IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 6, June 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.282

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.282|

|| Volume 10, Issue 7, July 2021 ||

| DOI:10.15662/IJAREEIE.2021.1007037 |

GSM based Low Cost Water Level Monitoring and Control System using Arduino

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ABSTRACT: Nowadays the people in the world are suffering from water scarcity issues. It is one of the common phenomena especially in the hostel. Water supply at the student's hostel is usually drawn from tank at the roof of the building and there is no alarming system to monitor the water level. The situation is more worsenonce there is no personnel for ON & OFF of the motor. Here there is a sump tank in the bottom of the hostel building to fill the tank in the top of the building.Two levels are considered in this work. The water reaches the first or maximum level in the tank, the pump is switched off ,whereas pump is switched on when the water in the tank reaches second or minimum level. Water level is measured by using ultrasonic sensor.The output of ultrasonic sensor is given to arduino.The Arduino reads the water level of the tank and same will be displayed in LCD. Once water level reaches the marked level, buzzer will give alarm. The message will be sent to mobile phone using GSM . Based on this analysis, water level monitoring and controlling system is developed and elaborated with hardware implementation.

KEYWORDS: Microcontroller, Ultrasonic Sensor, Motor Driver Circuit, GSM.

I.INTRODUCTION

Water tank is a container for storing water. Water tanks are used to provide storage of water to be used in many applications such as beverage, irrigation agriculture, fire extinguisher, agricultural farming, chemical manufacturing, foodpreparation . Water tank parameters include the general design of the tank and choice of construction materials, linings.Generally people depends onsupplementary or secondary water tank to store water thatis collected from rain water or water pumped from well orunderground. Same method is followed in most of the hostels. But how to measure the overhead tank iscompletely filled or what?For aged and physically challenged peoples it is difficult to manually switch ON and switch OFF the pump to monitor water level in water tank. Also it leads to overflow and wastage of water. The disadvantages of manually controllingwater level in the tank given as:

1) Human may made mistake 2) less accuracy 3)To seewater level in the tank it needs to opening and closing of tank where time get waste. So it is necessary to develop automatic water level.

In day to day life ,different types of smart technologies are introduced for many kinds of application. A smart monitoring and control, in general an electro-mechanical & computer programming using power and control machinery device that can perform automatically which depends on sensors.

This paper is designed to monitor the water level in a tank, and controlling the water pump by without human interfacing. An Arduino UnoR3 is used to achieve the desired operation. The level of water can be detected by using Ultrasonic sensor and sends a command to the Arduino. Buzzer is used to create a siren to stop or start the pump.This paper is prepared inorder to reduce the problem of water crisis and to reduce the power usage.From this, overflow of water can be prevented and the water level indication can be seen along LCDdisplay.The advantages of this method over manually monitoringwater level in the tank are –reliable, stable, accuracy

II.RELATED WORKS

This paper presented the development of water levelmonitoring system with an integration of GSM module to alert the person-in-charge through Short Message Service (SMS). The water level is observed and its data is sent over SMS to the

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register mobile number upon reaching the critical level.It is established with a capability to detect low level of the water in the tank and notify GSM modem to send SMS to the intended user hand phone or person in-charge. The microcontroller is connected to the modem using MAX232. The system functioning was checked by conductiong number of tests. However at times, delay in receiving SMS had occurred and it could be due to detector circuit, the programming of the PIC, and the soldering of the components connection on the prototype PCB.

This paper proposed a water tank monitoring andvisualization system using smart-phones known as *"Tankboy."* This system is a real-time monitoring system using adatabase to establish a marine communication system. "Tankboy" works anywhere and anytime. Earlier, this system wasrestricted to a PC environment. However, its implementationon a smart-phone environment is novel.The sensor data in our current database incurs a slightdelay; this delay is due to two factors. The first is the delay inaccessing the Web page. The second is due to the monitoringof the parsing information. Due to these restrictions, datacannot be transmitted in real time. These issues can beovercome with an improvement in the infrastructure of thetelecommunication systems and an enhancement in thecomputing power of smart-phones.

