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Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

CONTROL SYSTEMS (ECE2010)

PROJECT REPORT

'WATER LEVEL INDICATOR AND CONTROLLER USING ARDUINO'

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CERTIFICATE

This is to certify that the project work entitled “WATER LEVEL INDICATOR AND CONTROLLER” for Control Systems(ECE2010) is a record of bonafide work done under my supervision. The contents of this Project work, in full or in parts, have neither been taken from any other source nor have been submitted for any other CAL course.

Place: Vellore

Date:

ACKNOWLEDGEMENTS

We would like to thank our Professor. MUGELAN RK Sir for motivating us to take up this wonderful project and her inputs were of great help. We would also like to thank VIT University for allowing us to move out of the campus to explore more possibilities and buy the materials required for making the project. I would also like to thank all of my group members for their collaboration, patience and co-ordination in the work with me which eventually bore fruits and gave proper shape to this report.

OBJECTIVE

The objective of our project is to build a circuit which acts a water level indicator and controller.

INTRODUCTION

In this **Arduino based automatic water level indicator and controller project** we are going to measure the water level by using ultrasonic sensors. Basic principal of ultrasonic distance measurement is based on ECHO. When sound waves are transmitted in environment then they return back to the origin as ECHO after striking on any obstacle. So we have to only calculate its traveling time of both sounds means outgoing time and returning time to origin after striking on any obstacle. And after some calculation we can get a result that is the distance. This concept is used in our water controller project where the water motor pump is automatically turned on when water level in the tank becomes low.

MATERIALS REQUIRED

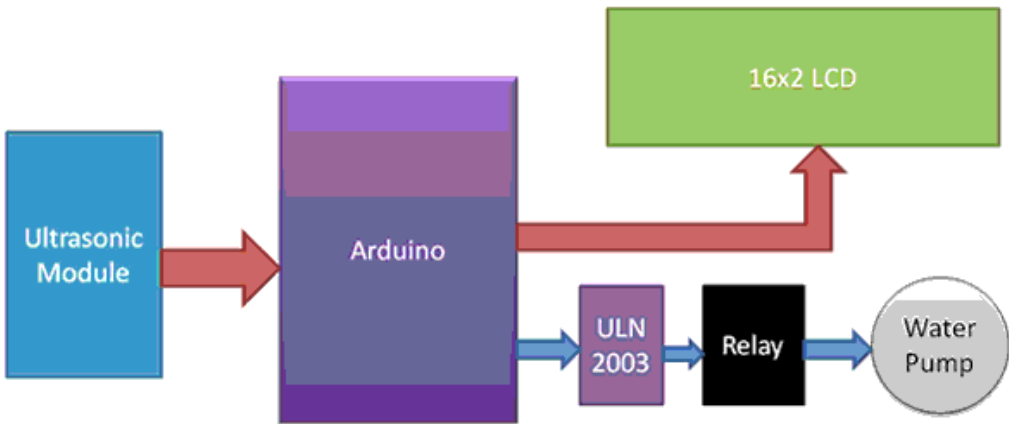
- Arduino Uno
- Ultrasonic sensor Module
- 16x2 LCD
- Relay 6 Volt
- ULN2003
- 7806
- PVT
- Copper wire
- 9 volt battery or 12 Volt adaptor
- Connecting wires

