Design Lab Project Report

Final Report

Counter based Water Level Indicator

A report submitted in part fulfilment Design Lab course

2nd Year (3rd Semester) in ECE

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Declaration

This report has been prepared on the basis of my own work and designs developed under Design Lab Course. Where other published and unpublished source materials have been used, these have been acknowledged.

Students Name:

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Abstract

The Water Level Indicator employs a simple mechanism to detect and indicate the water level in an overhead tank or any other water container. The sensing is done by using a set of nine stages or levels which are placed at nine different levels using free wires (connected to Vcc initially)of a circuit which when comes in contact with water gets grounded and hence completing the circuit and activating the respective level(base of the tank is considered ground). The level 9 represents the "tank full" condition while water below level 1 represents the "tank empty" condition.

When the water-level is below the minimum detectable level , the seven segment displays is arranged to show the digit 0, indicating that the tank is empty, When the water reaches level 1 (but is below level 2) the connection between the level 1 and ground gets completed (through the conducting medium – water) and the base voltage of transistor increases. This causes the base-emitter junction of transistor to get forward biased, this switches transistor from cut-off to conduction mode thus the corresponding pin is pulled to ground hence, the corresponding digit displayed by the seven-segment display is 1. The similar mechanism applies to the detection of all the other levels. When the tank is full, all inputs become low. This causes the display shows a 9, thereby indicating a "tank full" condition.

The circuit has been implemented using two methods ,Analog and Digital.

1)ANALOG

The circuit works off 5V regulated power supply. It is built around priority encoder IC 74HC147 (IC1), BCD-to-7-segment decoder IC CD4511 (IC2), 7-segment display LTS543 (DIS1) and a few discrete components. IC 74HC147 has nine active-low inputs and converts the active input into active-low BCD output. The input L-9 has the highest priority. IC1 senses water in the container from its nine input terminals.

2)DIGITAL

In this method water level indicator will be built using Arduino UNO & Ultrasonic Distance Sensor(will detect surface of water). The system would indicate the level of the water (Three different levels) inside a tank by sensing the distance the surface of water is away from the sensor with the help of Ultrasonic Distance Sensor.The project will be modified by fitting a buzzer and a motor for water removal if tank gets fully filled.The digital one is an upgrade from the analog one as it can show levels upto 100 stages thus more precise detection and indication.

This circuit is important in appliances such as the water cooler where there is a danger of motor-burnout when there is no water in the radiator used up. Also, most of the times there is a need to know the exact level of the liquid, in those situations where either empty or full is not the sufficient information, our count-based water level indicator will perform the required tasks and fulfil the requirements. A water level controller helps save money by limiting the waste of water and electricity. These devices accurately regulate how much energy is used to protect against any unnecessary water/electricity usage.

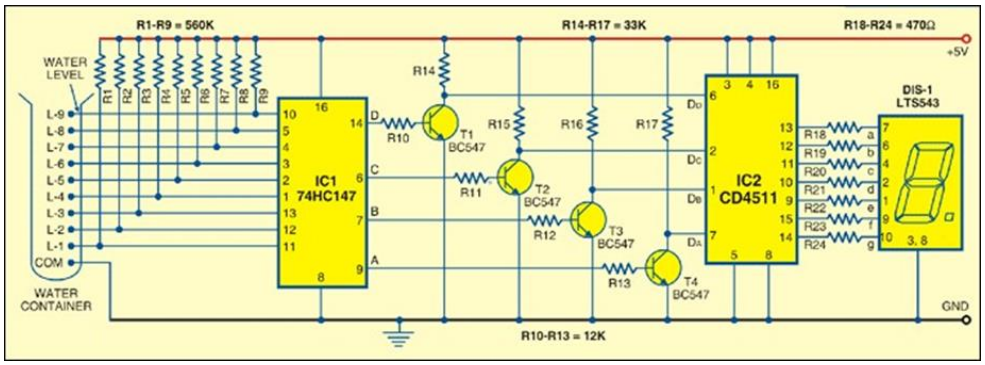
Applications of this project in real world:-

- Sewage pump level control
- The liquid level containers are huge in the companies
- Any person can identify the water level easily by hearing the beep sound that means it is user friendly.

Project Specification

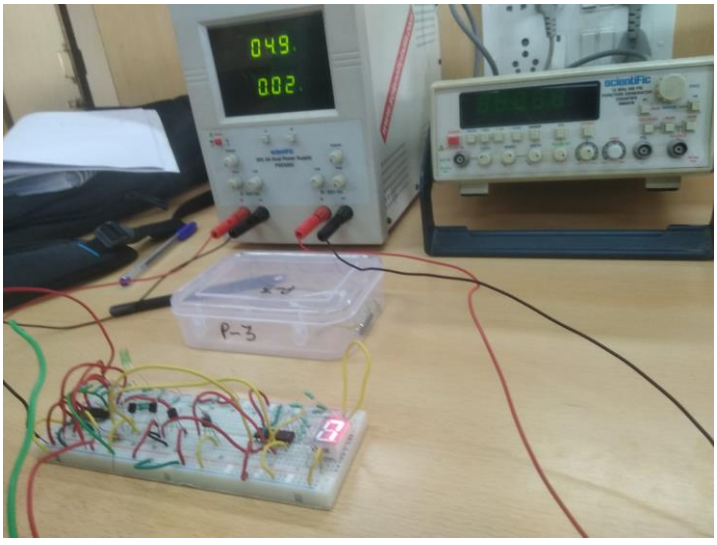
The primary project specification :-

1.) ANALOG:-



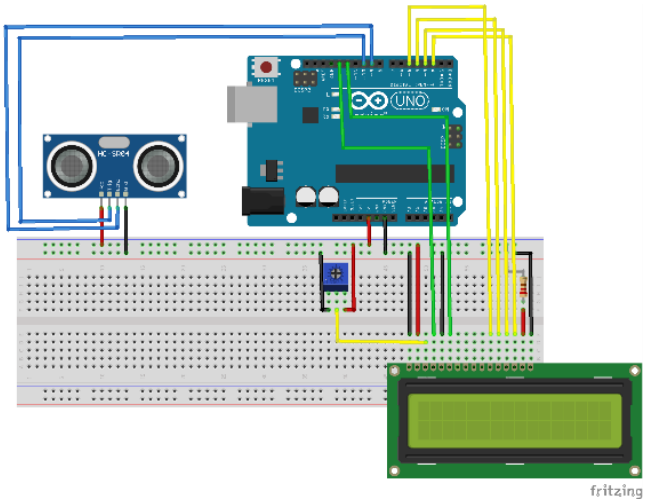
MODIFICATIONS:-

- Counter has been extended to 10 levels in which level 0 refers to empty tank condition
- In addition to this we have added LED and Buzzer system which will turn on if tank reaches full condition.
- The system is feasible to be used in real life conditions but right wire assembly is a challenge as water detection is through water getting in contact with the respective wire.



The level ‘9’ is equipped with an LED and Buzzer which will go on if it reaches level ‘9’.

2.) DIGITAL:-



MODIFICATIONS:-

- The counter has been extended to show 100 different water levels with the help of LCD screen used.
- The system has been also installed with a buzzer and a motor which will get into effect as soon as tank gets full.

Introduction

Water is the most important natural resources in human's life. Human needs the water in almost all daily activities such as washing, cleaning, taking a bath, the irrigation, and the industry needs. However, the amount of water is decreasing, whereas the number of people in the world are always increasing.

The technology contributes to the culture changes . The technology is commonly made in order to help the people perform some activities easy. Consequently, the cultural change is usually triggered by the technological transformation. One of the present technologies is the automation technology. In some cases, the people sometimes want to carry out their work to be set automatically so that they can save the energy to perform another activity. Some sophisticated automation materials have been established in order to set some works automatically such as ArduinoTM microprocessor, which enable to control the electrical circuits logically .

Methods to implement such automated systems can be done in two different ways:-

1. ANALOG:- An analog circuit is a circuit with a continuous, variable signal (that is, an analog signal), as opposed to a digital circuit where a signal must be one of two discrete levels. Analog circuits within electrical equipment can convey information through changes in the current, voltage, or frequency. In context to our project the water levels are indicated using variable voltage levels as water gets contacted.The circuit was implemented using priority encoder IC, BCD to 7segment decoder IC, transistors and resistors.

2. DIGITAL:- A digital circuit is a circuit where the signal must be one of two discrete levels. Each level is interpreted as one of two different states (for example, on/off, 0/1, true/false). Digital circuits use transistors to create logic gates in order to perform Boolean logic. This logic is the foundation of digital electronics and computer processing. Digital circuits are less susceptible to noise or degradation in quality than analog circuits In this implementation, the project was made using Arduino UNO (Atmega 328 based microcontroller) board.

COMPONENTS :-

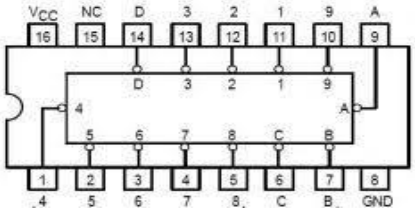
The list of components has been made in two different sections one for the DIGITAL implementation and other for the ANALOG circuit.

1.1.1. ANALOG:-

Components are:-

- IC 74HC147

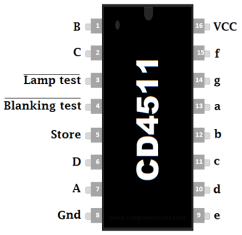
The 74HC147 9-input priority encoders accept data from nine active LOW inputs (A0 to A8) and provide a binary representation on the four active LOW outputs (Y0 to Y3). A priority is assigned to each input so that when two or more inputs are simultaneously active, the input with the highest priority is represented on the output, with input line A8 having the highest priority.



