IMPLEMENTATION OF AUTOMATIC WATER LEVEL CONTROLLER AND INDICATOR USING ARDUINO

By

SRIDURGA S P191318

BOKKA MOUNIKA P191306

MANDA AMULYA P191316

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BONAFIDE CERTIFICATE

Certified that this project report "**IMPLEMENTATION OF AUTOMATIC WATER LEVEL CONTROLLER AND INDICATOR USING ARDUINO**" is the bonafide work of **S.Sridurga , Manda Amulya and Bokka Mounika** who carried out the project under my supervision for the course title **MSCE07: Internet of Things.**

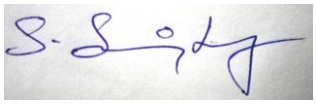
Dr.R.SARANYA
Department of Computer Science
Central University of Tamil Nadu
Thiruvarur – 610 005

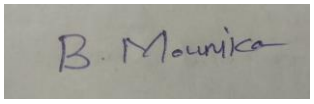
DECLARATION

We hereby declare that this project titled "IMPLEMENTATION OF AUTOMATIC WATER LEVEL CONTROLLER AND INDICATOR USING ARDUINO" submitted for the course **MSCE07: Internet of Things**, Department of Computer Science, School of Mathematics and Computer Science, Central University of Tamil Nadu, Thiruvarur – 610 005, is a record of bonafide project work carried out by us under the guidance and supervision of ***Dr.R.Saranya***, *Department of Computer Science, Central University of Tamil Nadu, Thiruvarur – 610 005*. This work is original and has not been submitted, in part or full to this or any other University / Institution.

Place: Thiruvarur
Date: 07.11.2020

PROJECT GROUP STUDENTS
NAME AND SIGNATURE

SRIDURGA S 

BOKKA MOUNIKA 

MANDA AMULYA 

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ABSTRACT

In our day to day life we are facing the common issue that running out of water and overflow of water in water tanks due to excess supply of water. It is very difficult to judge the level of water in the water tanks. When the pump is turned ON we may not find the tank is filled or not. The project on Automatic Water Level Indicator and Controller system sorted out all the issues that are related with the water tank. With this system we can find whether the tank is filled or not. This will automatically switch ON and OFF the motor whenever necessary without the human interference.

1. INTRODUCTION

Now a days the water is wasted by the users knowingly or unknowingly. It leads to the water scarcity problem in some rural areas and in developed cities also. Sometimes the water is wasted due to excess supply of water. It is very hard to observe everytime whether the tank is filled or not. So this project Automatic Water Level Indicator and Controller helps the users to overcome all the issues with the water tank. The water level is measured by the ultrasonic sensors. It sends the water level information to the Arduino then with the help of L293d IC chip the Arduino turns ON or OFF the motor automatically, with minimum requirement of human power.

2. PROBLEM DEFINITION AND REQUIREMENTS

The goal of this project “Automatic Water Level Indicator and Controller” is to find the water level in the water tank and with the help of Arduino the motor turns on or off automatically. It uses the ultrasonic sensor to measure the water level in the tank based on the principle of ECHO method. It sends measured information to the Arduino which is the controller of whole system. The Arduino makes the L293d IC chip to drive the motor. Then motor will switch ON or OFF automatically. If the water reaches high level then the buzzer will make a sound to alert the user and the motor turns OFF automatically.

2.1 EXISTING SYSTEM

1) Water Level Indicator:

This was an experiment setup by Praseed Kumar, Shamin S. Pathan and others in the 2019.This paper introduces a system i.e., water level indicator which proposes a simple water level monitoring system with different levels indicated. This method helped us to understand the use of how much water is there.

But this device works properly only for 200ml of capacity. And there is a need of automatic(human less) system to increase the accuracy .

2) Water Level Controller with LCD Indicator :

This was an experiment setup by Ms. Pooja, Ms. Nishmitha and others in the year 2018. In this system if the tank reaches the high level it show on LCD screen and the motor will automatically will switched off. And it has the ability to detect the level of water level in the source tank. So it is is easy to find the water level.

But in this experiment the motor will switched off only when then the water reaches high level. If the water reaches low level the motor will not automatically switched on. And by using LCD indicator the user may not know the water level if the user is far away to the LCD.

2.2 PROPOSED SYSTEM

The Automatic Water Level Indicator and Controller is an equipment which automatically turns ON and OFF the motor based on the water level without human interference. This equipment helps the users to monitor the status of water in the tank at any time.

The Ultrasonic Sensor will send an ultrasonic wave(sending as a trigger) to the water tank. This output wave is reflected back after hitting the suface of the water tank. Then the sensor measures the distance(i.e., the time taken by ttrigger wave to reflect back as an echo).Arduino calculates the distance between sensor and water level. The working of this experiment is mainly based on the Arduino control.

The working can be explained based on the distance between the sensor and water level as follows :

1) If the water level is low detected by the ultrasonic sensor then the L293dIC which is connected to the connected to the Arduino to drive the motor. It will make the motor to switched on.

2) If the water reaches the high level then buzzer will make a sound which is connected to the Arduino then L293dIC will make the motor to switched off.

FEATURES OF PROPOSED SYSTEM

1) To develop water level indication system and to control the water level in the tank.
2) To check the level of water in the tank ,depending on the water level the L293dIC switches the motor on when the water level reaches the predetermined level and if the water level goes below the predefined level the motor will automatically switched off.
3) If the water reaches high level, the buzzer is used to indicate to the user.
4) It is very useful because the user need not worry about the water content during the peak hours of the day.
5) It not only helps in the daily chores but also prevents water wastage and it alerts the user by making the buzzer sound.
6) Very accurate maintenance
7) This project is cheaper than the existing system because it requires simple components.

