International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.194 |

|| Volume 8, Issue 4, April 2020 ||

A Review on Automatic Water Level Indicator Using Ultrasonic Sensor

Ashwini Shinde[1], Kiran Kumari[2], Varsha Kedare[3] , Dhananjay Pawar[4]

Student, Department of E&TC, S.N.J.B's K. B. Jain C.O.E., Chandwad, Nashik, Maharashtra, India[1,2,3]

Assistant Professor, Department of E&TC, S.N.J.B's K.B. Jain C.O.E., Chandwad, Nashik Maharashtra,India[4]

ABSTRACT: We live in a world which is moving at such a fast pace that everything if automated will help us to keep our lives going. The project on water level Indicator will help us to know when the water in our tanks is either full or empty and automatically switch on and off the pump as and when necessary. By using the basic principle of ultrasonic sensors, i.e.the ECHO method, we calculate the time of the ultrasonic waves travelling to andfrom and after a few calculations the answer obtained will be the water level in the tank. By using this concept, the water pump is switched on or off automatically when the water level falls below a certain level.

KEYWORDS: Arduino UNO, Ultrasonic sensor, GSM Module, Relays, IC's, etc

I. INTRODUCTION

This is a closed loop feedback operating system as the constant availability, inflow and outflow of liquid content within a storage tank is dependent on the operation of the sensor which triggers ON/OFF the pump switch using a relay. The ultrasonic sensor has a trigger and an echo pin. The sensor is placed at the top end of the (overhead) tank with its transmitter and receiver faced towards the bottom of the tank. The ultrasonic sensor reads the distance from the bottom of the tank using ultrasonic wave transmission by the formula (distance = speed * time).After the sensor is triggered, it sends out sound waves to the surface of the water/liquid content which obstructs the signal at whichever level and echoes back to the sensor. This echo effect enables distance measurement by allowing the Arduino read the echo pin to determine time spent between triggering and receiving of the echo.

Note: Speed of sound is around 340m/s thus distance can be calculated using

Distance= (time/2)*Speed of sound

To determine the level of the water in the storage tank, total length of the tank Must be ascertained. This value would enable us calibrate our tank to suit design specifications. The microcontroller signals the relay for automatic switching OFF of the pump when water reduces to a low level, the device beeps an alarm to alert the user and automatically starts the pump to refill the tank.

II. LITERATURE SURVEY

Tank Water Level Indicator and Controller Using Arduino by Amrit Kumar Panigrahi, Chandan Kumar Singh, Diwesh Kumar, Nemisha Hota. This paper gave the idea of using echo method. It also helped us in making the system's mechanism simpler.Electrical Appliances Control Prototype by Using GSM Module and Arduino by Tigor Hamonangan Nasution, Muhammad Anggia Muchtar, Ikhsan Siregar, Ulfi Andayani, Esra Christian,Emerson Pascawira Sinulingga. This paper helped us to understand the connections between the components.Water Level Indicator using Micro-controller by Mudit Bajpai, Money Saxena. This paper helped us to understand the uses of probe method and how it is cost efficient.Water Level Monitoring System using IOT by Priya J, Sailusha Chekuri. This method helped us to understand the use of Bluetooth modules and how it can be made as portable device. Smart Wireless Water Level Monitoring and Pump Controlling System by Madhurima Santra, Sanjoy Biswas, Sibasis Bandhapadhyay, Kaushik Palit. This paper helped us to understand the use of echo method better and how it can be made cost efficient.

III. PROPOSED SYSTEM

The project on Automatic Water Level Indicator using Ultrasonic Sensor and GSM Module helps 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 connections are easy as well as its coding being simple. The system also provides continuous water level measurement. It is very useful because the user need not

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.194 |

|| Volume 8, Issue 4, April 2020 ||

worry about the water content during the peak hours of the day. It not only helps in the daily chores but also prevents water wastage. It reduces human labour, saves time and also keeps the user updated regarding the water content.

3.1 Block diagram

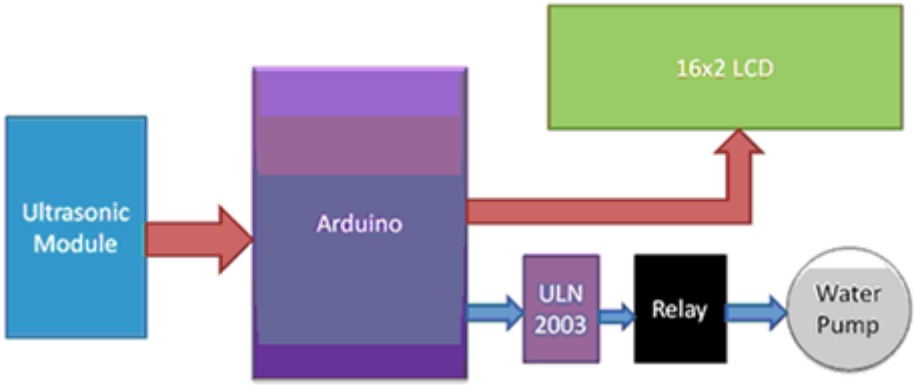

Fig 1. Block Diagram

Power Supply

It is also known as the driving circuit which is used to supply power to the other electronics devices connected to it depending on the type and requirement the power supply circuits vary.