This paper has designed GSM based water level and temperature monitoring system (WLTMS). They detected the water level of the tank which is connected to the industry. They also monitored the temperature of the tank. For this purpose, they used LM35 sensor which defines the parameters of the temperature sensor. Analogue output of LM35 is amplified through a process of signal conditioning, where OP-741 is used to amplify thesignal. Amplified signalis fed into an ADC for the sake of digital data. LCD is used for displaying result. PIC microcontroller is used for this procedure. Modem is also connected to this controller for the wireless communication of the data through GSM technology by receiving an alert through SMS.But delay in receiving SMS can occur due to detecting the circuit and the programming of PIC.

In this paper, a design of a water level indicator withPIC microcontroller is shown. This design is applicable for both reservoir and main tank in home or industries. PIC 18F452 used in this design.This design has buzzer , 10 swiches and LCD. The level of water in both reservoir and main tank is indicated by LCD and Alarm is given by the buzzer to stop the pump or water coming channel. These switches indicate water level of both tanks. PIC microcontrollers also controls the motor which pumps the water in the tank from the reservoir. In the auto mode, motor is automatically turned on when water level reaches 20% in the tank and it is turned off when water level reaches 100%. Choose PIC microcontroller for programming flexibility, faster speed of execution since microcontrollers are fully integrated inside the processor. As the completesystem works automatically so it doesn't require an expert person to operate it nor is expensive.

The worldwide continuous monitoring, controlling and alerting of dam water level by using mobile communication. GSM uses short message services (SMS) to directly control and monitor the opening and closingof the shutter in dam. This system alerts the people staying nearby places about the rise in water level by sending SMS. Temperature sensor is used to sense the changes in atmospheric temperature and take up suitable measure like releasing the excess water in dam for irrigation purpose.

This paper elaborates the design of the water level indicator and controller using microcontroller 8051. This canbe used both for household and commercial purposes. We make use of 8051 microcontroller. There is also a buzzer and a LCD inthisproject. LCD is used to show thewater level in the tank or reservoir. Port P0 is used for connecting levels of the tank while port P2 is used for connecting the LCD. Micro controller also controls the pump which is used to pump water to the tank. When the tank reaches the higher thershold mark the pump is switched off during auto mode while the pump is switched ON when tank reaches lowerthersholdmark. 8051 microcontroller is used as it is easily programmable and is quickly accessible as comparetoothermicrocontroller.

This paperfocusses on analyzing the water level, water quality and pressure of flowing water. Water quality is to be determined by considering several parameters like pH, turbidity. Water level is determined by considering the distance of water using ultra sonic senor. With the help of Raspberry Pi some Parameters of the water is determined The proposed system measures the level, turbidity, pressure and pH and these measured values are stored into database, and based on the threshold values set, Raspberry Pi notifies the registered userby sending text SMS with the values and these values can also be retrieved through website.

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In this article, they provided a survey of the current state of the art in the design and implementation of WSN-based WQM systems, describing a framework for WSN-based WQM systems and discussing the technologies used at each stage in the monitoringprocess. Furthermore, they described existing implementations that use WSNs to monitorwater quality. The communication techniques, energy management schemes, and dataprocessing approaches employed in these systems are also discussed.

This paper introduced an IoT enabled gadget which helps in administering and monitoring the consumption of water in multiple buildings simultaneously. This module can be effortlessly fixed onto desired water containers and carry on for long run. The Ultrasonic sensor is placed on the top of tank which continuously keeps track of the water level in real time, which will inform the users about the level of liquid and automatically turn on/off the water pump as per the defined functions. The preferred execution might be usable for wide-ranging monitoring of water resource, like in considerable firms and communities. This paper has presented the principal intentions. Furthermore, this involved in scheming and maturing of an automatic water level controllable system exposing the fitter wayof information processing architecture that interpenetrates for the interfacing scheme

This paper has designed a micro control based wireless water level monitoring system. It consists of an Arduino and Bluetooth module. The level information is received by the Arduino 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, buzzer is used as an additional indicator. Finally different water level settings, tracking and SMS & buzzer alertsaws demonstrated.Thus, the excess flow of water is monitored and controlled in this proposed system and saves power consumption.

This paper achieved a power efficient and simple solution to home water level monitoring, a system that can sense the water level and transferring the data via a GSM module was developed. The data transferred areanalyzed in real time using Arduino and transferred to a Graphic User Interface. The electronic device which senses the water level through graphical icons and visual indicators is interacted byGUI. GSM technology is an advantage which eliminates the cost of network usage. Also, the system is scalable and allows any number of different devices to be added with no major changes in its core.