2.3 REQUIREMENT SPECIFICATION

2.3.1 HARDWARE REQUIREMENTS

Name of the component		Specification
RAM	:	2 GB
Hard disk	:	320 GB
Compatibility	:	Windows, Android, PC

2.3.2 SOFTWARE REQUIREMENTS

Name of the component		Specification
Operating System	:	Windows 10, Windows xp
Language	:	C
IDE	:	Arduino IDE

2.3.3 COMPONENTS

The Components that are used for the hardware implementation of our paper are :

- ULTRASONIC SENSOR
- ARDUINO
- BUZZER
- CONNECTING WIRES
- L293d IC
- BREAD BOARD
- MOTOR PUMP

Ultrasonic Sensor :

It is basically a distance sensor and is used for mesuring the distance. It has two ultrasonic transmitters named as the echo and trigger. The transmitter gives a high frequency ultrasonic sound wave if it is bounces off from any solid thing and receiver receives it as an echo. The echo is then gives the measured distance to calculate the time difference between the transmitter and receiver signal.. It has an ultrasonic frequency of 40 KHz and its result is nearest to 0.3 cm

FIGURE – 2.1 ULTRASONIC SENSOR

Arduino UNO :

Arduino UNO is a microcontroller named as ATmega328P. The operating voltage is 5v. It contains 14 digital pins that is used for input/output(in that 6 can be used as PWM outputs) and 6 analog inputs .It has a 16Mhz quartz crystal , a USB connection , a power jack for current , an ICSP header and a reset button for reset the process. It contains everything needed to support the microcontroller. We simply need to connect it to a computer with a USB cable it with a AC-to-DC battery to get started.

The term “Uno” means “One” in Italian language so they released the product as Arduino software (IDE) 1.0 .The Uno board and version 1.0 of

Arduino software(IDE) were the reference versions of Arduino, to newer releases. The Uno board is the first in the series of usage of USB Arduino boards, and the reference model for the Arduino platform is an extensive list of current, past boards see the Arduino index of boards.

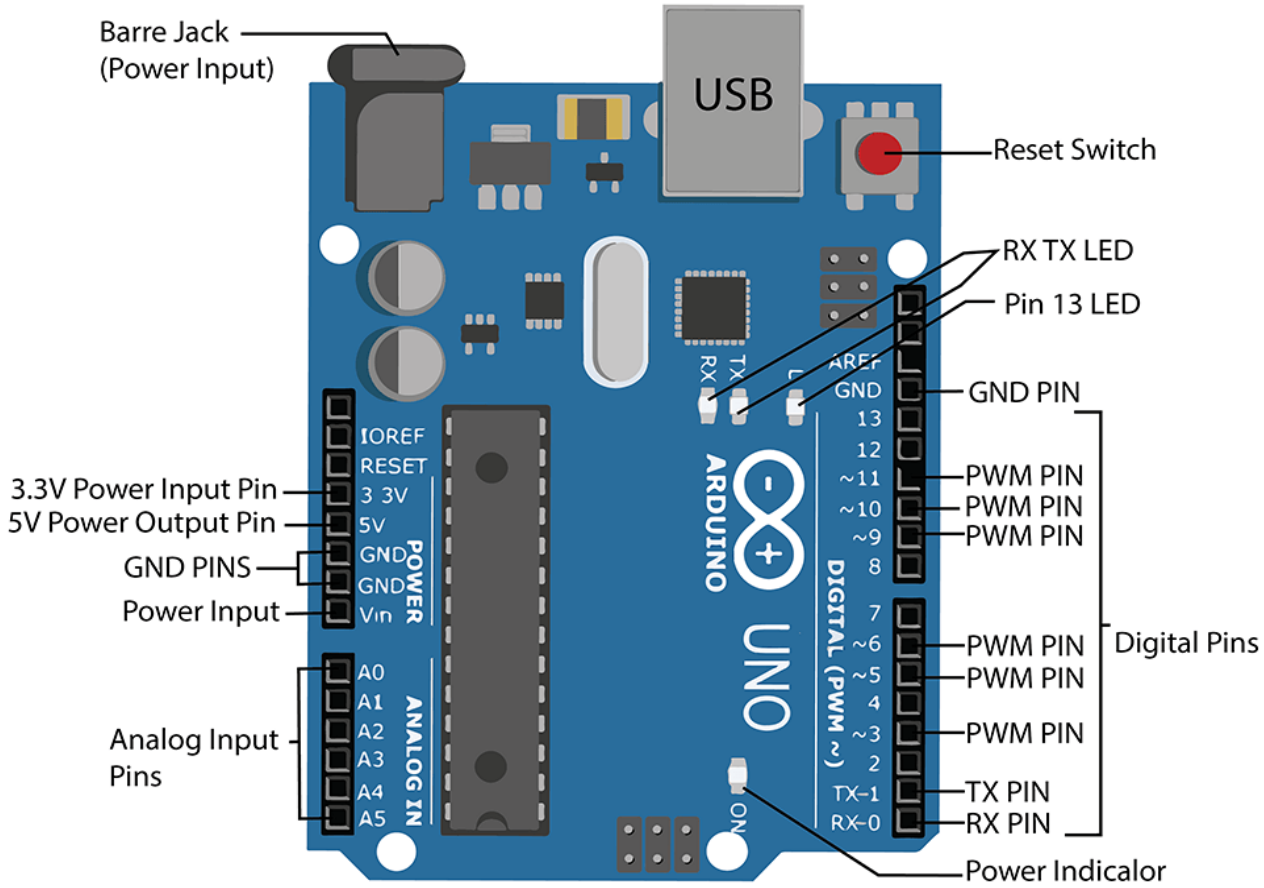


FIGURE – 2.2 ARDUINO UNO

BUZZER

A buzzer is an electronic device that is used to give signal. Typically it is used in automobiles, household things such as a microwave oven, or Tv shows . The word “buzzer” came from the loud noise . The buzzers made noice when they were electro mechanical devices operated as stepped down AC line voltage at 50 or 60cycles.But some other sounds commonly used to indicate that a button has been pressed and then ring a beep. It consists of

switches or sensors connected to control unit that determines which button was pushed or a preset time has delayed, and usually illuminates a light on the particular button or control panel, and makes the sounds as warning in the form of a continuous or breaking buzzing or beeping sound. Initially this was built as an electromechanical system which was similar to an electric bell without the metal gong(which makes the ringing noise) . Often these units were attached to a wall or ceiling and they used as ceiling or wall sounding board. Other implementation with some AC-connected devices to implement a circuit to make the AC current into a loud noice enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker.It varies the pitch of the sound or pulsed the sound on and off.

