IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-7, Issue-10, Oct 2019 E-ISSN: 2347-2693

Microcontroller Based Water Level Indicator And Controller System

Dwaipayan Saha[1*], Indrani Mukherjee[2], Jesmin Roy[3], Sumanta Chatterjee[4]

[1,2,3,4]Dept. of Computer Science and Engineering, JIS College of Engineering, Kalyani, West Bengal, India

[*]*Corresponding Author: sumanta.chatterjee@jiscollege.ac.in, Tel.: +91-8013859618*

DOI: https://doi.org/10.26438/ijcse/v7i10.164167 | Available online at: www.ijcseonline.org

Accepted: 09/Oct/2019, Published: 31/Oct/2019

***Abstract*—** The Water level indicator is a modification of an alarm system that is used in water tanks (not mandatory, can be used in any liquid container) to measure the water level and to indicate respectively. This article is mainly focussed on how can we save water from wastage as the amount of water is decreasing day by day due to various issues. Here we are using an Arduino UNO and an ultrasonic sensor to sense the water level so that we can aware of the people. Buzzers are used for buzzing purpose and an LCD is used for the display. Here the Arduino and the ultrasonic sensor make this model quite simple and easily can be modulated. This model is full of advanced technologies and its quite a user- friendly.

***Keywords*—** Arduino microcontroller, ultrasonic sensors, LCD display, buzzer

I. INTRODUCTION

As we all know the population is increasing day by day but in the same way ample water decreases also. Water scarcity is a very important concern of people nowadays. So we have tried to minimize this concern with the help of the water level indicator. So here basically we are mainly concerned about how we can use the Arduino and ultrasonic sensor together to detect the water level in the overhead tank.

The Arduino is programmed in such a way that it can control the flow of water by turning the water motor ON or OFF according to the needs with the help of ultrasonic sensors which is the main technique applied here in this model. Here two circuits are mainly used. One is the transmitter circuit and the other one is the receiver circuit. The ultrasonic sensor is used by the transmitter circuit to measure the water level by measuring the distance which is the unique property of this proposed model. Then the information is conveyed to the receiver circuit with the help of RF communication. Then an LCD setup is put to display the water level according to the condition and it is shown in terms of percentage and the LCD setup is in turn connected to the receiver circuit.

The most eye-catching and drawing feature is that the proposed model is wireless and it is quite accommodating and can be modified easily with the help of advanced technology.

II. RELATED WORK

The Water level indicator is a simple electronic device that is designed to detect and indicate the presence of water in a container so that it can provide an alert in time to avoid the leakage of water or water splits. As the days passed this electronic device is modified with better and advanced technology. Earlier there was a common design that a small cable lies flat on the floor of the container and it was dependent on the electrical conductivity of water and when the electrical conductivity is established the resistance between the two contacts decreases and the alarm sounds to indicate the presence of water. Then various adaptations and modifications are done along with advanced technology.

A. WATER LEVEL INDICATOR USING AVR MICROCONTROLLER.

In this indicator, an AVR microcontroller is used mainly for the detection purpose. Here along with a seven segmented display is used for the display purpose. Here sensors were used at different levels of the water tank to sense the water level. Buzzers were used for indication purpose.9 sensors were used for sensing purposes. Level '0'indicates the underflow or tank empty condition and level '8' indicates the overflow or tank full condition. In this model, water serve as the conduction medium and it completes the circuit. But this circuit is bit complicated so it's not that user-friendly.

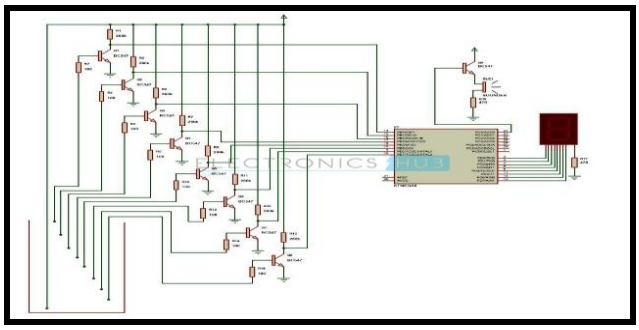

Fig. 1 Water level indicator using AVR microcontroller

B. WATER LEVEL INDICATOR USING ARDUINO

Using the Arduino water level indicator was proposed. This water level indicator is fully controlled by Arduino. In this proposed model 16*2 LCD is used to display the information according to the present condition of the water tank. The circuit used in this model is designed in such a way that it switches the motor ON when the water level falls below the minimum detected level and similarly it switches the motor OFF when the water level overflows the maximum detected level.

