level of water in the tank to agent. Sensor based water pollution detection, it will check the water quality by using these parameters such as PH level, and turbidity and temperature are measured in the real time by the sensors. IOT based Water Level Monitoring system [9] is an innovative system which will inform the users about the level of liquid and will prevent it from overflowing. To demonstrate this system makes use of containers, where the ultrasonic sensors placed over the containers to detect the liquid level and compare it with the container's depth. To measure the water level by using ultrasonic sensors [10]. The ultrasonic distance measurement is based on ECHO principle. When sound waves are transmitted in an environment then they come back to the origin as ECHO after striking on any obstacle. In addition to the above methods, we propose a simple wireless based water level monitoring and control system is presented in this paper.

2. PROPOSED MODEL

In this paper, we present a wireless based Water Level monitoring and control system using Arduino UNO and Bluetooth Modules is shown in figure 2, which help the user to be aware of the water level in the tank through an SMS alert and also pump is switched on and off automatically when the water in the tank reaches a particular threshold level. Arduino is used since its coding being simple as well as its connections are easy. The system also provides continuous water level measurement. It is very useful because the user need not worry about the water content during the peak hours of the day. It not only helps in daily chores but also prevents water wastage. It reduces human labor, saves time and also keeps the user updated regarding the water content.
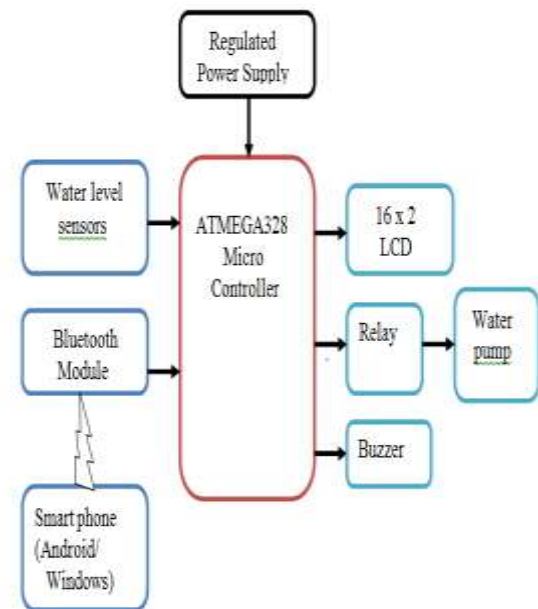

Figure 2: Proposed Model

3. PRINCIPLE OF OPERATION

In this paper, we design a micro controller based wireless water level monitoring system, which consists of major hardware devices like ATMEGA328 controller, Bluetooth module, water level sensors and LCD display.

The water level sensors are used to monitor the level of the water and forward the same information to the controller. Further, microcontroller processes the sensor information and the level of the water is displayed on the 16*2 LCD display. The Bluetooth module receives the command from Arduino microcontroller and the same will be transferred to the registered mobile through Bluetooth. Moreover, we place a buzzer as an additional indicator. Thus, smart phone receives the information regarding water levels through wireless channel.

4. HARDWARE IMPLEMENTATION AND RESULTS

We have designed a water level monitoring system and it consists of different sensor devices and other modules, their functionalities are shown in the figure 2. In this implementation model, we used ATMEGA 328 with a Bluetooth module. Sensors are connected to the Arduino UNO board for monitoring, ADC will convert the corresponding sensor reading to its digital value and from that value, the corresponding environmental parameter will be evaluated. After sensing the data from different sensor devices, which are placed in a particular area of interest. The sensed data will be automatically sent to the Bluetooth connection to the smartphone when a proper connection is established with the server device.

By using this system any level value of any liquid can be controlled. So we performed different levels to find this. Here in this paper we used 4 different levels which are given as follows:

1. 10% (initial stage)

2. 40% level of water.

3. 80% level of water.

4. 100% level of water.

The Test results of these test cases are shown below:

Test Case 1: Initial stage

The initial stage setup is shown in figure 3. From test case 1, we demonstrate that when the water is getting filled initially it displays on the LCD screen and it sends a status of water level to the mobile through Bluetooth module that is 10% of water is filled, pump status is ON and Buzzer is ON condition.
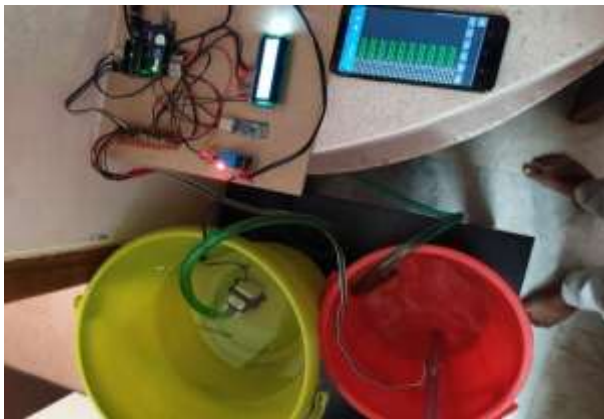

Figure 3: Output of Level Sensor for Initial Stage Water

Test Case 2: 40% of water level

From test case 2, we came to know that when the water is getting to touch another level i.e., 40% it displays on the LCD screen and it sends a status of water level to the mobile through Bluetooth module that is 40% of water is filled, pump status is ON and buzzer is ON which is shown in the figure 4.
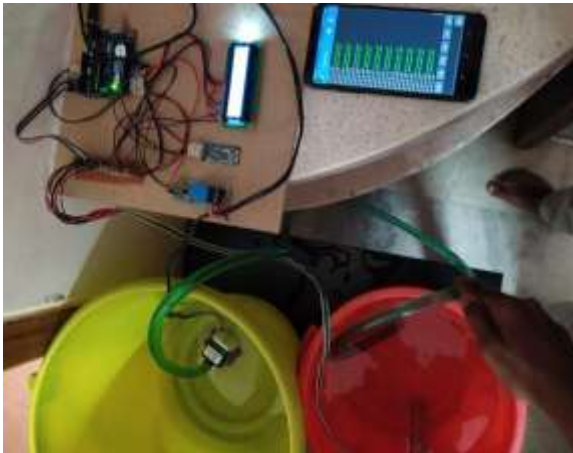

Figure 4: Output of 40% of Water Level

Test Case 3: 80% of water level

From test case 3, we observe that the water level is gradually increasing it is almost half of the bucket is filled and status in mobile is 80% of water is filled. The figure 5 shows the buzzer will be in OFF condition when the water level is 80%.

Figure 5: Output of 80% of Water Level

Figure 6: Output of 100% of water level.

Test Case 4:100% of water level

From test 4, explains that when the water gets filled completely and the buzzer is in off condition and water pump is going to off automatically. Its displays on the screen and sends a message to the mobile through blue tooth module which is shown in the figure 6.

5. CONCLUSION

In this paper, we have presented "Wireless based Water level monitoring and control system using Arduino and Bluetooth Modules". It has been implemented using hardware components like Arduino, Bluetooth module, LCD and sensors. Here, we can monitor the levels of water present in any tank or container by that we can control the water flow. Furthermore, we can observe certain water levels through LCD and Smart Phone via Bluetooth Module. Initially, we programmed from 10% and the buzzer will be in ON condition from the initial stage (10%) to 60% after that buzzer is going to OFF automatically. The water pump starts filling from 10% to 100% after reaching 100% the water pump is going to OFF automatically. Secondly, using highly advanced IC's and with the help of growing technology, the control system has been successfully implemented. In-future, we can extend the proposed system for various applications to monitor and control the water levels.

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