1.)Supply Voltage- Minimum-4.75 V Normal- 5V Maximum-5.25V
2.)High level Output Current- (-400) micro amp
3.) Low level Output Current – (8) milli amp
4.)Operating free-air temperature-70oC

- CD4511

This IC combines the low quiescent power dissipation and high noise immunity feature of CMOS with NPN bipolar transistor, which is capable of giving output current of 25mA. Mainly this IC is used for lighting up or driving various types of display like 7-segment, low voltage fluorescent display and incandescent display. But this IC is mainly used for driving the 7-segment display.



BCD inputs				segment outputs							display
D	C	B	A	a	b	c	d	e	f	g	
0	0	0	0	1	1	1	1	1	1	0	0
0	0	0	1	0	1	1	0	0	0	0	1
0	0	1	0	1	1	0	1	1	0	1	2
0	0	1	1	1	1	1	1	0	0	1	3
0	1	0	0	0	1	1	0	0	1	1	4
0	1	0	1	1	0	1	1	0	1	1	5
0	1	1	0	0	0	1	1	1	1	1	6
0	1	1	1	1	1	1	0	0	0	0	7
1	0	0	0	1	1	1	1	1	1	1	8
1	0	0	1	1	1	1	0	0	1	1	9

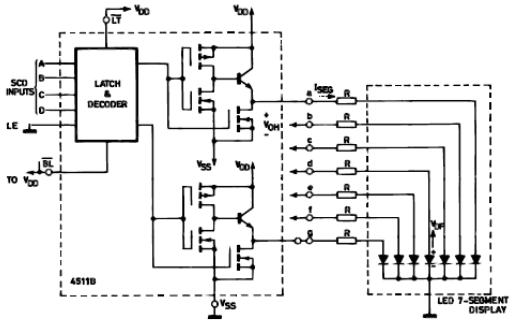
FEATURES:-

1. Low logic circuit power dissipation
2. High current sourcing outputs (up to 25 mA)
3. Latch storage of code
4. Blanking input
5. Lamp test provision
6. Read outblanking on all illegal input combinations
7. Lamp intensity modulation capability
8. Time share (multiplexing) facility
9. Equivalent to Motorola MC14511

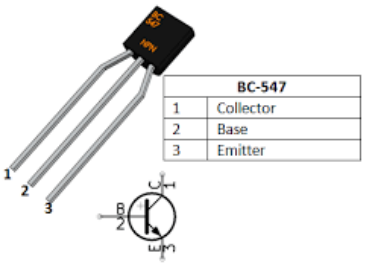
SPECIFICATIONS:-

Supply Voltage- Minimum-3 V Normal- 12V Maximum-18V
Operating free-air temperature-25C Max.
Input current of 1 micro amp at 18 V

INTERNAL WORKING:-



- BC547



BC547 is an NPN bi-polar junction transistor. A transistor, stands for transfer of resistance, is commonly used to amplify current. A small current at its base controls a larger current at collector & emitter terminals. BC547 is mainly used for amplification and switching purposes.

➢ Specifications of BC 547

Maximum Ratings Collector-Base Voltage (VCBO) = 50V

Collector-Emitter Voltage (VCEO) =45 V.

Emitter-Base Voltage (VEBO) = 6V.

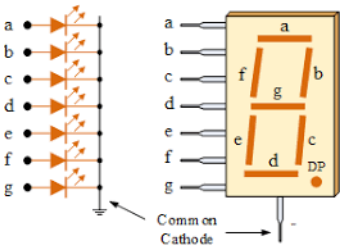
Collector Current (DC) (IC) =100 mA

Collector Power Dissipation (PC) =500mW

Junction Temperature (TJ) =150oC

Storage Temperature (TSTG) = -65 to 150oC

- Common-cathode 7-segment display



In the common cathode display, all the cathode connections of the LED's are joined together to logic "0" or ground. The individual segments are illuminated by application of a "HIGH", logic "1" signal to the individual Anode terminals.

➢ FEATURES

Low current operation

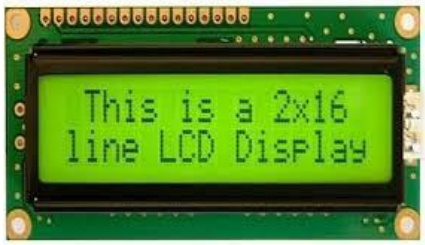
- ✓ Better, brighter and larger display than conventional LCD displays
- ✓ Current consumption : 30mA / segment
- ✓ Peak current : 70Ma

1.1.2 DIGITAL:-

Components used:-

- 16X2 LCD:An **LCD** is an electronic **display** module which uses **liquid crystal** to produce a visible image. The **16×2 LCD display** is a very basic module commonly used in DIYs and circuits. The **16×2** translates o a **diplay 16** characters per line

in **2** such lines. In this **LCD** each character is **displayed** in a 5×7 pixel matrix.

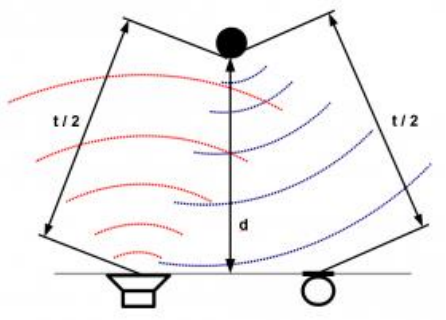


- Ultrasonic Distance Sensor: Ultrasonic distance sensor determines the distance to an object by measuring the time taken by the sound to reflect back from that object. The frequency of the sound is somewhere in the range of ultrasound, this ensures more concentrated direction of the sound wave because sound at higher frequency dissipates less in the environment. A typical ultrasonic distance sensor consists of two membranes. One membrane produces sound, another catches reflected echo.

➢ Working of the sensor:-

Ultrasonic sensors work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object.

While some sensors use a separate sound emitter and receiver, it's also possible to combine these into one package device, having an ultrasonic element alternate between emitting and receiving signals. This type of sensor can be manufactured in a smaller package than with separate elements, which is convenient for applications where size is at a premium.

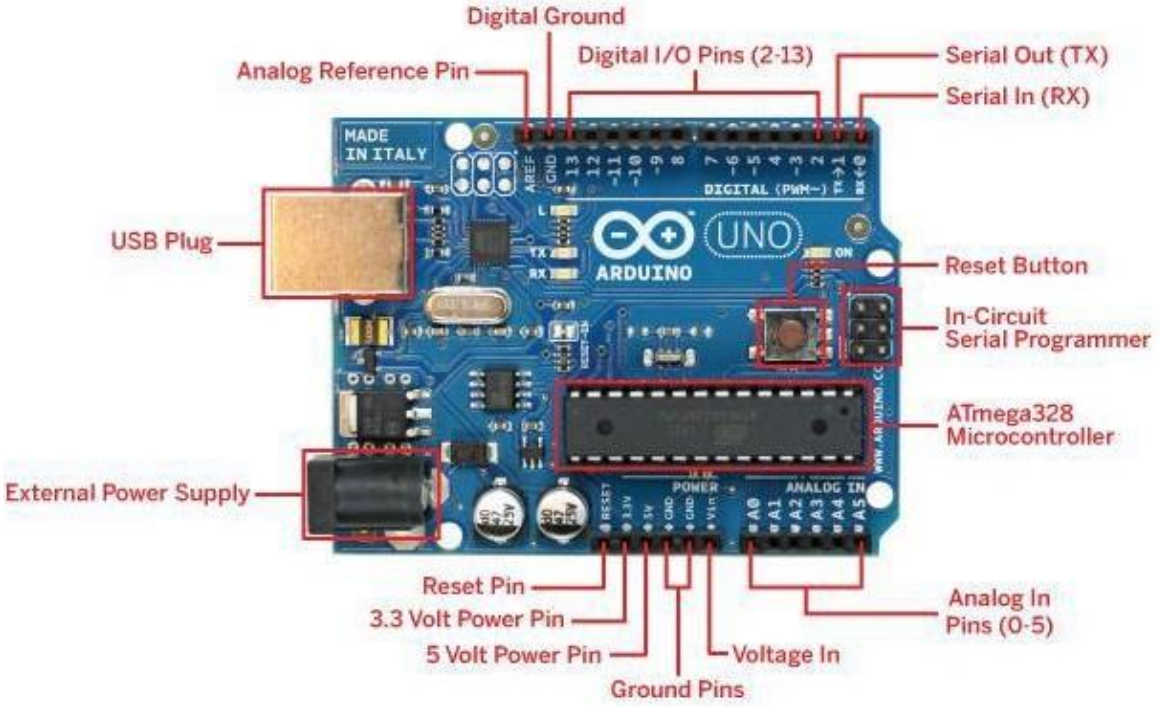


- Arduino UNO R3 Board:

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

- BASIC FEATURES:-
  - ✓ Summary Microcontroller ATmega328 Operating Voltage- 5V
  - ✓ Input Voltage (recommended) 7-12V
  - ✓ Input Voltage (limits)- 6-20V
  - ✓ Digital I/O Pins-14 (of which 6 provide PWM output)
  - ✓ Analog Input Pins-6 DC
  - ✓ Current per I/O Pin-40 mA
  - ✓ DC Current for 3.3V- 50mA
  - ✓ Flash Memory-32 KB (ATmega328) of which 0.5 KB used by bootloader 2 KB (ATmega328)
  - ✓ SRAM- 2 KB (ATmega328)

- ✓ EEPROM - 1 KB (ATmega328) Clock Speed - 16 MHz



Processor of Arduino Uno- AtMega328 ATmega328 is commonly used in many projects and autonomous systems where a simple, low-powered, low-cost micro-controller is needed. ATmega-328 is basically an Advanced Virtual RISC (AVR) microcontroller. It supports the data up to eight (8) bits. ATmega-328 has 32KB internal built-in memory. ATmega 328 has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). This property shows if the electric supply supplied to the microcontroller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATmega-328 has 2KB Static Random Access Memory (SRAM)