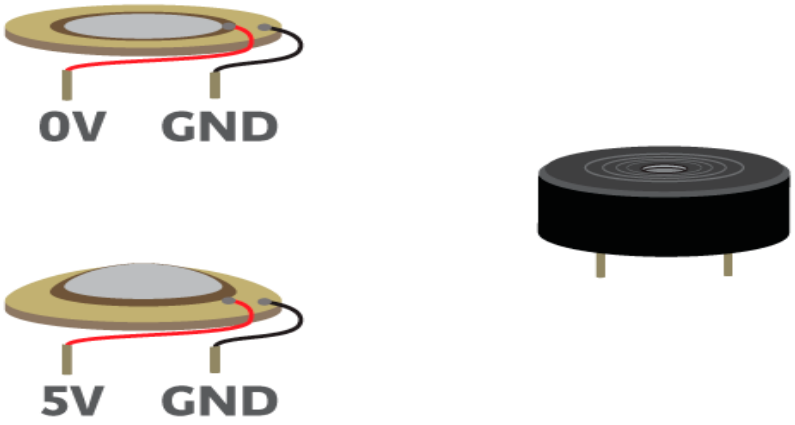


FIGURE – 2.3 BUZZER

CONNECTING WIRES

In any electronic circuit system wires are the conductive connections between the devices in contact . Basically, they have zero resistance and

they provide perfect connections. On the breadboard, they look like a colourful jumper wires.

Connecting wires is required to connect all the above components with Arduino and breadboard.

FIGURE – 2.4 JUMPER WIRES

L293d IC

The **L293D** is a popular 16-Pin **Motor Driver IC** chip. As the name suggests it is mainly used to drive the motors. A single **L293D IC** has capable of running two DC motors at the same time and also the direction of these two motors can be controlled independently.

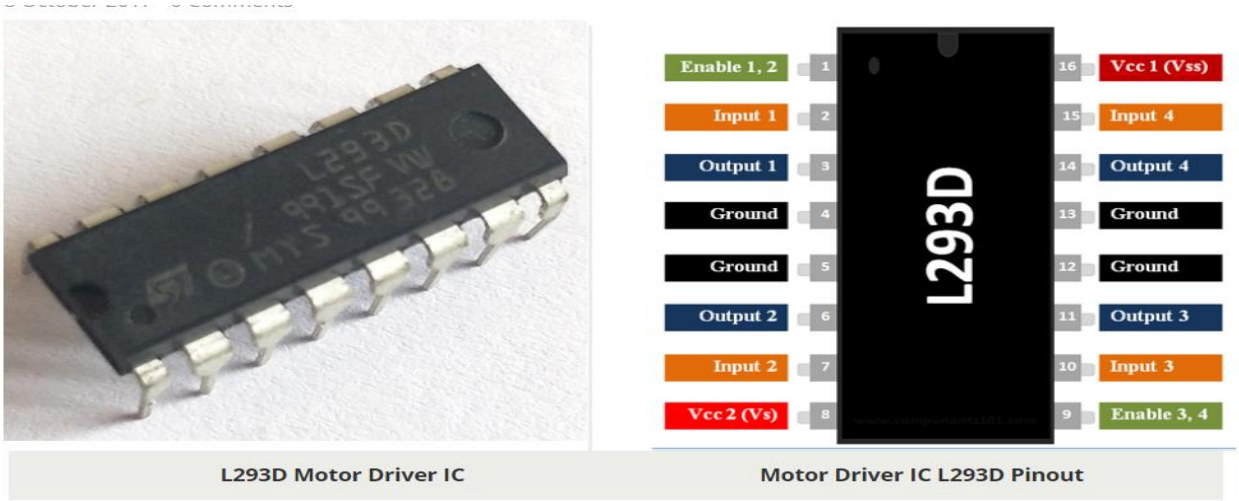


FIGURE – 2.5 L293D IC

Bread Board :

Breadboards are usually plugged into a standard power supply that either connects to a wall outlet or a battery. Certain holes in the breadboard are connected to positive or negative voltage so that when a circuit is correctly connected and the breadboard is plugged in, current flows through the circuit. Usually it uses low levels of voltage and current so that components are safe to touch even when the current passing through the breadboard, but it is nice idea to keep the breadboard unplugged and if it has a power switch make it turned off until the circuit is used. So we can avoid shocks or damaged components.

It is very easy and faster to work with breadboards. To lay out circuits it would be to try to wire components without one . So they're useful for quickly testing and sample electronics ideas. Breadboards can also be used without soldering, which makes it easy to remove components and reuse them when we're done with an experiment. If we're building a simple electronic paper for home use, you may be able to leave it on the breadboard while it's in use, but a commercial paper would need to be remade on a permanent platform.