III. BLOCK DIAGRAM OF PROPOSED SYSTEM

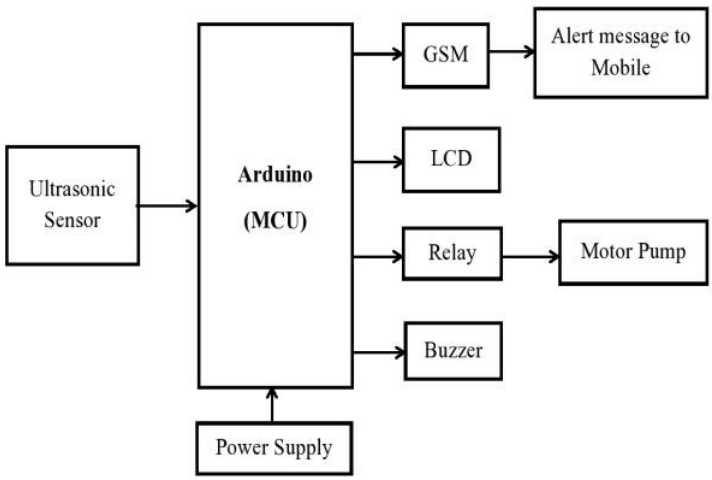

Fig. 1Block Diagram for the proposed system

HARDWARE IMPLEMENTATION: The water level monitoring technique can be controlled by using software and hardware components.

ARDUINO UNO: It is a microcontroller board developed by Arduino.cc and based on Atmega328. Arduino UNO is a valuable addition in the electronics that consists of USB interface, 14 digital I/O pins, 6 analog pins, and Atmega328

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microcontroller. Serialcommunication using Transmitter and Receiver pins supported by arduino.

Fig. 2 Arduino Uno

UltrasonicSensor:Ultrasonic sensor is used to measure distance in range of 2cm-400cm with accuracy of 3mm. The sensor module comprisesof ultrasonic transmitter, receiver and the controlcircuit. The transmittertransmits ultrasonic wave when the wave hits the obstacle it get reflected back and received at receiver and they are convert to electric wave. Sensor output is in term of centimeter or inches. Operating voltage is 5V with 40Hz frequency.

Fig. 3 Ultrasonic Sensor

Relay:A relay is a switching device, it works to isolate or change the state of an electric circuit from one state toanother.

Fig. 4 Relay

LCD: LCD is an electronic display panel, which is used as outputunit

Fig. 5 LCD

Buzzer:A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric devices. (piezoforshort).

Fig. 6Buzzer

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GSM module (SIM 900A): In this work, the sim900A is the protocol for transferring the data from one end to another. GSM is a cutting-edge digital cellular technology which is used for transmission of mobile data and voice services operating at frequency ranges 900MHz and 1800MHz. The various cell sizes in a GSM network are micro, pico, macro and umbrella cells. There are threestages to a GSM device, first is a mobile station, base substation and network subsystem. GSM offers various unique features that are beneficial for designing this model. Some of the important features are listed in Table

GSM Features
1. Good spectrum efficiency
2. International
3. ISDN compatibility
4. SIM phonebook
5. FDN
6. Good encryption
7. SMS service

Fig. 7GSM Module

In GSM, a good end to end security is maintained as per the generalized security protocols.

SOFTWARE COMPONENTS:ARDUINO UNOR3, THINGSPEAK - "ThingSpeak is an open-source Internet of Things (IoT) application.

IFTT - It is a software platform that connects apps, devices and services from different developers in order to trigger more applications.