ATmega328 Features

Features

- High Performance, Low Power AVR® 8-Bit Microcontroller
- Advanced RISC Architecture
  - 131 Powerful Instructions – Most Single Clock Cycle Execution
  - 32 x 8 General Purpose Working Registers
  - Fully Static Operation
  - Up to 20 MIPS Throughput at 20 MHz
  - On-chip 2-cycle Multiplier
- High Endurance Non-volatile Memory Segments
  - 4/8/16/32K Bytes of In-System Self-Programmable Flash program memory
  - 256/512/512/1K Bytes EEPROM
  - 512/1K/1K/2K Bytes Internal SRAM
  - Write/Erase Cycles: 10,000 Flash/100,000 EEPROM
  - Data retention: 20 years at 85°C/100 years at 25°C(1)
  - Optional Boot Code Section with Independent Lock Bits
    In-System Programming by On-chip Boot Program
    True Read-While-Write Operation
  - Programming Lock for Software Security
- Peripheral Features
  - Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode
  - One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode
  - Real Time Counter with Separate Oscillator
  - Six PWM Channels
  - 8-channel 10-bit ADC in TQFP and QFN/MLF package
    Temperature Measurement
  - 6-channel 10-bit ADC in PDIP Package
    Temperature Measurement
  - Programmable Serial USART
  - Master/Slave SPI Serial Interface
  - Byte-oriented 2-wire Serial Interface (Philips I²C compatible)
  - Programmable Watchdog Timer with Separate On-chip Oscillator
  - On-chip Analog Comparator
  - Interrupt and Wake-up on Pin Change
- Special Microcontroller Features
  - Power-on Reset and Programmable Brown-out Detection
  - Internal Calibrated Oscillator
  - External and Internal Interrupt Sources
  - Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby
- I/O and Packages
  - 23 Programmable I/O Lines
  - 28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF
- Operating Voltage:
  - 1.8 - 5.5V
- Temperature Range:
  - -40°C to 85°C
- Speed Grade:
  - 0 - 4 MHz@1.8 - 5.5V, 0 - 10 MHz@2.7 - 5.5.V, 0 - 20 MHz @ 4.5 - 5.5V
- Power Consumption at 1 MHz, 1.8V, 25°C
  - Active Mode: 0.2 mA
  - Power-down Mode: 0.1 µA
  - Power-save Mode: 0.75 µA (Including 32 kHz RTC)

ATmega328 data sheet p. 1

- PIEZO BUZZER:-

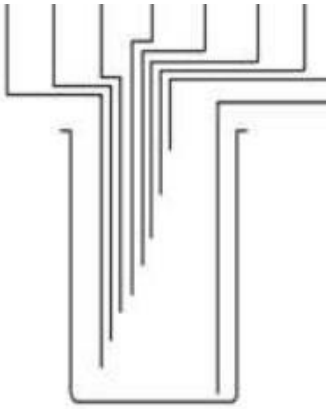
  The **piezo buzzer** produces sound based on reverse of the piezoelectric effect. The generation of pressure variation or strain by the application of electric potential across a piezoelectric material is the underlying principle. These buzzers can be used alert a user of an event corresponding to a switching action, counter signal or sensor input. They are also used in alarm circuits.

Chapter 2:**PROJECT EXPLANATION:-**

2.1 ANALOG CIRCUIT:

2.1.1 CONCEPT :-

- Concept of water level indicator involves ten different stages of water level which to be placed at different levels as shown in figure. One common ground pin is kept at the lowest position.



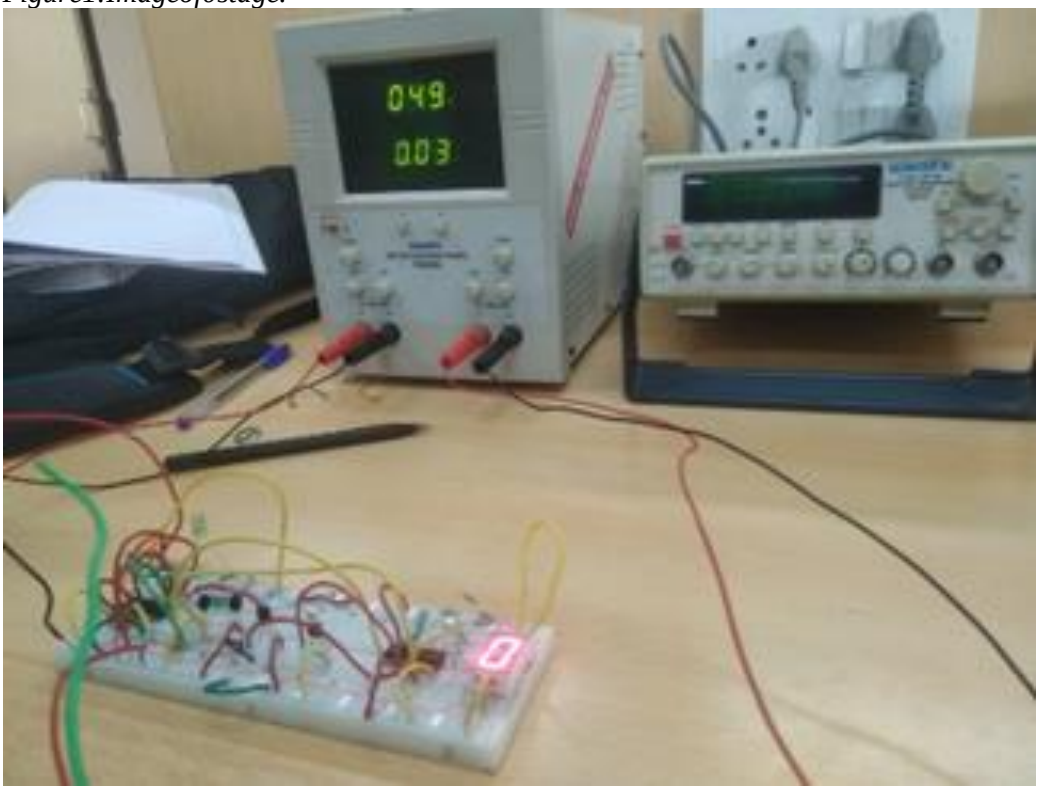
- As the water rises, and touches the wires present, the circuit between the ground and that stage gets completed due to conductivity of water. Hence the corresponding level number is displayed on the 7-segment display.
- The circuit works off 5V regulated power supply. It is built around priority encoder IC 74HC147 (IC1), BCD-to-7-segment decoder IC CD4511 (IC2), 7-segment display LTS543 (DIS1) and a few discrete components.

2.1.2 Circuit Implementation and working:-

- The circuit works off 5V regulated power supply. It is built around priority encoder IC 74HC147 (IC1), BCD-to-7-segment decoder IC CD4511 (IC2), 7-segment display LTS543 (DIS1) and a few discrete components. Due to high input impedance, IC1 senses water in the container from its nine input terminals. The inputs are connected to +5V via 560-kilo-ohm resistors. The ground terminal of the sensor must be kept at the bottom of the container (tank). IC 74HC147 has nine active-low inputs and converts the active input into active-low BCD output. The input L-9 has the highest priority.

- Due to high input impedance, IC1 senses water in the container from its nine input terminals. The inputs are connected to +5V via 560-kilo-ohm resistors. The ground terminal of the sensor must be kept at the bottom of the container (tank). IC 74HC147 has nine active-low inputs and converts the active input into active-low BCD output. The input L-9 has the highest priority.
- Following images are Multisim simulation and practical implementation of the project.

Figure1:Imageof0stage.