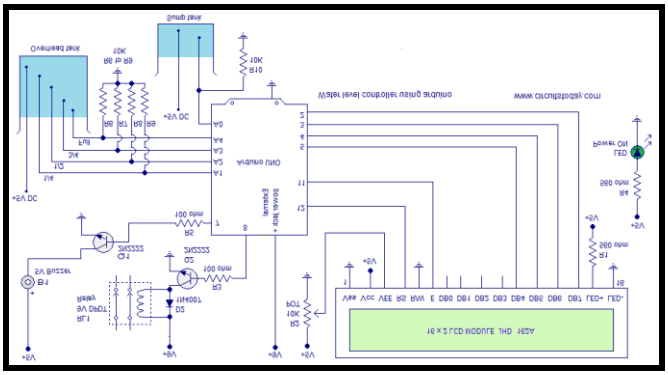

Fig 2 Circuit diagram of water level indicator using Arduino

C. WATER LEVEL INDICATOR USING 8051

Using 8051 another water level indicator was proposed. In this model 8051 microcontroller is used for controlling the water level. By the help of 8051, the water level in the overhead tank is detected automatically. An LCD is used for displaying the water level. Here 4 wires are used for water sensing and the wires are placed at the different levels and the dc supply is placed at the base of the tank. The four wires which are placed at the different levels, based on the outputs of these wires the microcontroller displays the water level at the LCD as well as controls the motor also. When the water level is low it shows that the tank is underflow and motor is turned ON and when the water level is above the maximum detected level then the motor is turned OFF. The 8051 microcontroller is programmed in such a way that whenever this two condition is received the microcontroller displays the respective information.

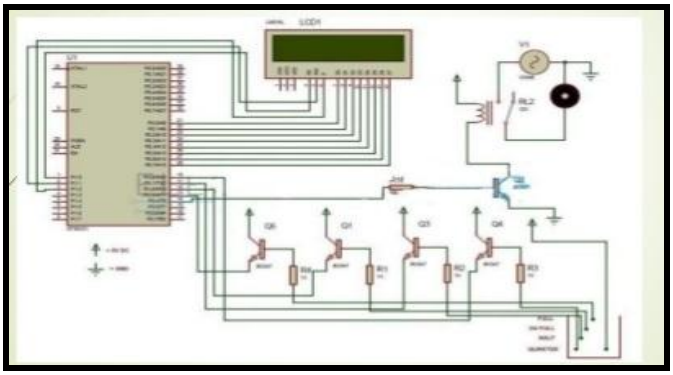

Fig. 3 Water level indicator using 8051

III. PROPOSED IDEA

This project has been prepared, by using Arduino Nano, which is highly efficient and advantageous over previous methods of detecting water levels. Unlike the previous contact methods where we used resistors, capacitors, and inductors, this method of ours is contactless. In this method, there are no chances of rusting and short-circuiting. Here we don't even need water to act like a medium for the flow of current. And moreover, ultrasonic sensors are used here, which are placed outside the tank. Arduino Nano is fully programmable, reducing the chances of errors and faults in the circuits if properly implemented. And with the help of this system, no human intervention is needed, once the programming is completed.

A. PROPOSED CIRCUIT DIAGRAM

Here we consider two circuits, one will be transmitting data and the other will receive the data and are called transmitter circuit and receiver circuit respectively.