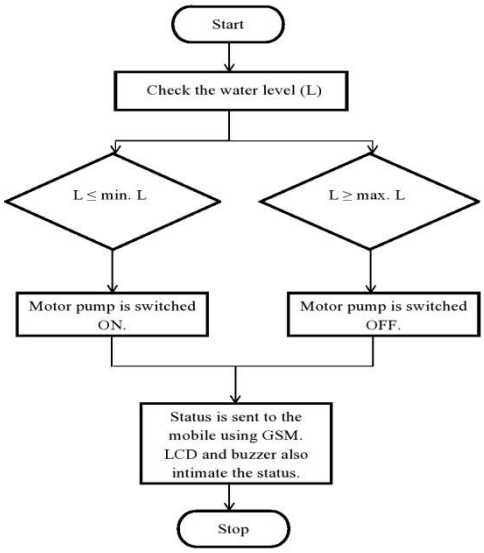

Fig. 8Flow chart

IV.RESULT AND ANALYSIS

In this paper water level monitoring system comprises of LCD display inorder to display the water level of the tank. In future the LED may be used as an indicator in the water level monitoring.If the water level reaches the first marked level, then the pump(motor)is automatically turn OFF or else tank reaches second marked level (minimum),then the pump is turn ON automatically. Hence, this water level monitoring is unmanned system with no wastage of water and power.Then next step is to connect the input relay and sensor to detect the water level ,LCD display is placed to find

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out the water level indication.If water reaches the marked maximum level or minimum level then the status will be displayed in the LCD display.From this one can monitor the water level. The notification is also sent to mobile via GSM technology to the concern person.

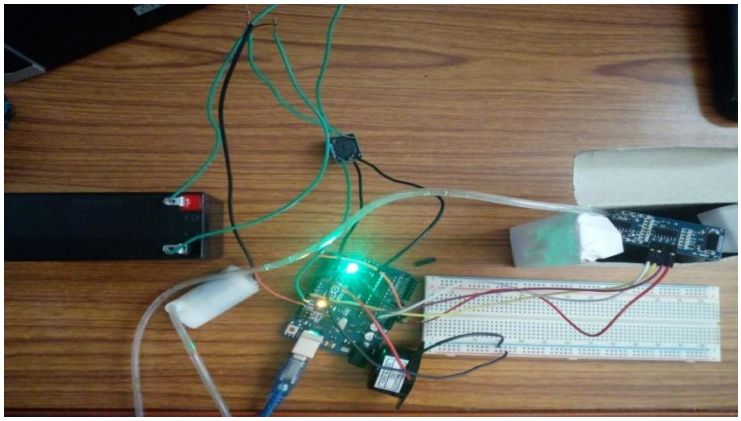

Fig. 9Hardware Setup

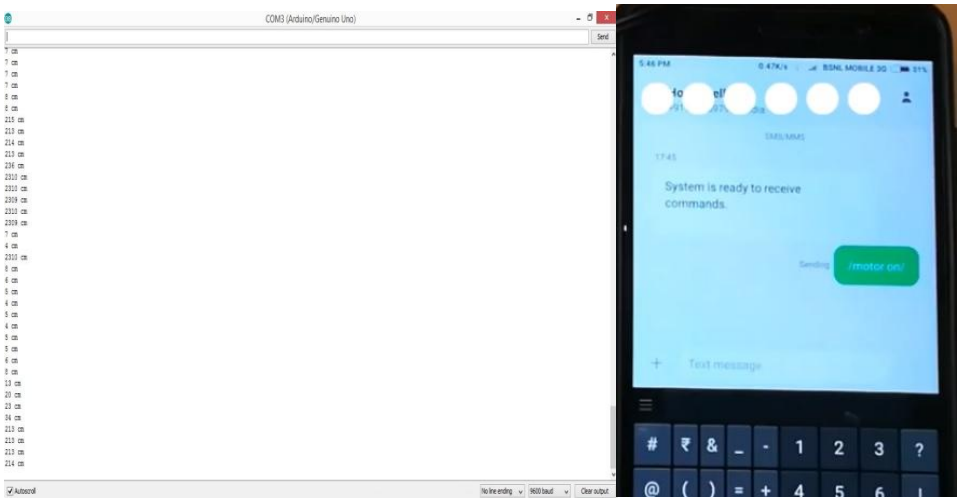

Fig. 10Sensor Output

APPLICATIONS: It can be used in factories, Agriculture ,home, commercial complexes,Irrigation system in agriculture, hotels, industries, apartments, buildings, colleges, complexes, etc. to monitorwater level in the tank automatically

V.CONCLUSION

The advanced water level monitoring using arduino technology can be implemented in the place of house ,industry office etc., It is important to reduce wastage of water & saves water , reduce the usage of electricity.. The low cost of equipment and the simple procedure of our method are significant when compared other methods.