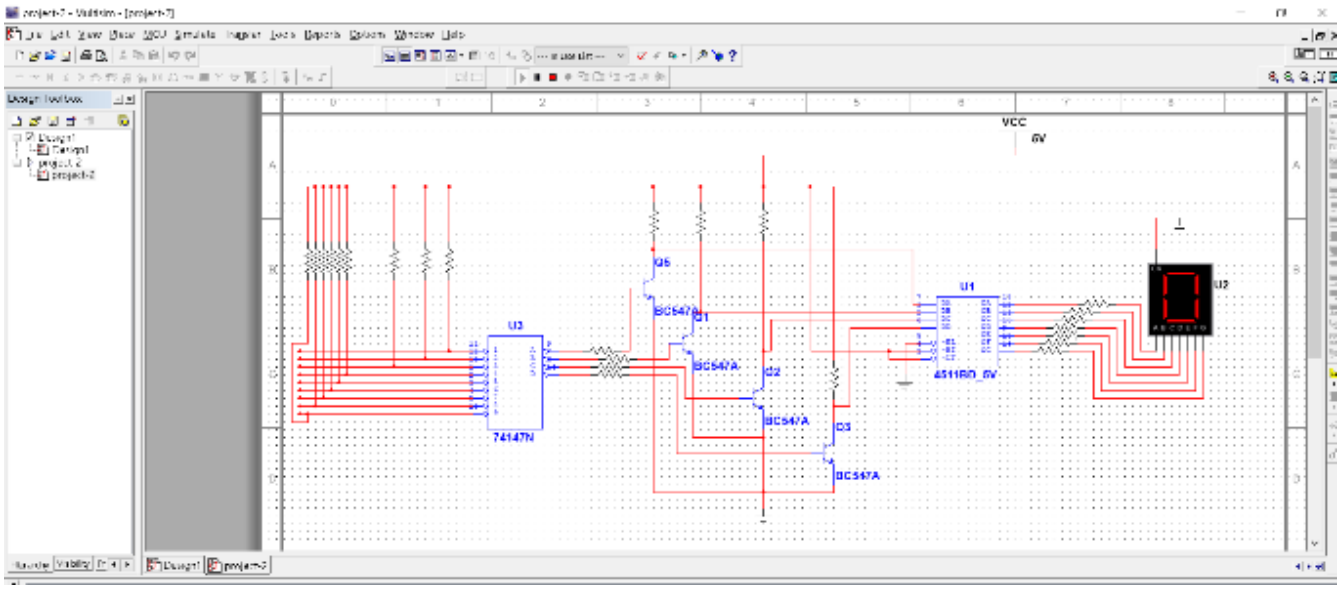
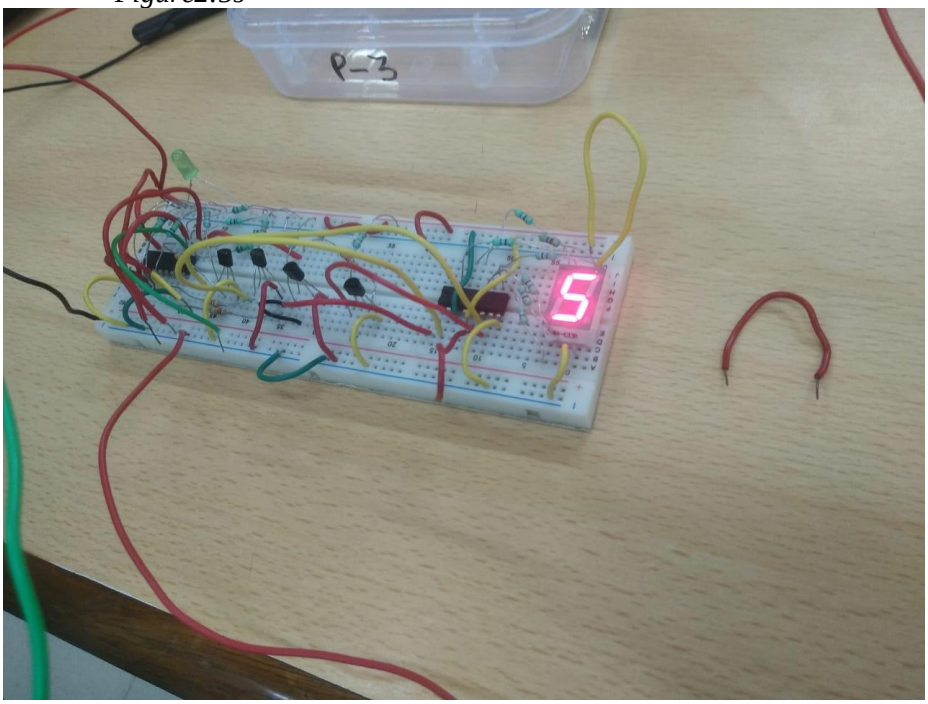
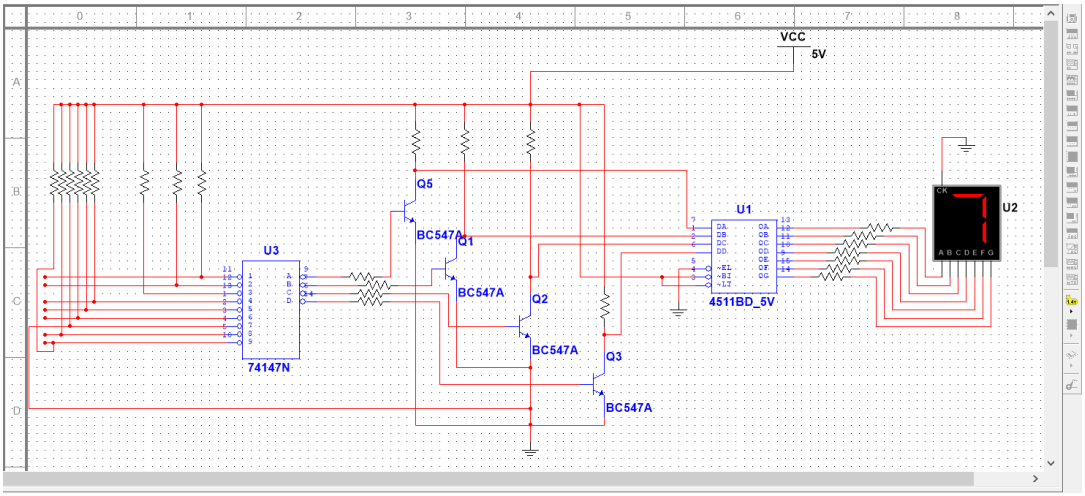

VCC
5V
U3
74147N
Q5
BC547A
Q1
BC547A
Q2
BC547A
Q3
BC547A
U1
4511BD_5V
U2

Figure2:5s




VCC
5V
U3
74147N
Q5
BC547A
Q1
BC547A
Q2
BC547A
Q3
BC547A
U1
4511BD_5V
U2

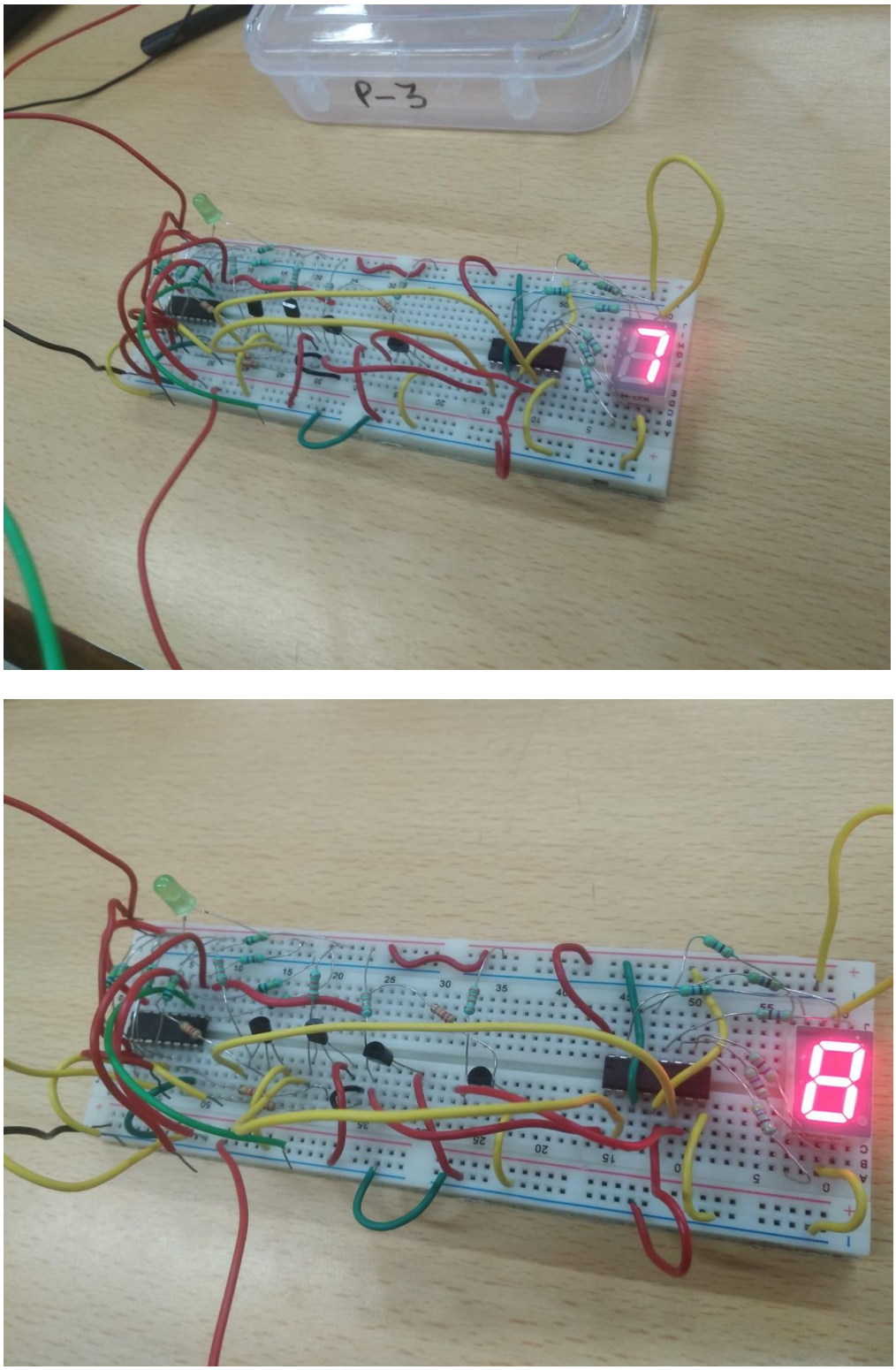


Figure 1. Image of 7 and 8 stage

2.2: DIGITAL:

2.2.1 CONCEPT:

The circuit displays the level of water in the tank and switches the motor ON when the water level goes below a predetermined level. The circuit

automatically switches the motor OFF when the tank is full. The water level and other important data are displayed on a 16×2 LCD display. The circuit also monitors the level of water in the sump tank (source tank). If the level in side the sump tank is low, the motor will not be switched ON and this protects the tank from dry running. A beep sound is generated when the level in the sump tank is low or if there is any fault with the sensors.