WORKING PRINCIPLE

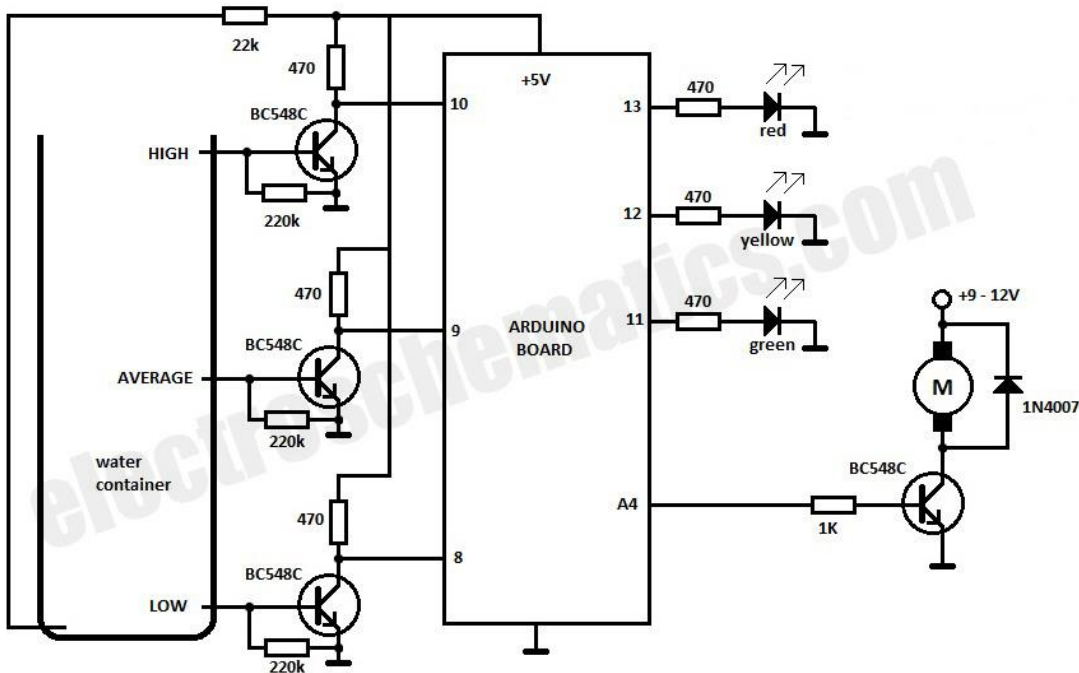
- Working of this project is very simple we have used Ultrasonic sensor module which sends the sound waves in the water tank and detects reflection of sound waves that is ECHO. First of all we need to trigger the ultrasonic sensor module to transmit signal by using Arduino and then wait to receive ECHO. Arduino reads the time between triggering and received ECHO. We know that speed of sound is around 340 m/s. so we can calculate distance by using given formula:
- $\text{Distance} = (\text{travel time}/2) * \text{speed of sound}$
- Where speed of sound is approximately 340m per second.
- By using this methods we gets distance from sensor to water surface. After it we need to calculate water level.
- Now we need to calculate the total length of water tank. As we know the length of water tank then we can calculate the water level by subtracting resulting distance coming from ultrasonic from total length of tank. And we will get the water level distance. Now we can convert this water level in to the percent

of water, and can display it on LCD. The working of the complete **water level indicator project** is shown in below block diagram.

BLOCK DIAGRAM



CIRCUIT DIAGRAM



CIRCUIT DIAGRAM AND EXPLANATION

The circuit diagram of the water level controller using Arduino is shown above. Conductive method is used to measure the level. The sensor assembly consists of four aluminum wires arranged at 1/4, 1/2, 3/4 and full levels in the tank. The dry ends of these wires are connected to analog input pins A1, A2, A3 and A4 of the Arduino respectively. A fifth wire is positioned at the bottom of the tank. Resistors R6 to R9 are pull down resistors. The dry end of this wire is connected to +5V DC. When the water touches a particular probe, electrical connection is established between that probe and the +5V probe because water has slight conductivity. As a result current flows through that probe and this current is converted into a proportional voltage by the pull down resistor. Arduino reads the voltage dropped across each pull down resistor for sensing the level of water in the tank. Same method is used for measuring the level of water in the sump tank.