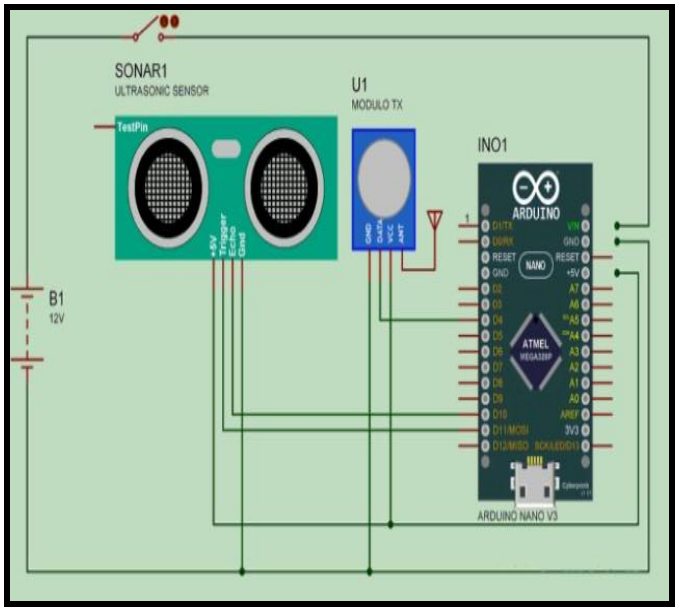

Fig 4 Proposed circuit diagram

Transmitter circuit:

Here in this circuit, we will connect the ultrasonic sensor to the D10 and D11 pins of the Arduino. The sensor will be powered by the Vcc and the GND pins, which will be connected to those of the Arduino. The calculated data will be hence transmitted with the help of the RF transmitter, whose data pin will be connected to D4 of the Arduino and, the Vcc and the GND pins will be connected to those of the Arduino. An antenna will be used and will be connected to the ANT pin of the RF transmitter. The whole circuit will be powered by a 9-volt source. The Source will be connected to the Vin and GND of Arduino, with the help of a switch.

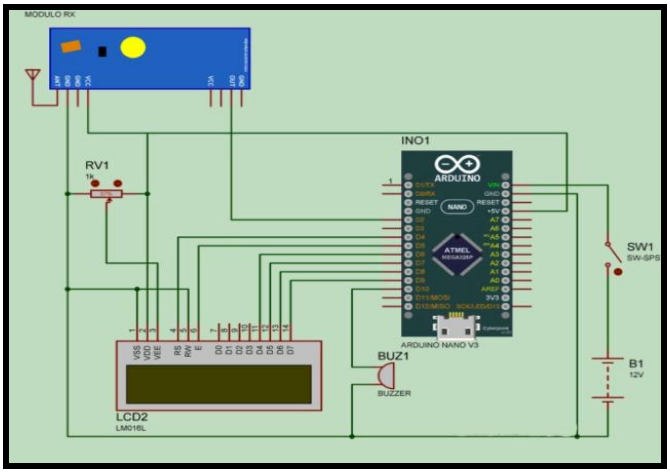

Fig. 5 Transmitter circuit of the proposed idea

Receiver circuit:
The whole circuit will be powered by a 9-volt source with the help of a switch. The Source will be connected to the Vin and GND of Arduino. The LCD will be connected to the pins of the Arduino from pin to D4 to D9. The Vcc and the GND pins of the LCD will be connected to those of the Arduino, and the contrast of the LCD will be controlled by moving the preset, which will be connected to the pin 3 of the LCD. Here the RF Receiver will receive the transmitted data transmitted from the transmitter circuit.

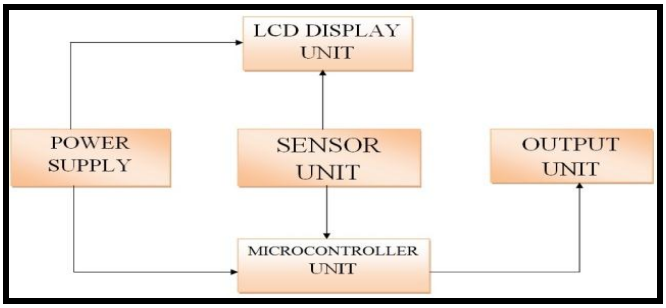

Fig.6 Workflow Diagram

IV. METHODOLOGY

Our system works in two parts. The first part deals with the transmitting and receiving of the signals (high-frequency sound waves), which is performed by the ultrasonic sensor, placed on the top of the tank. The sensor has two openings, one is known as a trigger and the other is known as echo. The entire work has been done in a circuit called, transmitter circuit. Another circuit named receiver circuit is also present.