2.2.2 SOURCE CODE:

```
    /* Water Level Meter
Measuring water level with ultrasonic sensor HR S04.
Arduino IDE 1.5.8
*/
#include<LiquidCrystal.h>
int trig = 7;
int echo = 6;
//int piezoPin = 8;
//  The circuit:
// * LCD RS pin to digital pin 12
// * LCD Enable pin to digital pin 11
// * LCD D4 pin to 0digital pin 5
// * LCD D5 pin to digital pin 4
// * LCD D6 pin to digital pin 3
// * LCD D7 pin to digital pin 2
// * LCD R/W pin to ground
// * LCD VSS pin to ground
// * LCD VCC pin to 5V
// * 10K resistor:
// * ends to +5V and ground
// * wiper to LCD VO pin (pin 3)

LiquidCrystal lcd(12,11,5,4,3,2);

void setup()
{
  lcd.begin(16,2);
  Serial.begin(9600);
  pinMode(trig, OUTPUT);
  pinMode(echo, INPUT);
}


void loop()
{
```

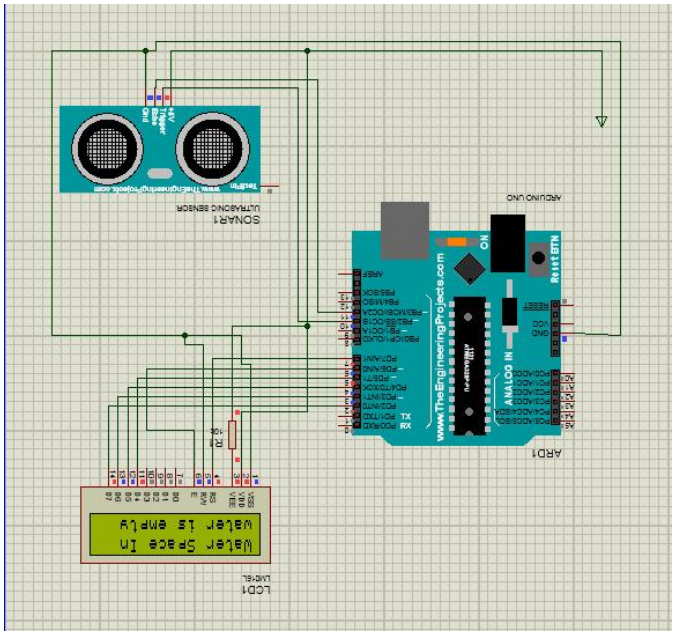
```
float t = 0, h = 0, hp = 100;
lcd.clear();

// Transmitting pulse
digitalWrite(trig, LOW);
delayMicroseconds(2);
digitalWrite(trig, HIGH);
delayMicroseconds(10);
digitalWrite(trig, LOW);
// Waiting for pulse
t = pulseIn(echo, HIGH);
// Calculating distance
h = t / 58;
h = h - 6;  // offset correction
h = 50 - h;  // water height, 0 - 50 cm
hp = 2 * h;  // distance in %, 0-100 %

// Sending to computer
  Serial.println("water level\n");
  Serial.print("\n");

  lcd.setCursor(0,0);
  lcd.print("water level:");
     //lcd.print("\n");

if(hp>=100)
{
  Serial.print("tank is full\n");
  lcd.setCursor(0,1);
  lcd.print("tank full");
    Serial.print("\n");
    delay(100);

  tone(piezoPin, 1000, 500);
}
if(hp>0 && hp<100)
 {
  Serial.print(hp);
   Serial.print("\n");
 lcd.setCursor(0,1);
 //lcd.print("\n");
 lcd.print(hp);
}
if(hp<=0)
{
```

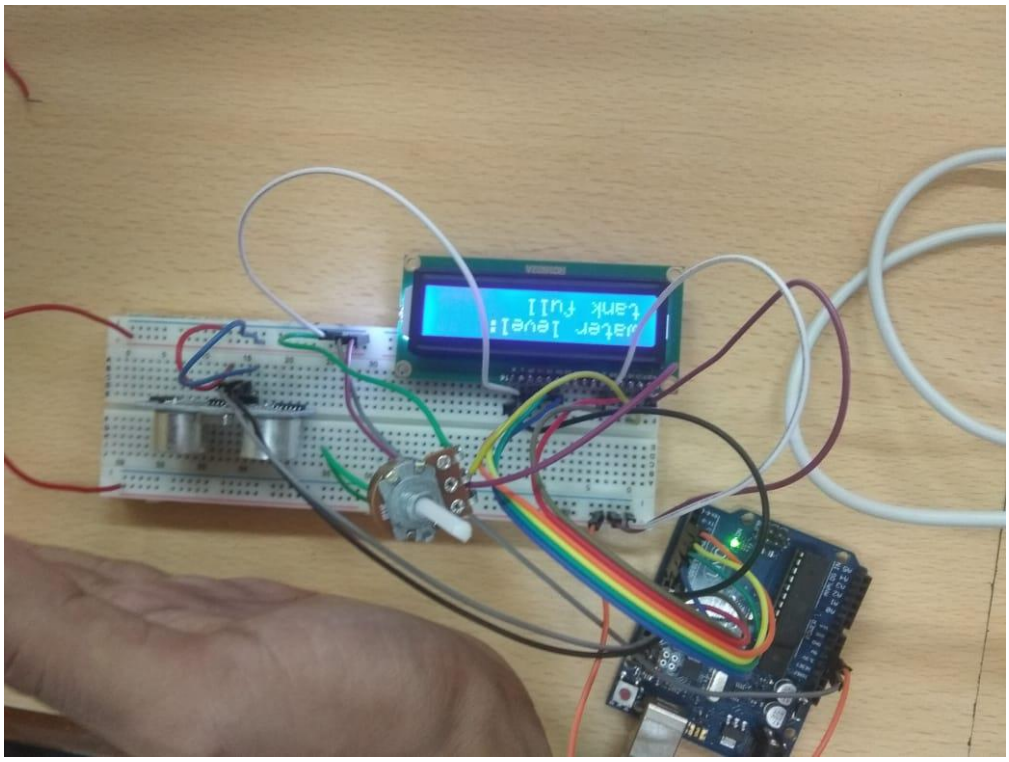
```
    Serial.print("tank is empty\n");
    Serial.print("\n");
    lcd.setCursor(0,1);
    //lcd.print("\n");
    lcd.print("tank empty");
      tone(piezoPin, 1000, 500);

  }
    Serial.print(" cm\n");
  Serial.print("\n");
  delay(1000);
}
```

2.2.3 CIRCUIT EXPLANATION:

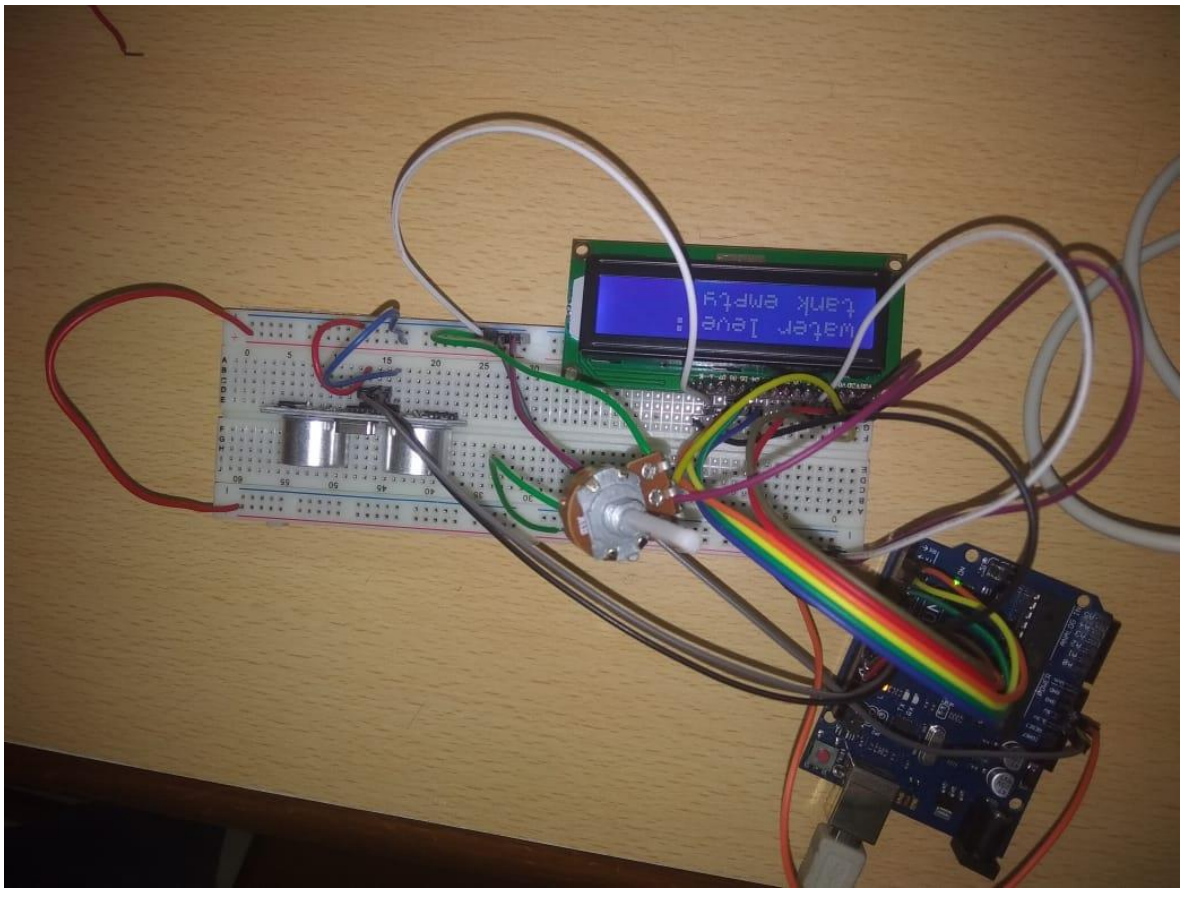
This is the digital analysis of the Counter based Water Level Indicator. In this analysis we are using Arduino UNO board, and the 16*2 LCD display with a ultrasonic distance sensor. The code is written in such a way that according to the distance of surface from the LEVEL sensor and the required number is displayed.