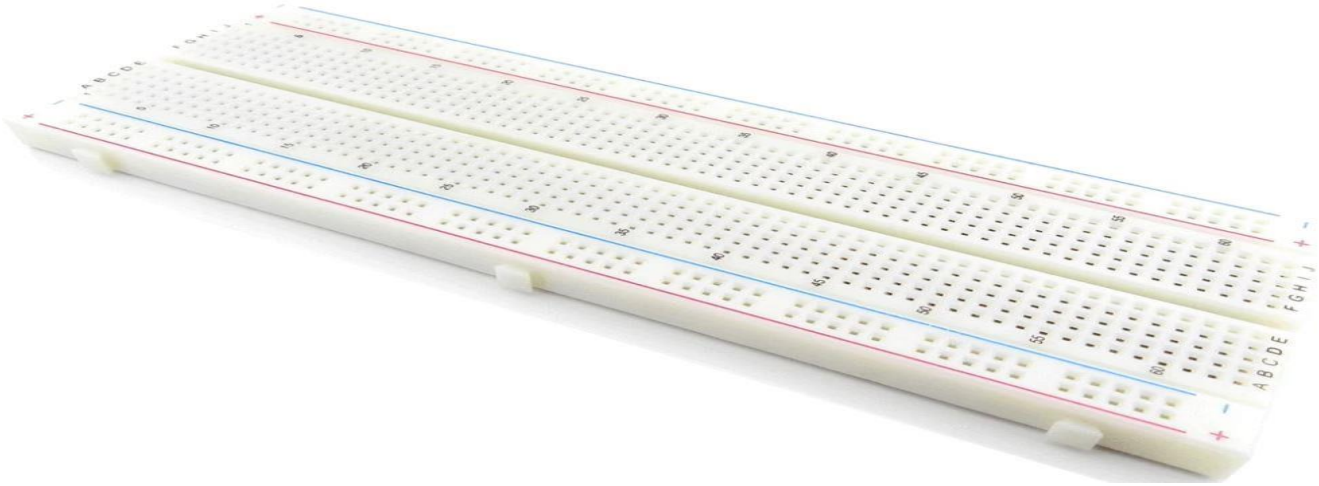


FIGURE – 2.6 BREAD BOARD

DC Water Pump Motor :

A **DC motor** (Direct Current **motor**) is the most common used type of **motor**. This is normally used to supply the water into the sump tank when the motor switched on. **DC motors** contains two leads, one positive and one negative. If we connect these two leads to a battery directly, the **motor** will rotate. If we switch off the leads, the **motor** will rotate in the opposite direction.

FIGURE – 2.7 DC WATER PUMP MOTOR

The component that are used for software requirements is "**Arduino IDE software** " .

ARDUINO IDE :

The Arduino Integrated Development Environment (IDE) is an open source cross-platform application for Windows, MAC OS, Linux. The main code for the IDE is released under the GNU(General Public License) version2. The Arduino IDE supports only the languages C and C++ by using special

rules of code structuring. It gives a software library from the building of the project which provides many common input and output procedures. The user-written code requires only two basic functions, for starting the circuit system and the main program loop that are compiled and linked with a program stub main() into an executable cyclic . Executive program with the GNU tool chain also included with this IDE distribution.