The trigger emits high-frequency sound waves, which travel from the top of the tank to the bottom of the tank. As soon as these waves come and hit any obstacle or object (in this case water), they return to the sensor back, in the form of echo waves. These echo waves are received by the echo opening of the ultrasonic sensor.

Consequently, the water level indicator Arduino calculates the time taken between the sound waves going out from the trigger and coming back to the echo as echo waves. The distance travelled is directly proportional to the time taken. The distance is thus calculated in centimetres and sent to the receiver circuit using RF communication. It is, in this receiver circuit, where the data taken up from the transmitter circuit is converted into percentage and then displayed on the LCD.
Speed of sound is around 340m/s; this distance can be calculated using:

Distance = (time/2)*speed of the sound

When the percentage is 0%, this indicates that there is no water in the tank and the buzzer beeps as an alarm. The microcontroller signals relay for automatic switching ON OF the pump. When water reduces to a low level; the device beeps an alarm to alert the user and automatically starts the pump again to refill the tank.

Gradually the percentage displayed on the LCD changes. As the percentage shows 90%, the buzzer starts buzzing, and when the percentage reaches 100%, the buzzer buzzes the loudest and automatically stops the pump.

V. RESULTS AND DISCUSSION

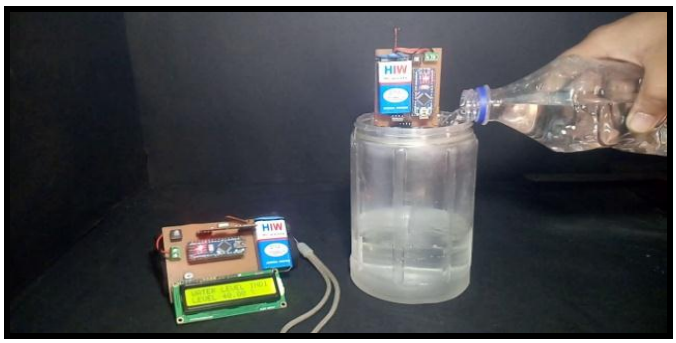

Fig.7 The LCD displays 40%.

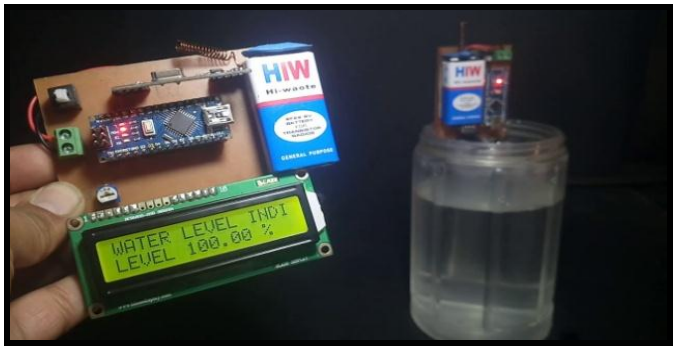

Fig.8 The LCD displays 100%.

After completion of this research work, we get to know how Arduino Nano works and the efficiency of Arduino Nano over other methods of water level determination. In this research work, we have used a contactless method of determining the water level in tanks using ultrasonic sensors, which works similarly as radar; because by using a contactless method we did not harm the quality of water in the tank which was instead impossible if contact methods were used.

After completion of the circuit, when executed we observed that when the tank was empty, and the display displayed 0%, the buzzer buzzed and the pump is switched ON automatically. Slowly as the tank got filled, and the display displayed 90%, the buzzer had started buzzing, thus, indicating that the tank is on the verge of getting filled. When the display displayed 100%, the buzzer buzzed the loudest and the pump was switched OFF automatically.
Recent studies have shown that, compared to water level indicator using AVR microcontrollers, the project designed by us, uses more advanced technology. It is fully programmed and designed in a way to reduce human intervention.