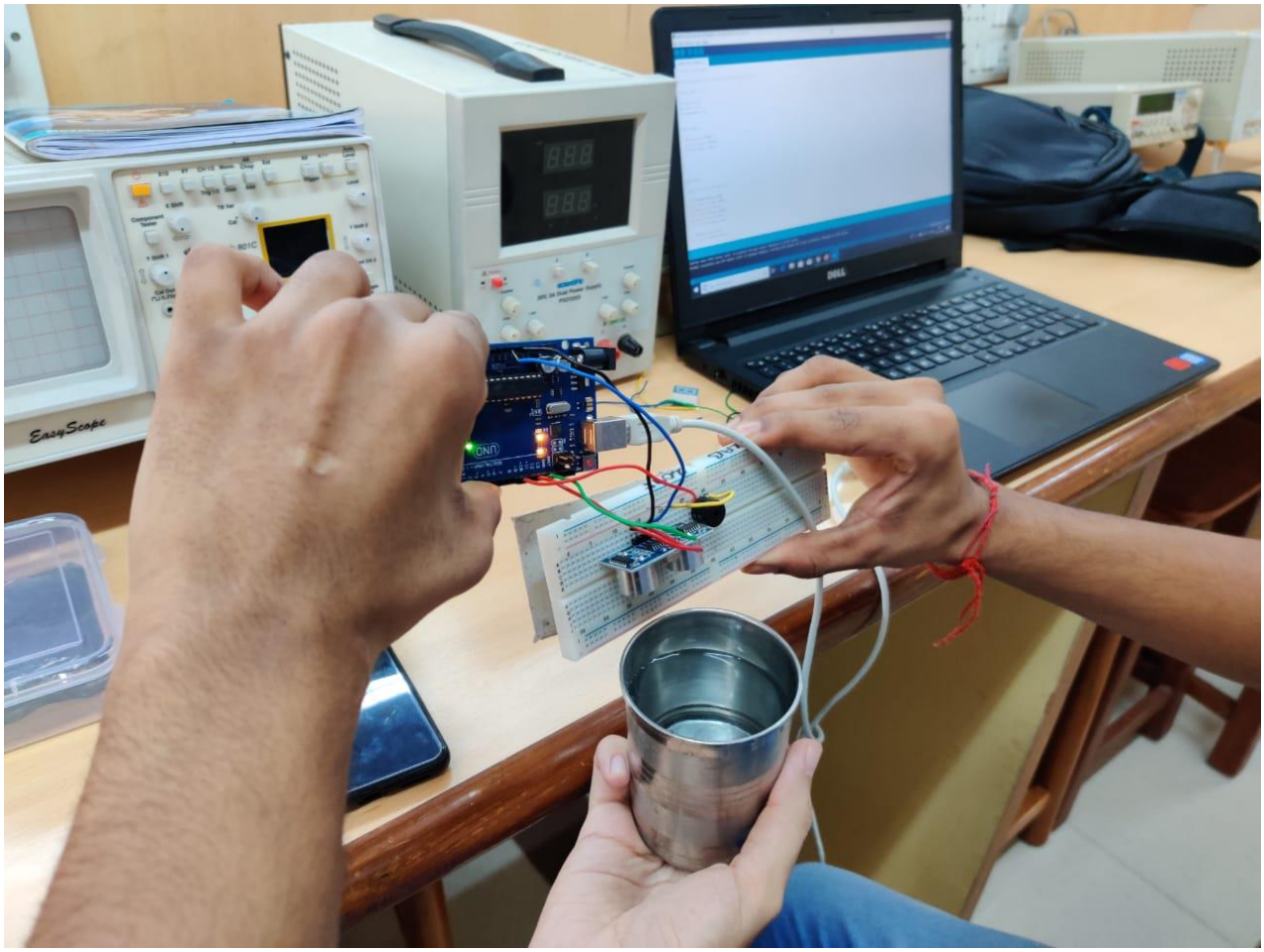
2.2.4 IMAGES:

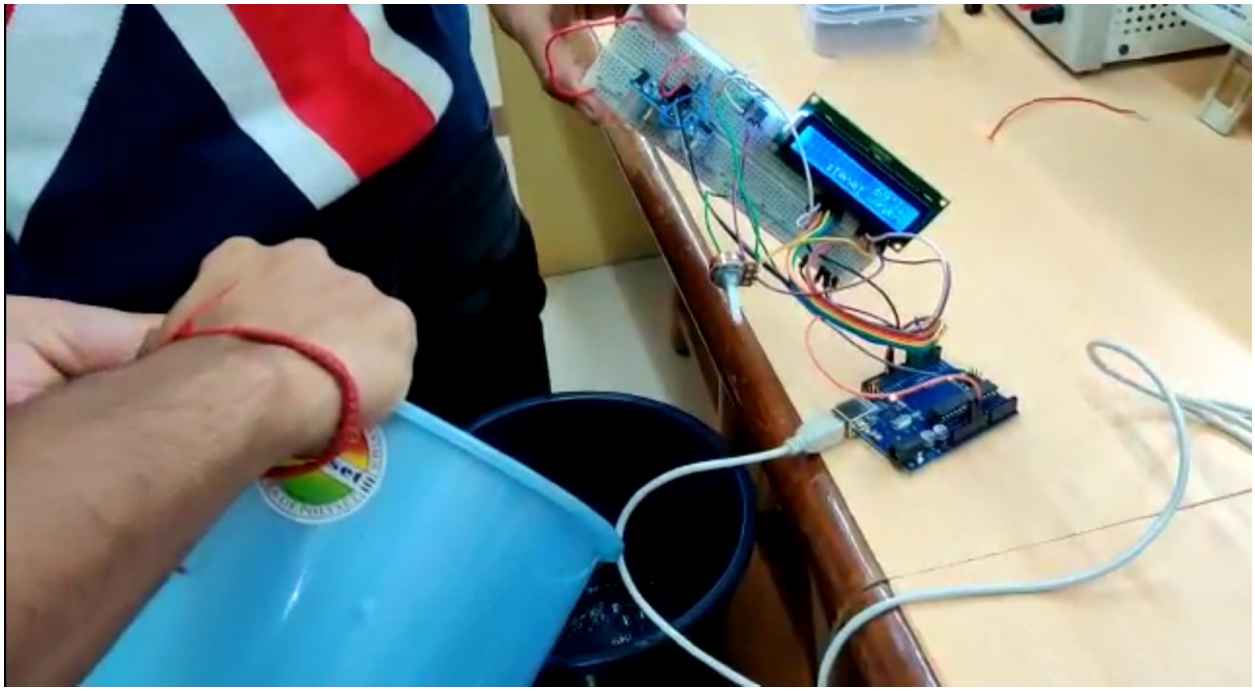




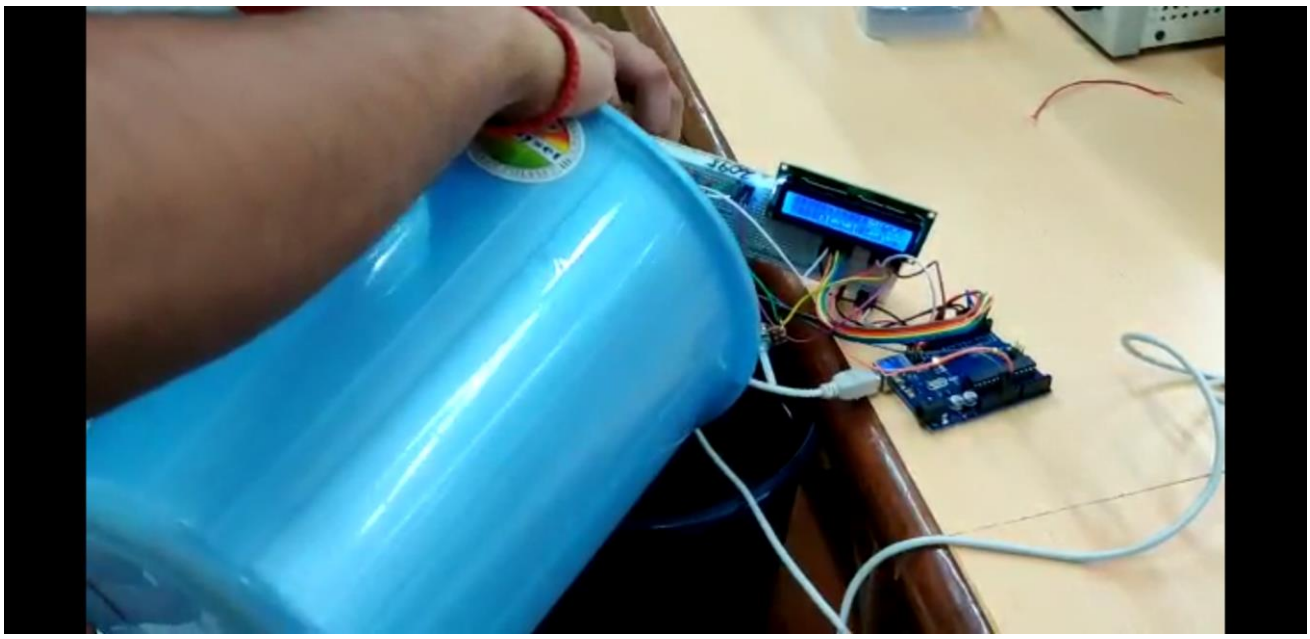
The sensor sensed the hand and showed full tank.