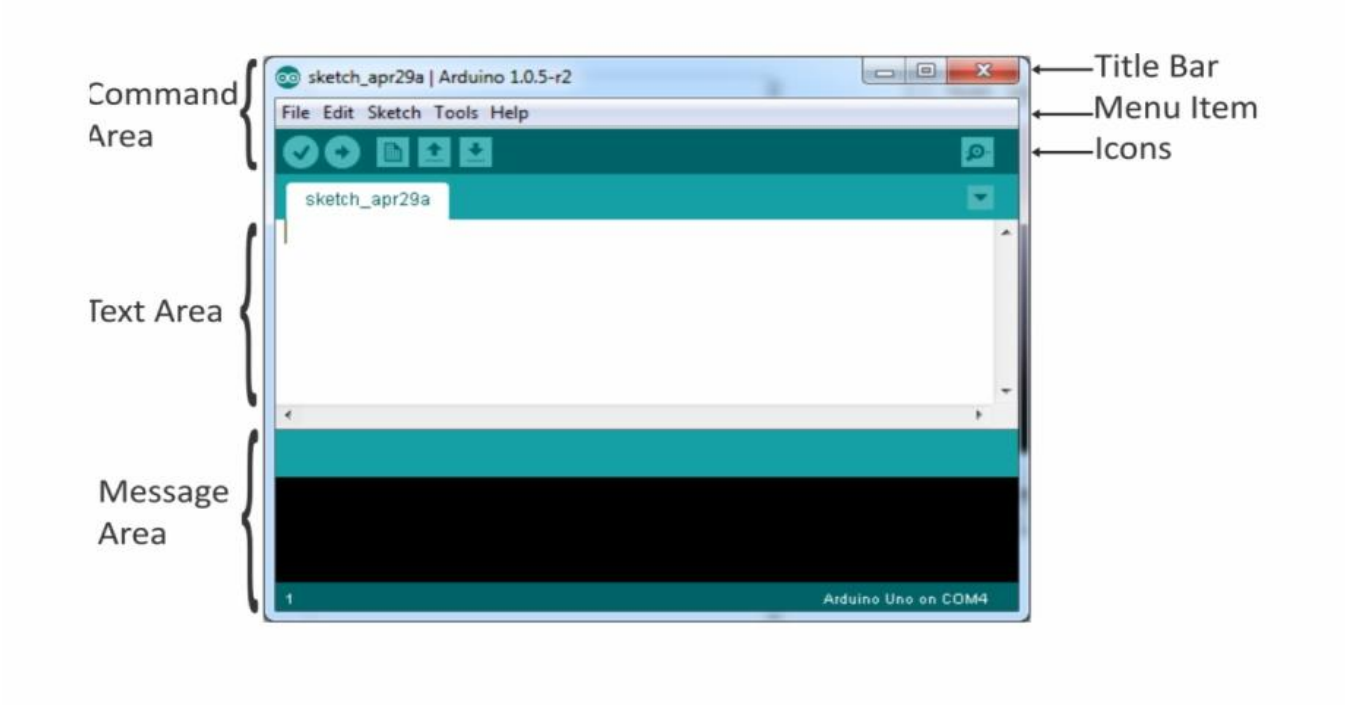


FIGURE – 2.8 ARDUINO IDE

3. SYSTEM ANALYSIS

3.1 ACTIVITY DIAGRAM

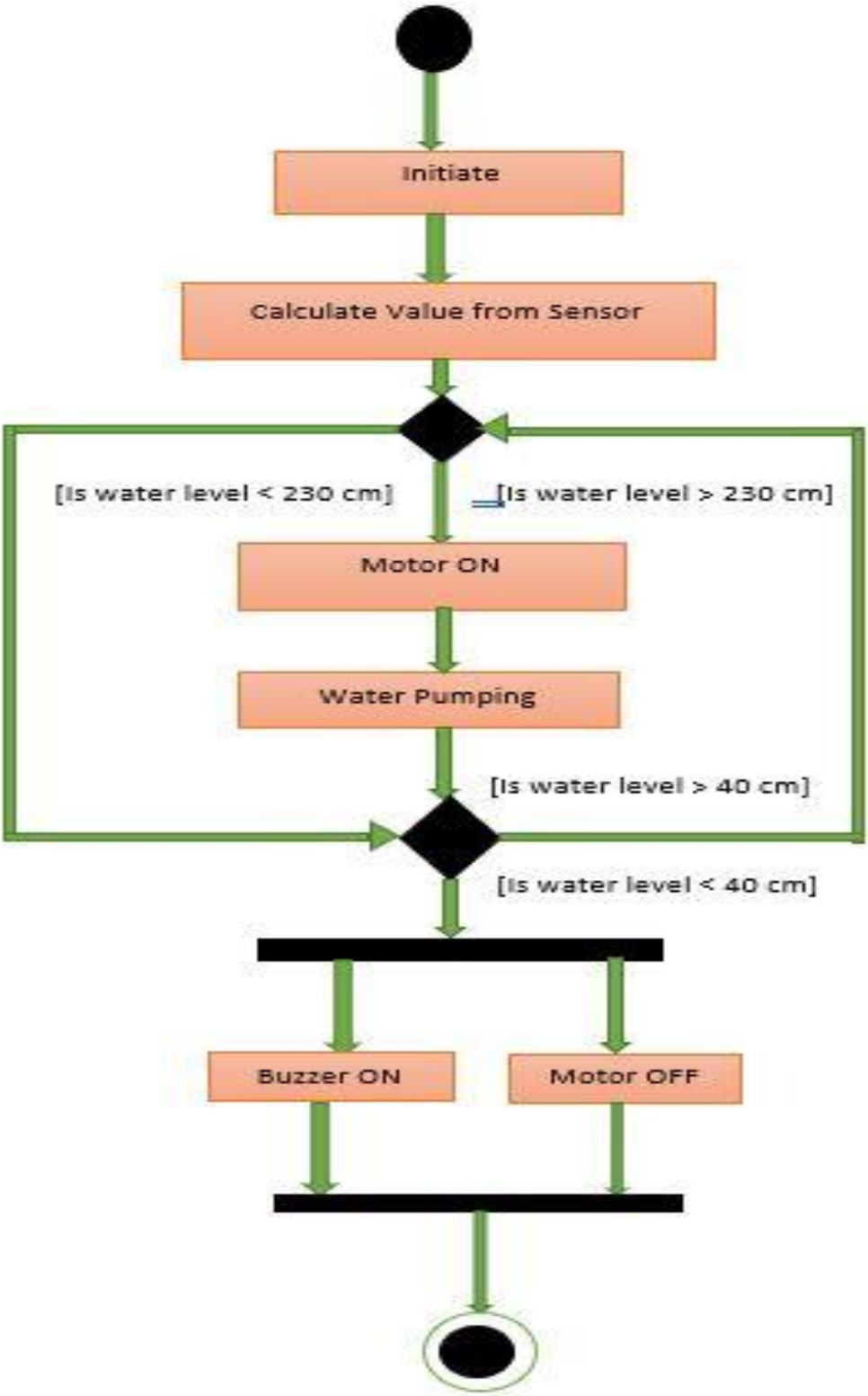


FIGURE – 3.1 ACTIVITY DIAGRAM – WATER LEVEL CONTROLLER AND INDICATOR

3.2 SEQUENCE DIAGRAM

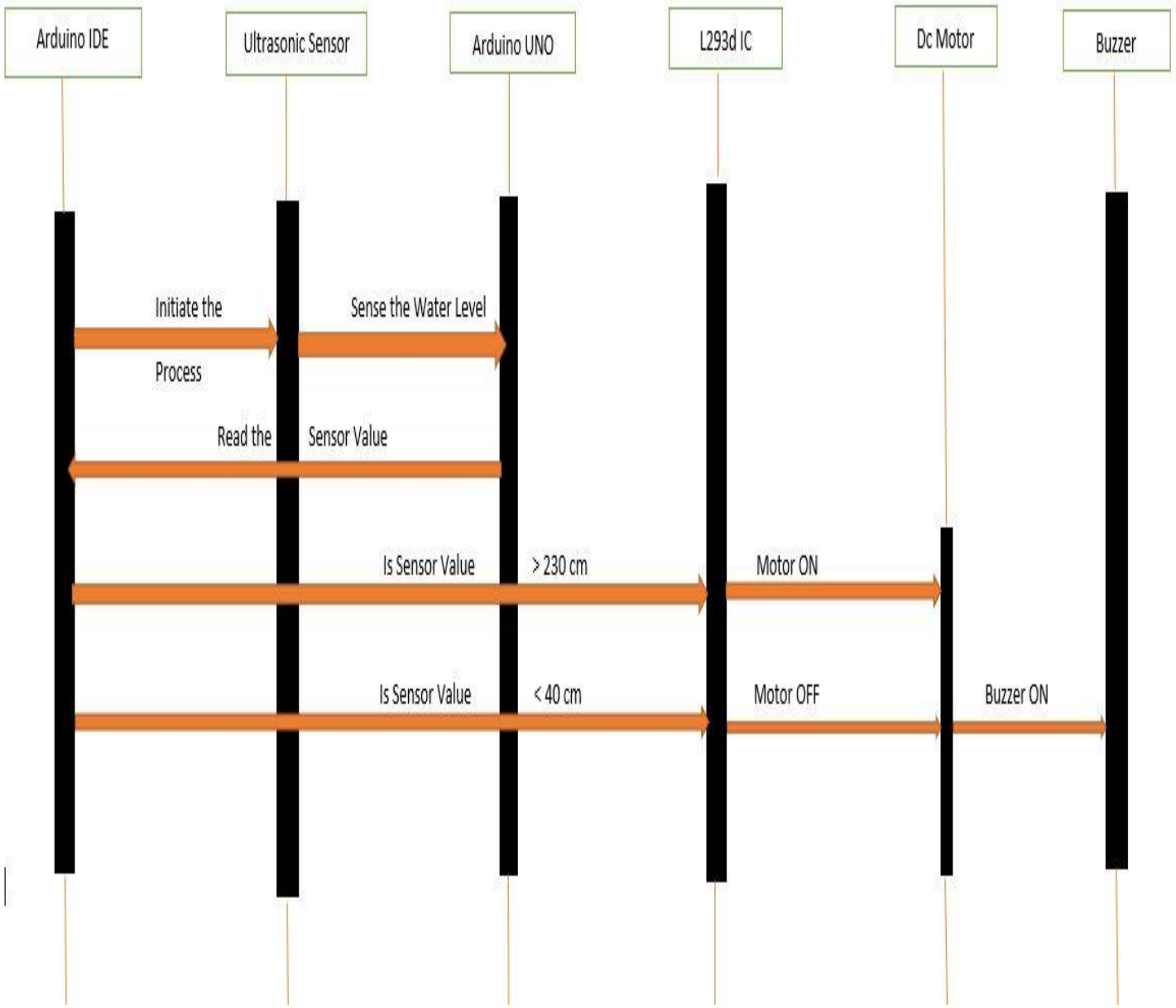


FIGURE – 3.2 SEQUENCE DIAGRAM – WATER LEVEL CONTROLLER AND INDICATOR

4 . SYSTEM DESIGN

The system is comprised of L293d IC, sensors and integration of motor pumps with the decision making system. The arduino UNO board plays a vital role in this system. It first receives the signal from the ultrasonic sensors and sends the received data to the L293d IC. It will act appropriately. This ultrasonic sensor determines the water level and it is expressed in terms of levels.