VI. CONCLUSION AND FUTURE SCOPE

This paper is one step ahead of how we can save water from wastage through advanced techniques. Nowadays everyone is busy with their works and they want everything automatic so that they can be free from the double workload. So everyone wants automatic machines in the markets and these are in demands now. So to meet up to their demands this research work is one proposal towards it. This water level indicator is not only used to detect the water level in tanks but also can be expanded to even detect the fuel level in fuel tanks in a similar way. This will not only reduce the wastage of water but also excessive fuel wastage. As a result of which, sustainable development will be achieved shortly soon if implemented meticulously. It's a low cost and user - friendly model which any normal fellow being can use. This can even be applied by constructing such types of projects in our homes to reduce domestic water wastage, even in our localities, schools, colleges. If this project is implemented on a large scale, it will serve the need of water resources. This is an environmental approach to reduce wastage of resources.

REFERENCES

[1] 2017International Conference on Information Communication and Embedded Systems (ICICES),Date Added to IEEE *Xplore*: 19October 2017 INSPEC Accession Number: 17261648DOI: 10.1109/ICICES.2017.8070773,Publisher: IEEE

[2] 2011 Second International Conference on Mechanic Automation and Control Engineering,**Date Added to IEEE *Xplore*:** 18 August 2011,**INSPECAccessionNumber:** 12267073,**DOI:** 10.1109/MACE.2011.5988288,**Publisher:** IEEE

[3] 2018 International Conference on Information Communication and Embedded Systems (ICICES),**Date Added to IEEE *Xplore*:** 03 December2018,**INSPECAccessionNumber:** 18290816,**DOI:** 10.1109/WASTE.2018.8554111,**Publisher:** IEEE

[4] 2014 IEEE Geoscience and Remote Sensing Symposium,**Date Added to IEEE *Xplore*:** 06 November 2014,**Electronic ISBN:** 978-1-4799-57750,**INSPECAccessionNumber:** 14716043,**DOI:** 10.1109/IGARSS.2014.6947655**Publisher:** IEEE

[5] 2009 Third International Symposium on Intelligent Information Technology Application,**Print ISBN:** 978-0-7695-3859-4,**INSPEC AccessionNumber:** 11051506,**DOI:** 10.1109/IITA.2009.302**Publisher:** IEEE

[6] 2010 International Conference on Computational Intelligence and SoftwareEngineering,**INSPECAccessionNumber:** 11706971,**DOI:** 10.1109/CISE.2010.5677083

[7] 2013 International Conference on Electrical Engineering and SoftwareApplications,**INSPECAccessionNumber:** 13711833**DOI:** 10.1109/ICEESA.2013.6578434,**Publisher:** IEEE.

[8] 2014 IEEE Conference on Systems, Process and Control (ICSPC 2014),**INSPECAccessionNumber:** 15058732**DOI:** 10.1109/SPC.2014.7086225,**Publisher:** IEEE

[9] IEEETransactions on Instrumentation and Measurement (Volume: 56 , Issue:5 ,Oct.2007),**Page(s):** 1532 1536,**INSPECAccessionNumber:** 9632998,**DOI:** 10.1109/TIM.2007.895665**Publisher:** IEEE

[10]2019 International Conference on Robotics,Electrical and Signal Processing Techniques (ICREST),**INSPEC Accession Number:** 18485785,**DOI:** 10.1109/ICREST.2019.8644344,**Publisher:** IEEE

Authors Profile

Dwaipayan Saha is a second year UG student of Computer Science and Engineering from JIS College of Engineering, Kalyani, Nadia, West Bengal, India.

Indrani Mukherjee is a second year UG student of Computer Science and Engineering from JIS College of Engineering, Kalyani, Nadia, West Bengal, India.

Jesmin Roy is a second year UG student of Computer Science and Engineering from JIS College of Engineering, Kalyani, Nadia, West Bengal, India.

Sumanta Chatterjee is presently working as an Assistant Professor of JIS College of Engineering, Kalyani, Nadia, West Bengal. He has worked 2 years in the Industry and 8 years in the Academic Sector. He completed his M.Tech degree in Computer Science and Engineering and B.Tech degree in Information Technology from West Bengal University of Technology. He is recently working on the emerging research field "E-Commerce" and EmbeddedSystem. He has made significant contribution on the research field "ECommerce" and EmbeddedSystem. He is a member of International Association of Computer Science and Information Techn-ology (IACSIT) and also a member of International Association for Engineers (IAENG).