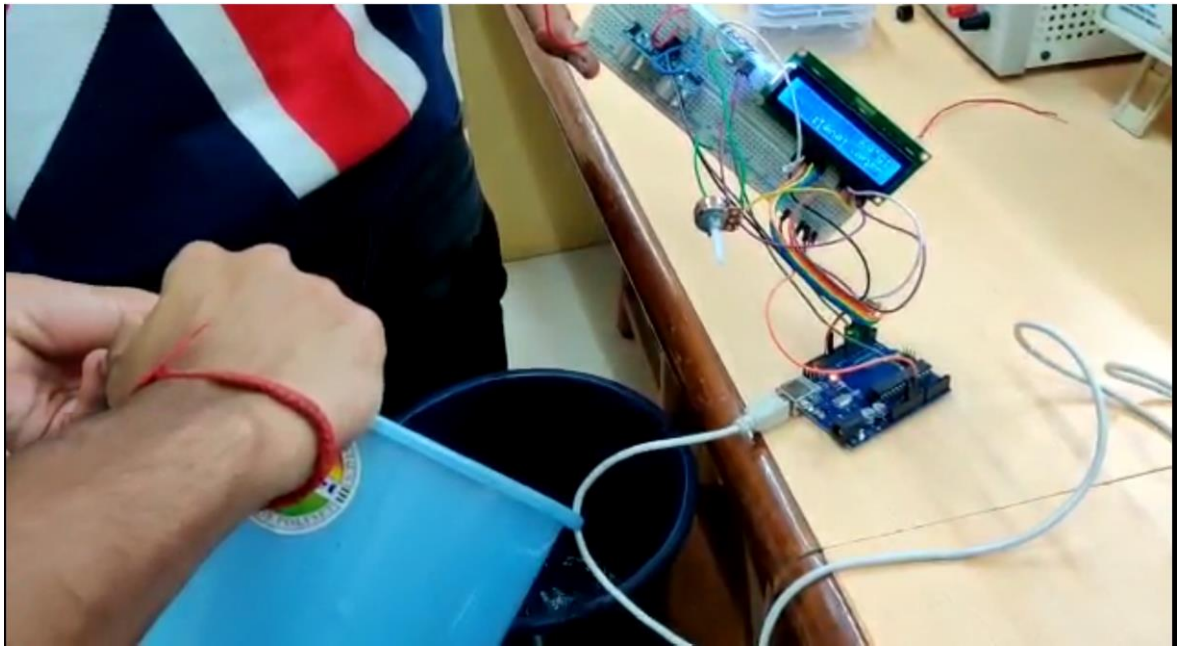






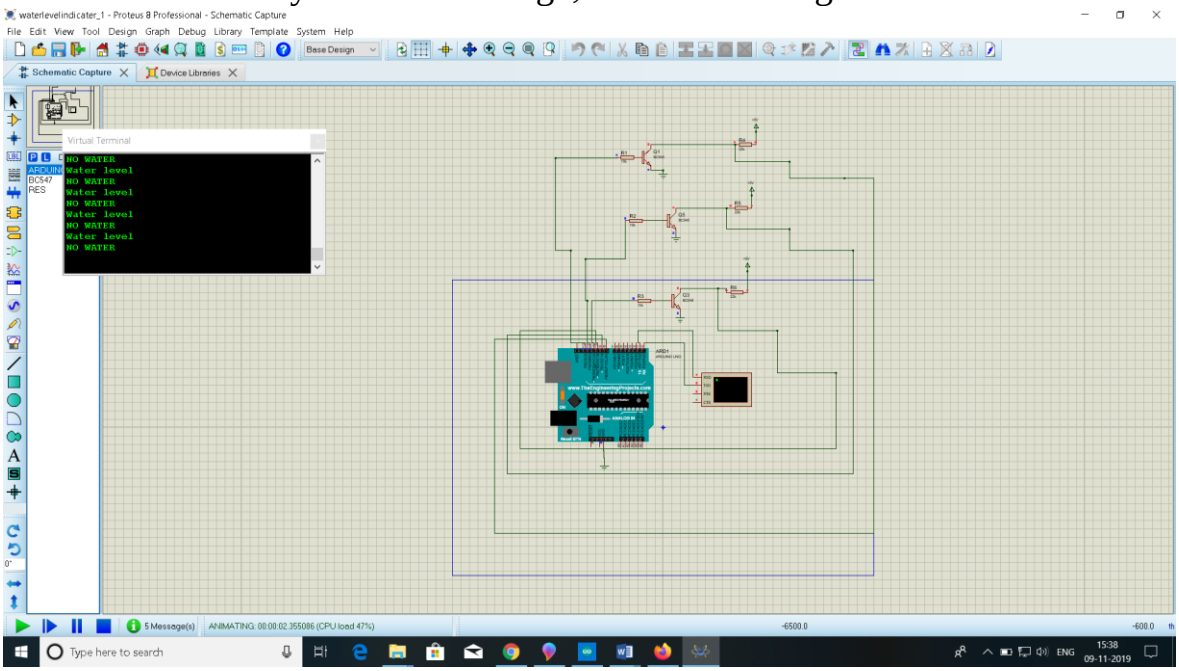
The following images show sensing of water with changing levels.

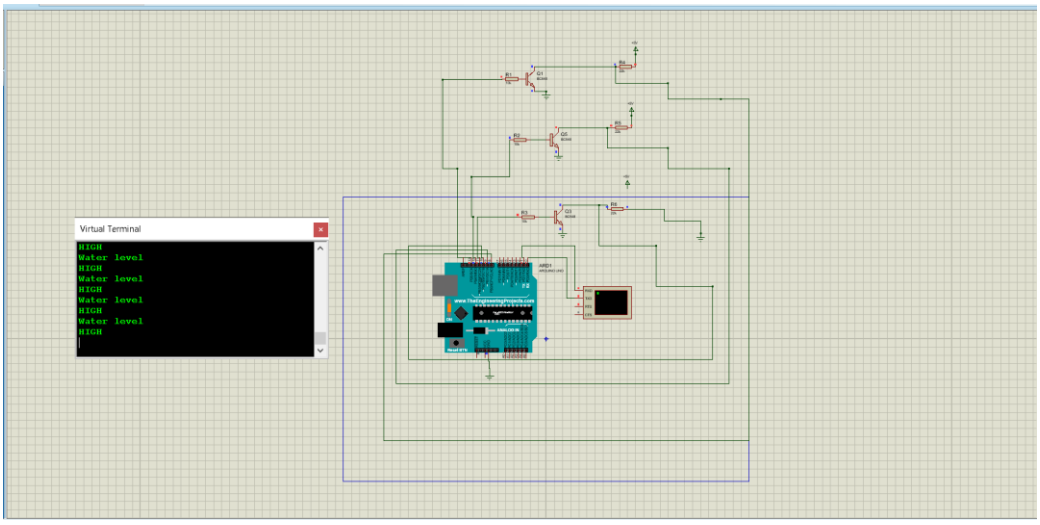




Chapter 3:**ALTERNATE CIRCUIT (Using Microprocessor without Ultrasonic Sensor) :-**

- The use of Ultrasonic Distance Sensor can be replaced by using transistors for switching in digital mode.
- This alternate method can be used by people who would avoid the use of sensors.
- Three transisters are used for switching of signals with that level being activated which gets grounded same principle used for analog circuits.
- This circuit has only three levels High,Low and Average.





Chapter 4:**COST OF BASIC COMPONENTS:-**

1.) ANALOG CIRCUIT:-

1.1	IC74HC147	₹58
1.2	CD4511	₹51
1.3	24 resistors	₹120
1.4	BC547	₹24
1.6	7-segment display	₹15
	TOTAL COST (Approx.)	₹268

2.) DIGITAL CIRCUIT:-

1.7	Arduino UNO	₹30
1.8	1K Resistor	₹5
1.9	16*2 LCD DISPLAY	₹165
1.10	ULTRASONIC DISTANCE SENSOR	₹75
	TOTAL COST (Approx.)	₹475

Chapter 5:**MODIFICATIONS DONE:**

- A buzzer is installed which will go on when tank gets full.
- Automatic motor turning ON when the water goes below LEVEL 1, i.e. when 0 is displayed on the 7-segment display. This feature will ensure that the user never runs out of water.
- The state of the motor can be received over SMS, or Bluetooth, etc. This will keep the user informed about the state of the motor, whether ON or OFF over his device itself, the water levels can also be sent via the same channels.
- If any unwanted foreign element enters the tank this will also be notified hence also working as a safety equipment.

FUTURE ENHANCEMENT :

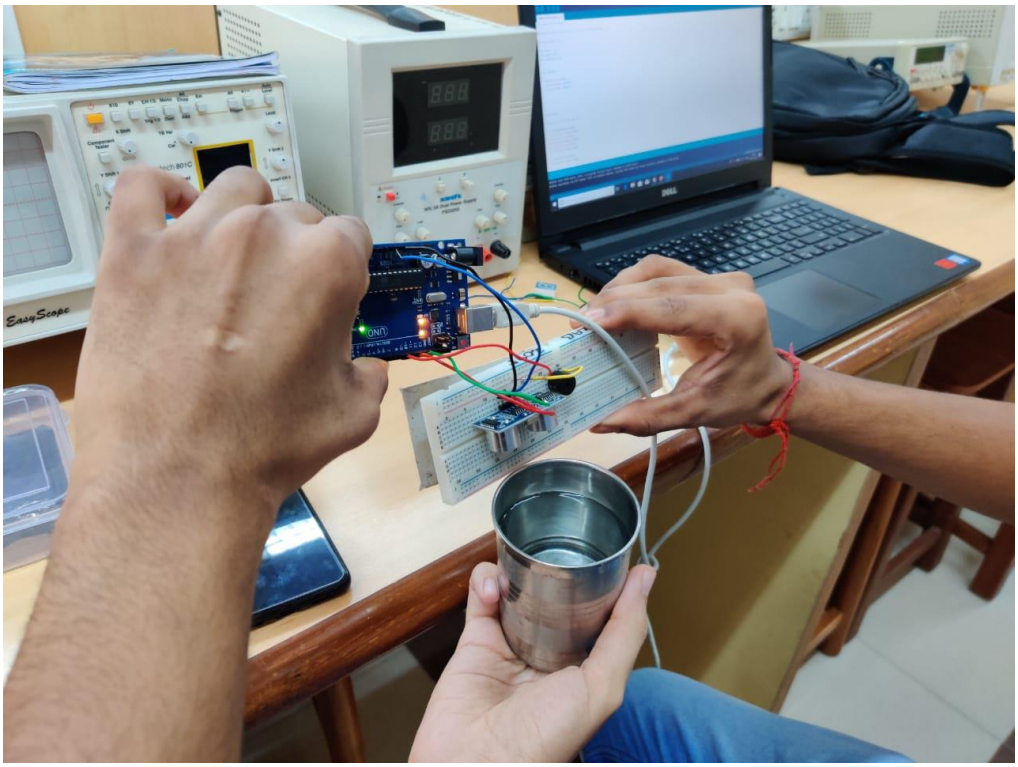
- The product can be further developed as an IOT device thus can be operated from your phone or social media
- The product could be extended to not just water but many more liquids.