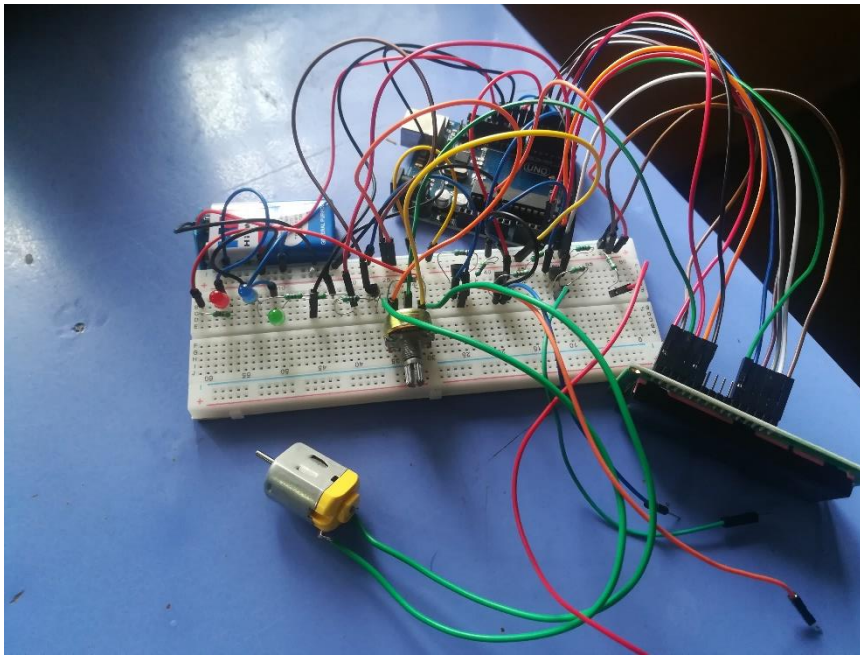
Digital pin 7 of the Arduino controls the buzzer and digital pin 8 controls the motor. Transistor Q1 drives the buzzer and resistor R5 limits the base current of Q1. Transistor Q2 drives the relay. Resistor R3 limits the base current of Q2. D2 is a freewheeling diode. POT R2 is used to adjust the contrast of the LCD. resistor R1 limits the current through the back light LED. Resistor R4 limits the current through the power ON LED. Complete program for the water level controller using Arduino is given below.

In this circuit Ultrasonic sensor module is placed at the top of bucket (water tank) for demonstration. This sensor module will read the distance between sensor module and water surface, and it will show the distance on LCD screen with message "Water Space in Tank is:". It means we are here showing empty place of distance or volume for water instead of water level. Because of this functionality we can use this system in any water tank. When empty water level reaches at distance about 30 cm then Arduino turns ON the water pump by driving relay. And now LCD will show

“LOW Water Level” “Motor turned ON”, and Relay status LED will start glowing

Now if the empty space reaches at distance about 12 cm Arduino turns OFF the relay and LCD will show “Tank is full” “Motor Turned OFF”. Buzzer also beep for some time and relay status LED will turned OFF.

OUR CIRCUIT



ARDUINO CODE:

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(4,6,2,3,5,7);

byte sensorPin[] = {8, 9, 10};

byte ledPin[] = {11, 12, 13}; // number of leds = numbers of sensors

const byte sensors = 3;

int level = 0;