Arduino UNO

Arduino UNO has the micro-controller ATmega328 embedded in it. It has 14 digital I/O pins out of which 6 provide PWR output. It is an open-source and provides prototype platform. It also has a 16MHX crystal oscillator attached to it. In addition to the above features, it also has an USB connection, a power jack, an ICSP, header and reset button. It has everything to support a micro-controller. It can simply be connected to a computer using an USB cable or power it with an AC or a DC adapter or a battery.

Ultrasonic Sensor (HC-SR04)

It is basically a distance sensor and is used for detecting the distance using SONAR method. It has two ultrasonic transmitters namely the receiver and the control circuit. The transmitter emits a high frequency ultrasonic sound wave which bounces off from any solid object and receiver receives it as an echo. The echo is then processed by the control circuit to calculate the time and the difference between the transmitter and receiver signal. This time can subsequently be used to measure the measure the distance between the sensor and the reflecting object

Relay

In order to isolate two circuits electrically and to connect them magnetically relays are used. They are very useful in switching from one circuit to another when they are completely separated. The relays comprise of an input and an output section. The input section has a coil which produces magnetic field when a small voltage from an electrical circuit is applied. This applied voltage is known as the operating voltage.

IC 7806

It is a voltage regulator integrated circuit. It belongs to the family of 78xx series of fixed linear voltage regulated ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage as output. A constant output voltage value is maintained by this IC.

IC ULN2003

ULN2003 IC is one of the most commonly used Motor driver IC. This IC comes in handy when the need arises to drive high current loads using digital logic circuits like Op-maps, Timers, Gates, Arduino, PIC, ARM etc. For example a motor that requires 9V and 300mA to run cannot be powered by an Arduino I/O, hence we use this IC to source enough current and voltage for the load. This IC is commonly used to drive Relay modules, Motors, high current LEDs and even Stepper Motors. In general this IC permits a low-power circuit to control signals or to switch high current ON and OFF which is electrically isolated from the controlling circuit

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.194 |

|| Volume 8, Issue 4, April 2020 ||

3.2 Algorithm

- Start
- Initializing the ultrasonic sensor module
- Calibrating the values obtained from the ultrasonic sensor
- Check the water level in the tank
- If full then send SMS to LCD
- LCD display the message
- Stop