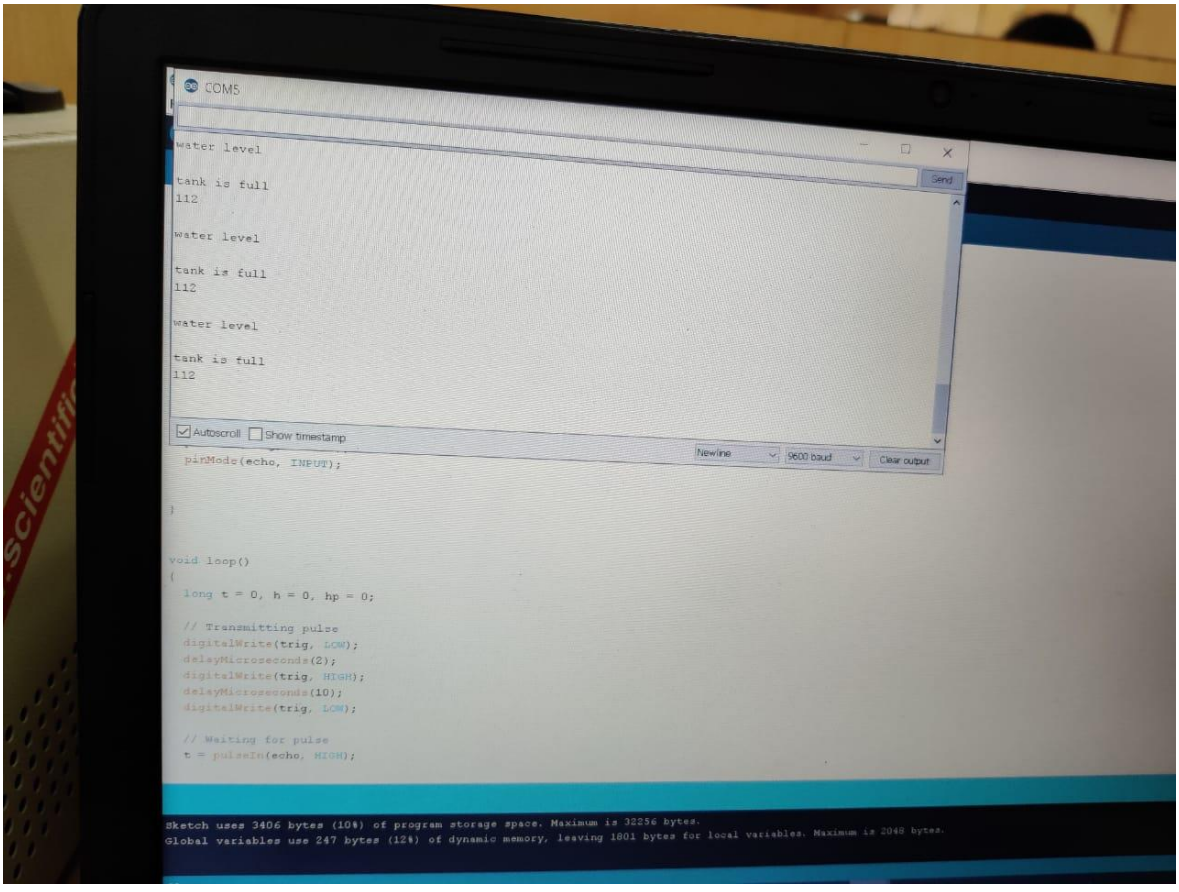
Chapter 6:**Explanation of the Source code of operation of the Arduino:-**

- Ultrasonic Distance sensor detects surface of water and prints the corresponding values on Serial Monitor and LCD screen.

- The ultrasonic sensor as a trigger and an echo pin. The arduino provides a high signal of 10microseconds to this pin. After the HC-SR04 is triggered, it sends out eight 40Khz sound waves to the surface of the water. On getting to the surface of the water, the wave is echoed back to the sensor and the arduino reads the echo pin to determine time spent between triggering and receiving of the echo.

- The Ultrasonic sensor module is placed at the top of glass (water tank demo object) for demonstration. This sensor module will read the distance between itself and the water surface and it will show the level of water and the status of the motor on the LCD screen. If the distance is greater than or equal to 40 cm then Arduino turns ON the BUZZER. The LCD will show “LEVEL: LOW” and “BUZZER: ON”. When the distance reaches distance about 10cm arduino turns OFF the relay and LCD and Serial Monitor will show “LEVEL: FULL” and “BuZZER: OFF”. The LCD will also display medium and high levels when it get to these points.





The serial monitor shows the respective changes.

Chapter 7: Project Information and Rules:-

Given below is the guidelines and information about the project. This project is made by following each and every point as mentioned below.

1)Understanding the working of complete circuit, and the role of each component used in the project.

2)Calibrating the sensors and relevant components to optimize overall performance of the project.

3)Calculate important parameters of the project like voltage,current,power consumption,frequency of operation,bandwidth,cost effectiveness etc.

4)Details of each components used in the circuit.

5)Packaging of the project to resemble any similar project in the market.

6)Efforts by the group to upgrade any function or feature of the project.

7)Quality of the report generated by the group.

8)If the group fails to make a real time working project then group will be analyzed on the basis of sincere effects by the group to complete the project.

9)Limitations of the circuit in the terms of power consumption, range of operational frequency, speed of operation, expandability, etc.

10)Datasheet/datasheets studied during the course of project, and knowledge of the components w.r.t their datasheet.

Chapter 8:**Limitations of the circuit:-**

The Limitations are as follows:-

1.) The sensors are made out of sound receiving membranes which is prone to weathering. Can be easily fixed by removal and new installation the of the membrane. To do that in Lab setting keep the sensor disconnected when not in use.

2.) Not water proof. Water Level Indicator will be used near or around a water tank and a water proof device will be more durable. However,These days we have water repellant sprays that can be sprayed on our device to make it splash proof.

3.) "Kiwi Camp Dry Heavy Duty Water Repellant, 10.5 Ounce by Kiwi" sold on Amazon.com costs around 1000 Rs and can be used to coat upto 20-25 devices. Increasing device cost by around 50-60 Rs.

4.) We haven't designed an adapter for the Rs345 device which means it cannot be directly plugged into household AC supply. It is battery operated. Can be easily fixed by designing an AC to DC converter. And because our device can operate in a sufficient voltage range we might not even need to smoothen the output wave, thereby saving cost! However, Our Arduino device can be operated by household AC directly.

5.)The package however doesn't come with battery and hence won't work during power cuts. Fortunately, water motors also don't work during power cuts. Hence, solving this problem is unnecessary.

Chapter 9:**CONCLUSIONS:-**

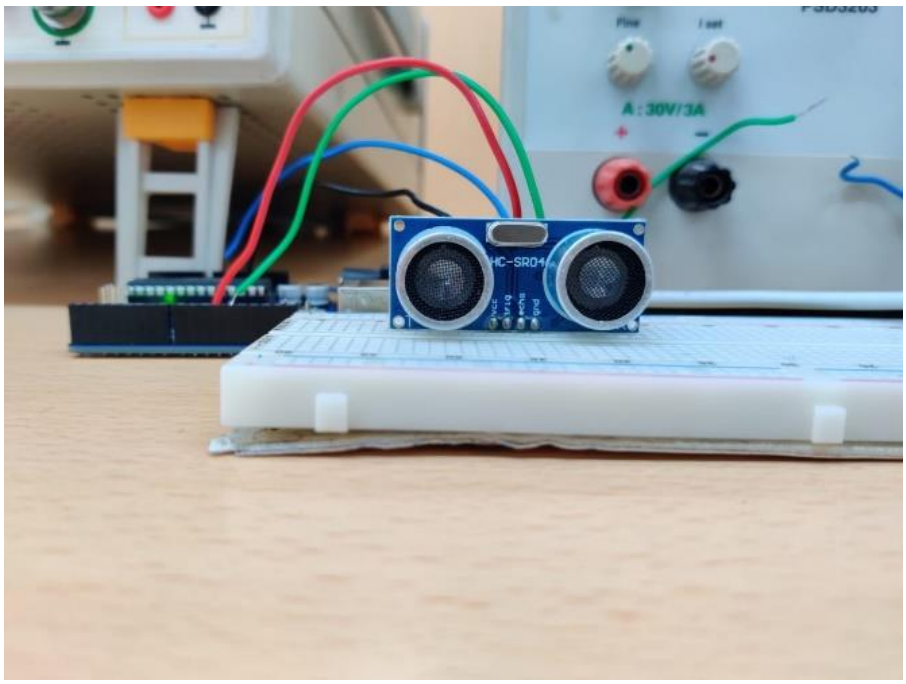
There are several advantages as well as disadvantages of this water level indicator-

ADVANTAGES:-

- It is fully automated device.
- It will save electricity and water by constant montoring and indication of water.
- New control minimise fouling and deterioration.
- Will prevent unwanted watage of water.

DISADVANTAGES:-

- Ultrasonic distance sensor might not provide exact precise values of water .
- Sensor due to constant and persistent usage might get weared out.
- Sensor even might get wrong values as it might detect some other foreign object in the tank which may not be water.



ALTERNATE SOLUTIONS:-

Alternative solutions like, Ground probe sensors, Floating sensors, Magnetic float sensors, etc. are being used in place of Ultrasonic distance sensor.

This water level sensor can be used in place of Ultrasonic Distance Sensor.

This multi level ground sensor can also be used for water level detection.

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