Then it compares the output level with the reference level. If the reference level is higher than the water level, then the pump gets turned ON and the water will come automatically by the motor which is been driven by the L293d IC. In the vice versa condition, the buzzer will make a sound then the L293d IC make the motor turned OFF.

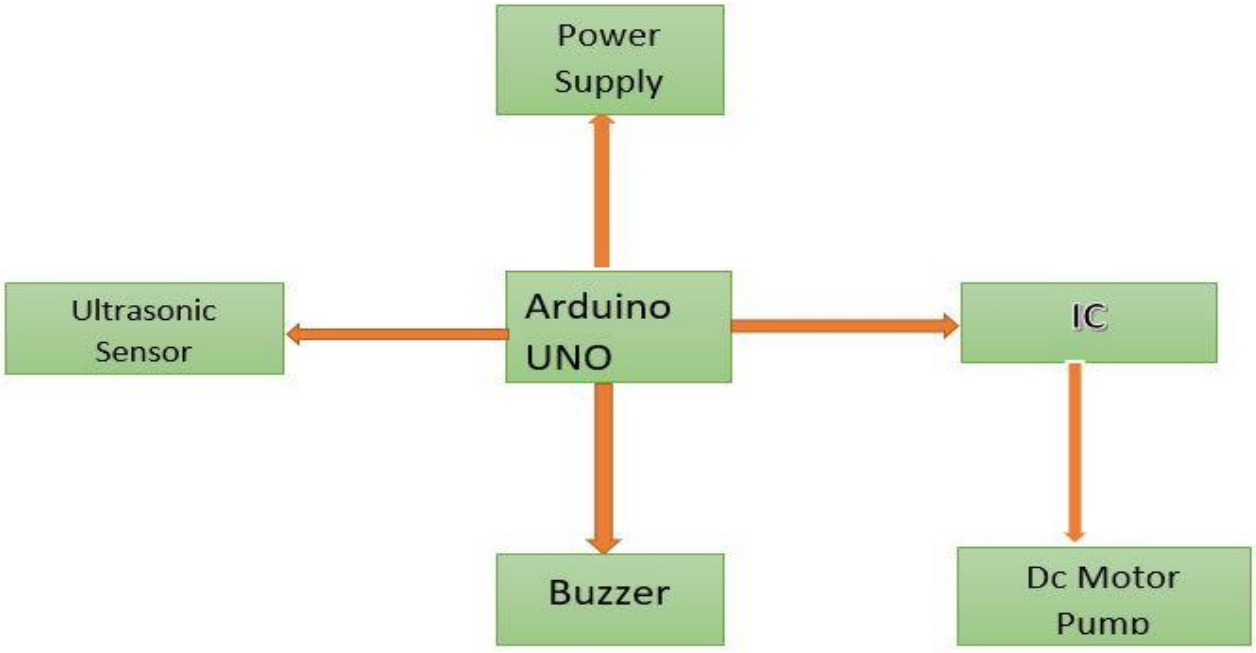


FIGURE – 4.1 BLOCK DIAGRAM

4.1 ARCHITECTURAL DESIGN

The system architecture for Automatic water level indicator and controller is based on ultrasonic sensors that are placed on the sump tank. They monitor the water level of the tank and then it will decide whether water supply is needed or not.This type of water controlling systems out perform in the hospitals, schools etc .