3.3 Flow chart

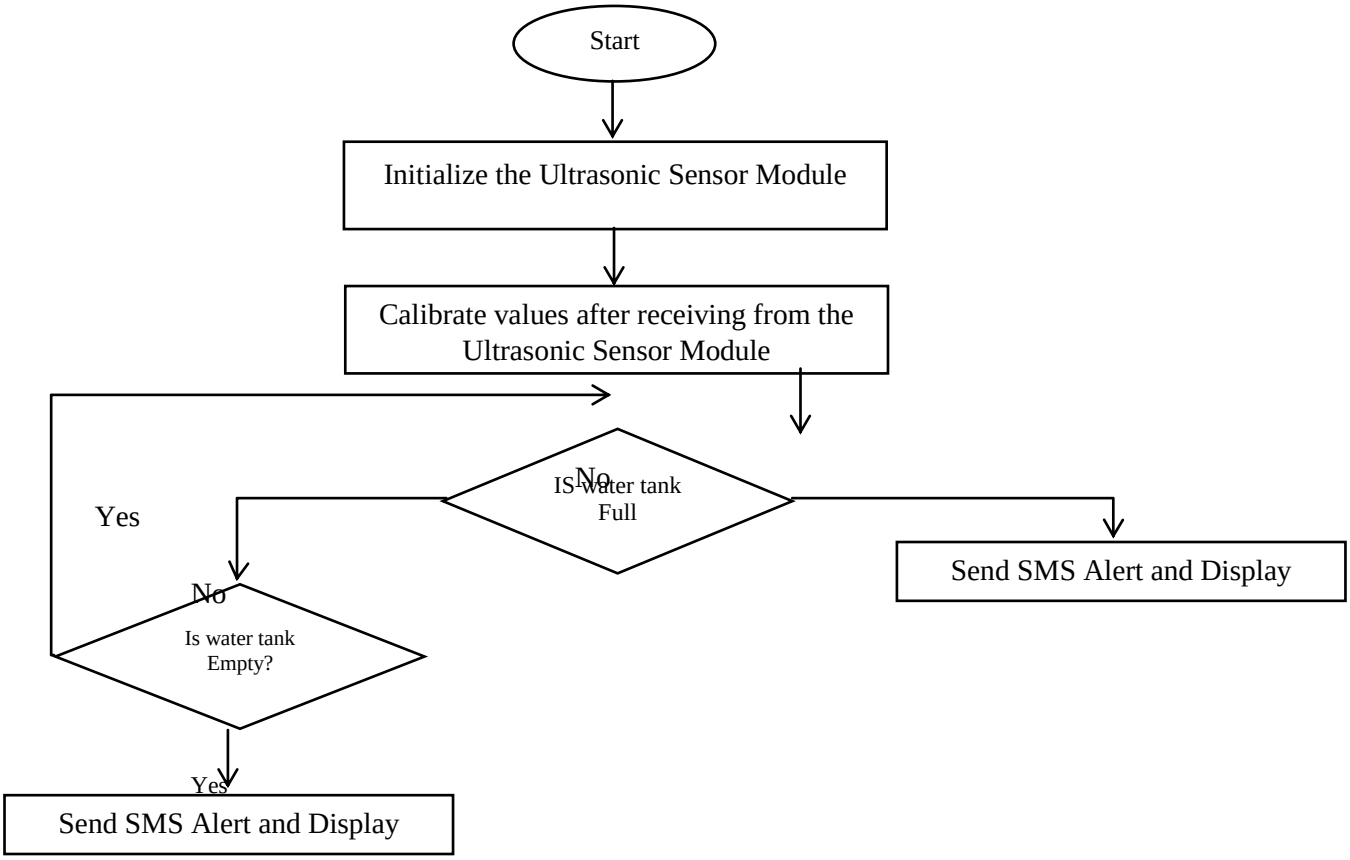

Fig. 2. Flowchart

When the circuit is switched on the ultrasonic sensor transmits the generated sound signal to the bottom of the water tank which is the target and whose water level is to be measured. The signal after touching the base of the tank is reflected back and is received by the receiver of the ultrasonic sensor. The time taken through the entire journey of the transmitted signal is recorded. Then by applying the formula,

Range = {(time taken) X Velocity of the transmitted signal (i.e. 340 m/s)} /2

The output obtained is the required distance.

Calculations and Result Analysis

Considering the temperature conditions to be 28℃, an estimation is drawn regarding the distance measurement of the sensors to the base of the tank. The measurements were done using a measuring tape and the results are tabulated as follows-

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | Impact Factor: 7.194 |

|| Volume 8, Issue 4, April 2020 ||

Actual Distance (cm)	Measured Distance (cm)	Error
30	32	+2
60	61.5	+1.5
90	90	+0
120	121	+1
150	152	+2

The error percentage is calculated as:

Error Percentage = [(Measured Distance-Actual Distance)/Actual Distance]*100%

%error = [{(32+61.5+90+121+152) - (30+60+90+120+150)}/(30+60+90+120+150)]*100%

%error = [(456.5 – 450)/450]*100%

%error = (6.5/450)*100%

%error = 0.014444444*100%

%error = 1.44444%

IV. CONCLUSION

Automation of the various components around us has been widely increased to reduce human intervention and save time. It is known that improper water management can have harmful effects on both the system and the environment. The main objective of this project is not only to reduce manual labour but also help save water in an efficient manner. Finally, a conclusion can drawn that this project can definitely be useful on a large scale basis due to its minimum requirement of man power and also the installation process being easier making it more compatible for everyone to use.

REFERENCES

1. Abdullah, A. (2008). ; Eater Level in Tank acing Sensors and P1D Controller. Btech Thesis, University Malaysia Sarawak, Sarawak,123 p.
2. Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue Proceedings of the World Congress
on Engineering and Computer Science, pp 220-225
3. Osama Mahfooz, MujtabaMemon, and AsimIftikhar, “Project Review on Water Level Sensing Using PLC,” Journal of Engineering &
Technology Science, vol. 2, no. 2, pp. 160-170,2012
4. JagadeshBoopathi, “555 Timer Based Water Level Controller,” Electronics Tutorials by Jagansindia, Inc., 23 June 2013
5. Wires and Connections Created by Mike Barela
6. ATMEL 89s52 data sheets
7.the 8051 microcontroller and embedded systems by Muhammad alimazidi and Janice Gillespie mazidi and pearson education