VI.FUTURE WORK

It can be used in every homes, it will be useful for automation filling of tank for both the working person for human.It is used in field of Agriculture and gardening for passing the water.This method can be implemented in future for multiple tanks and quality of water can also be measured.

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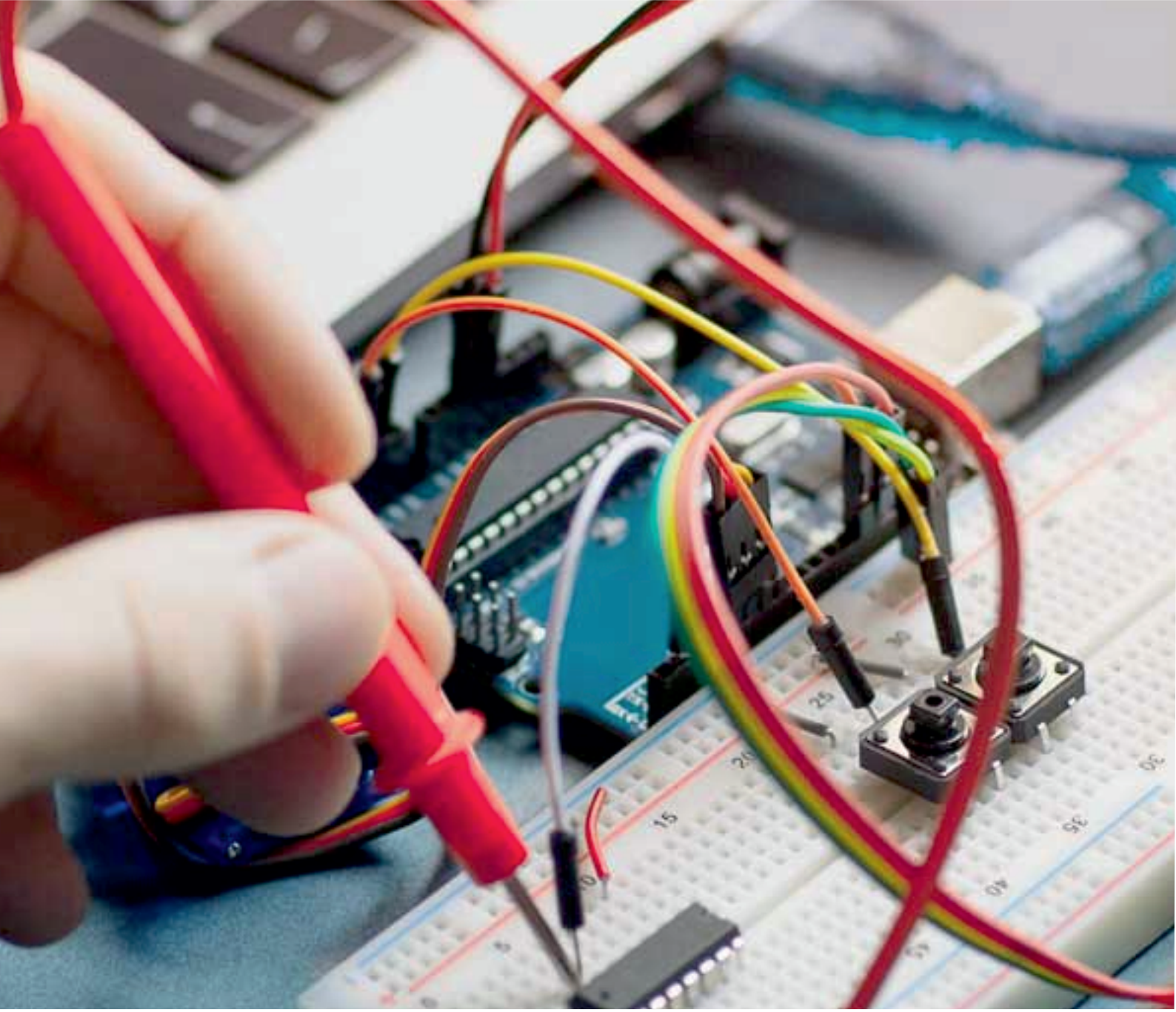

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