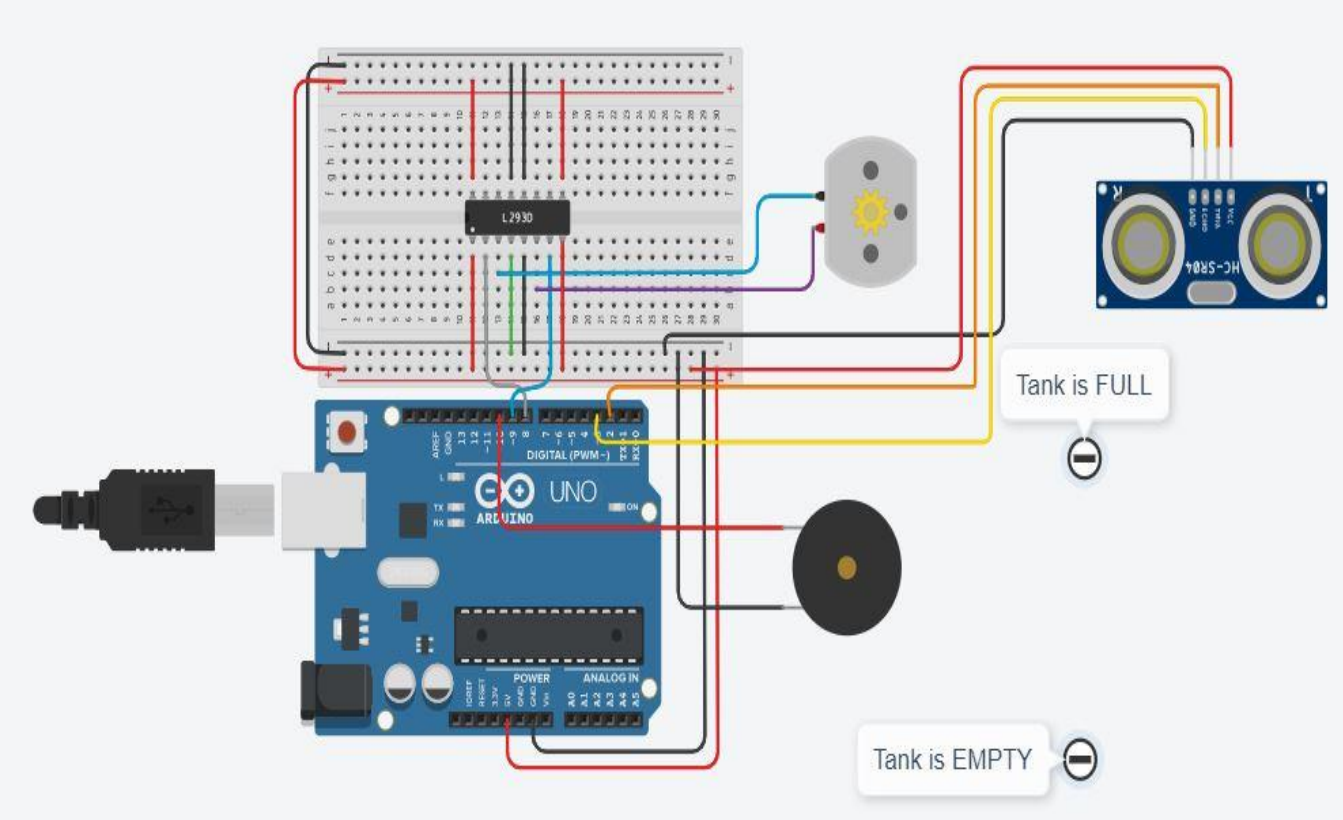


FIGURE – 4.2 ARCHITECTURAL DESIGN

5. IMPLEMENTATION & SCREENSHOTS

5.1 METHODOLOGY:

- The ultrasonic sensor contains echo and trigger pins. These 2 pins are directly connected to the arduino 2, 3 pins .
- First the ultrasonic sensor send the signal through echo then it hits the surface of the water tank and then reflected back through trigger.
- It measures the water level if it is at level 1(predetermined by the user) then the L293d IC which is connected to the ardunio to drive the motor .
- It will the make the motor swithed on.
- If the water reaches the level 6 (predetermined by the user) then the buzzer will make a sound then the L293d IC will the make the motor switched off.
- Motor will start and stop according to the water level.
- The buzzer makes a sound only when the water reaches high level.

SOURCE CODE :

```
int LevelSensorVal = 0;

int echoPin = 0;

int triggerPin = 0;

long readUltrasonicDistance(int triggerPin, int echoPin)
{
  pinMode(triggerPin, OUTPUT);
  digitalWrite(triggerPin, LOW);
```

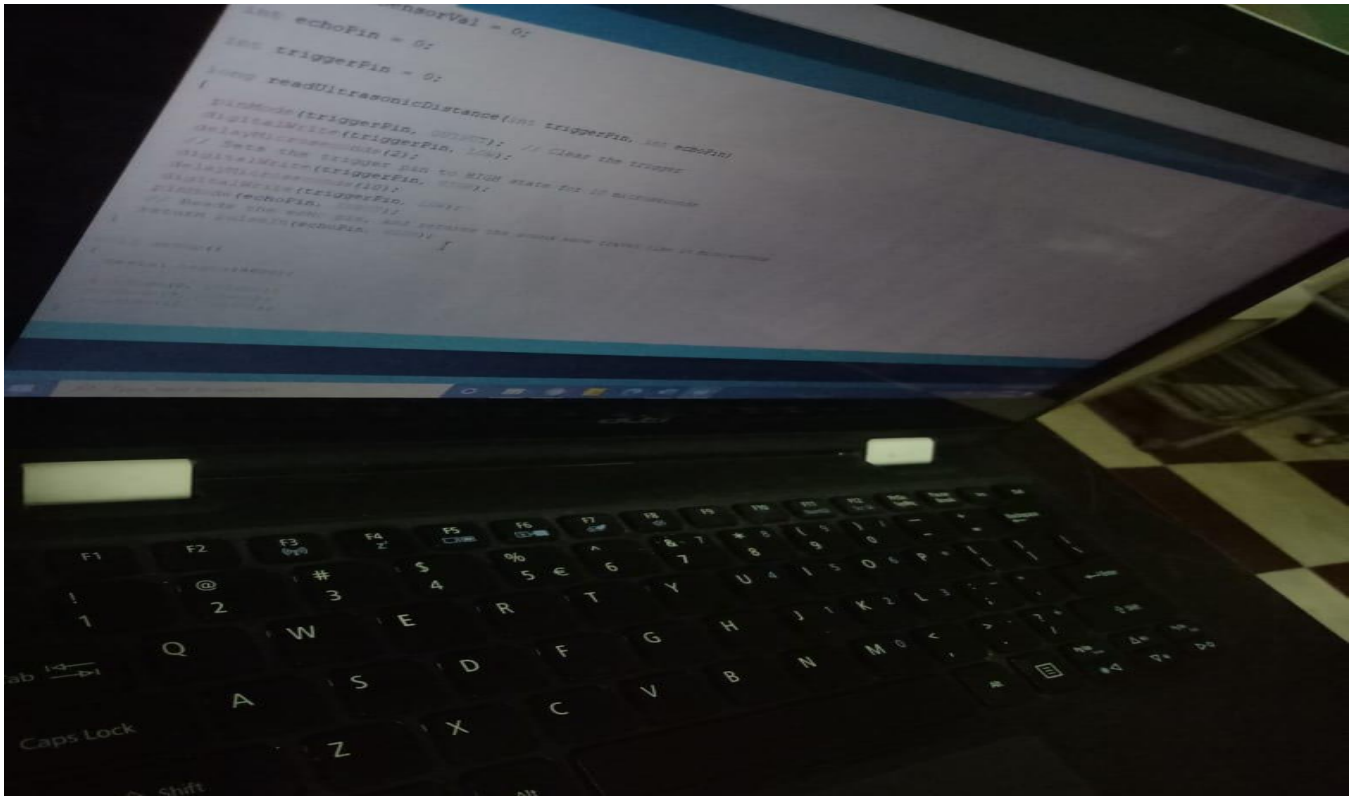
```
  delayMicroseconds(2);


digitalWrite(triggerPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(triggerPin, LOW);
  pinMode(echoPin, INPUT);

  return pulseIn(echoPin, HIGH);
}

void setup()
{
  Serial.begin(9600);

  pinMode(8, OUTPUT);
  pinMode(9, OUTPUT);
  pinMode(10, OUTPUT);
}

void loop()
{
  echoPin = 3;
  triggerPin = 2;
  LevelSensorVal = 0.01723 * readUltrasonicDistance(2, 3);
  Serial.println("Level Control System");
  Serial.println(LevelSensorVal);
  if (LevelSensorVal <= 40) {
    Serial.println("Tank is FULL");
*    digitalWrite(8, HIGH);
    digitalWrite(9, HIGH);
    tone(10, 29, 1000); // play tone 10 (A#0 = 29 Hz)
  }
  if (LevelSensorVal >= 230) {
    Serial.println("Tank is EMPTY");
    digitalWrite(8, LOW);
```

```
    digitalWrite(9, HIGH);
  }
  delay(10);
}
```

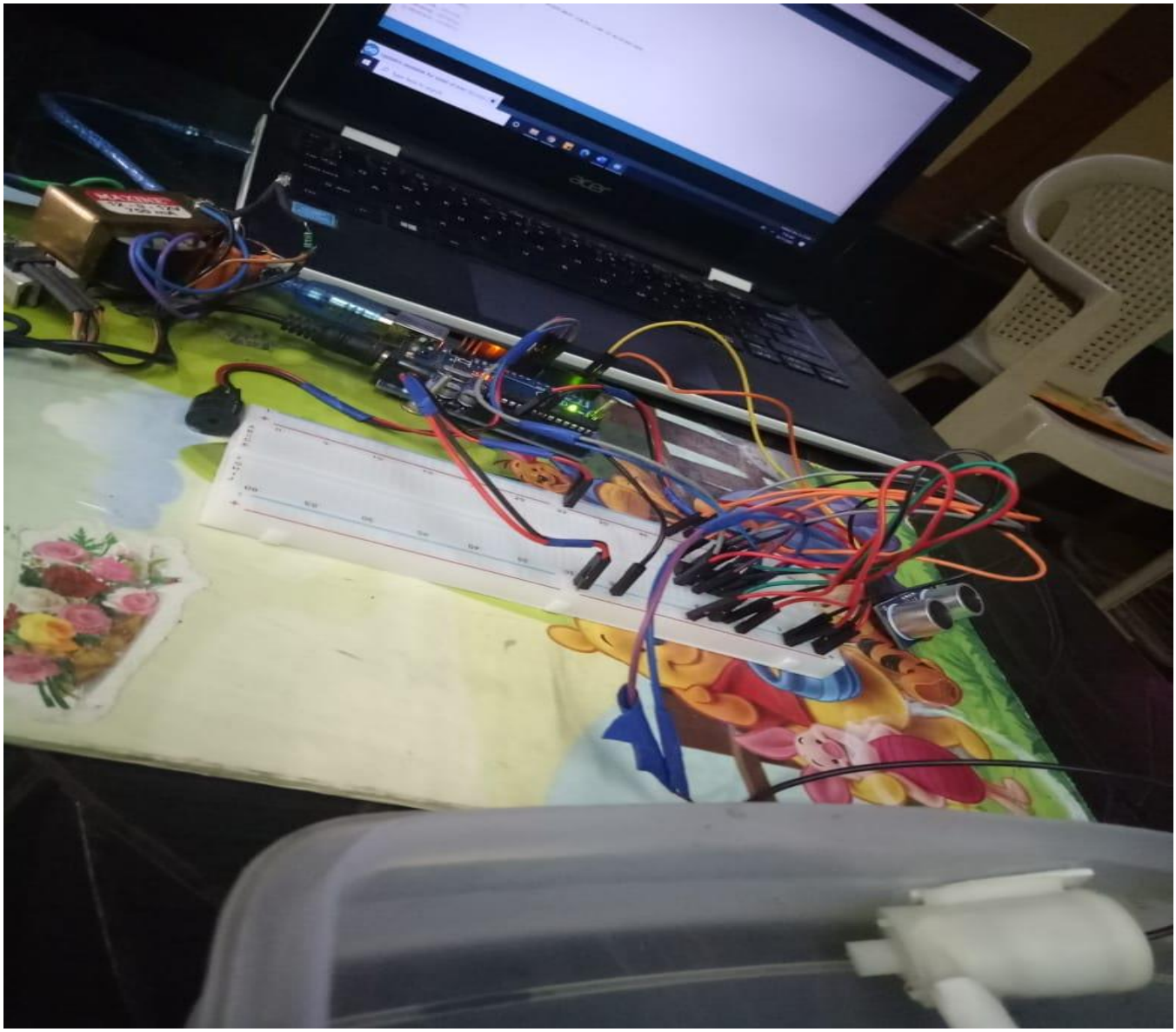
SCREEN SHOT[Circuit Connections]

SCREEN SHOT[Plastic boxes to fill the water]

SCREEN SHOT[Arduino UNO]



SCREEN SHOT[Implementation]



CONCLUSION

Automatic water level indicator and controller system helps the users to maintain the efficient usage of water. It reduces human interference and saves time because it is developed to run automatically. So, the users need not bother about the overflow of water and wastage of current etc. It is great opportunity for us to bring the technology little bit far.

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