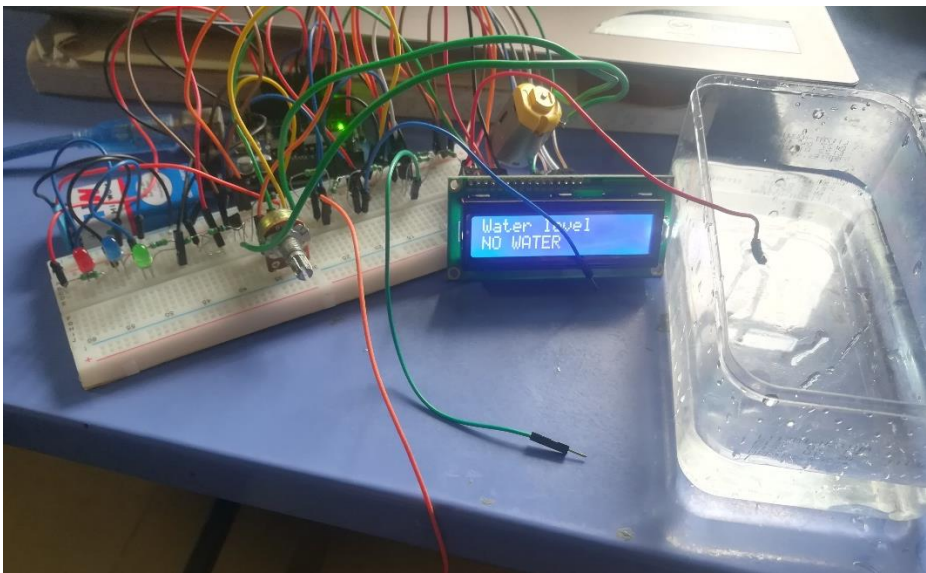
int motor = A4;
```



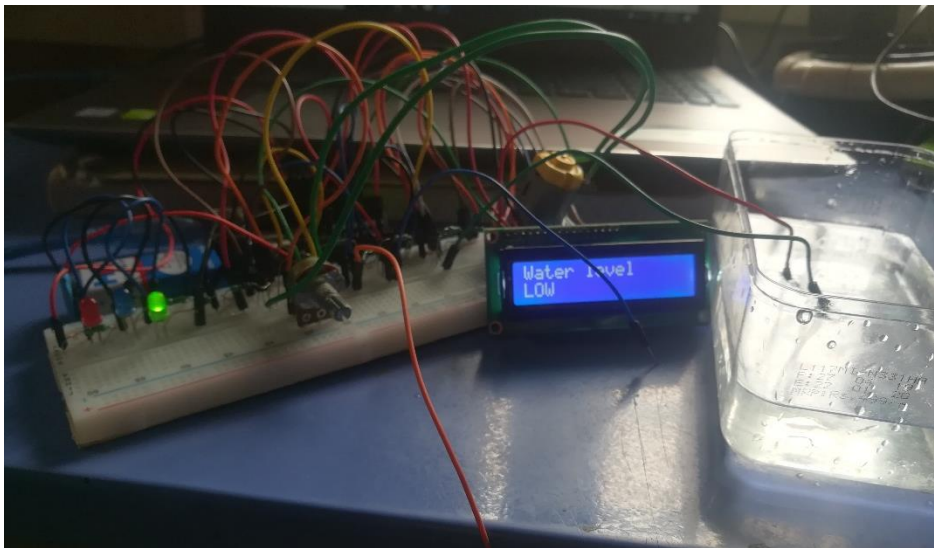
```
void setup() {  
    for(int i = 0; i < sensors; i++) {  
        pinMode(sensorPin[i], INPUT);  
        pinMode(ledPin[i], OUTPUT);  
    }  
    pinMode(motor, OUTPUT);  
    lcd.begin(16, 2);  
}  
  
void loop() {  
    level = 0;  
    for(int i = 0; i < sensors; i++) {  
        if(digitalRead(sensorPin[i]) == LOW) {  
            digitalWrite(ledPin[i], HIGH);  
            level = sensors - i;  
        } else {  
            digitalWrite(ledPin[i], LOW);  
        }  
    }  
    lcd.clear();  
    lcd.print("Water level");  
    lcd.setCursor(0,1);  
    switch(level) {  
        case 1:  
            lcd.print("HIGH");  
            digitalWrite(motor, HIGH);  
    }
```

```
    break;
case 2:
    lcd.print("AVERAGE");
    digitalWrite(motor, LOW);
    break;
case 3:
    lcd.print("LOW");
    digitalWrite(motor, LOW);
    break;
default:
    lcd.print("NO WATER");
    digitalWrite(motor, LOW);
    break;
}
delay(50);
}
```

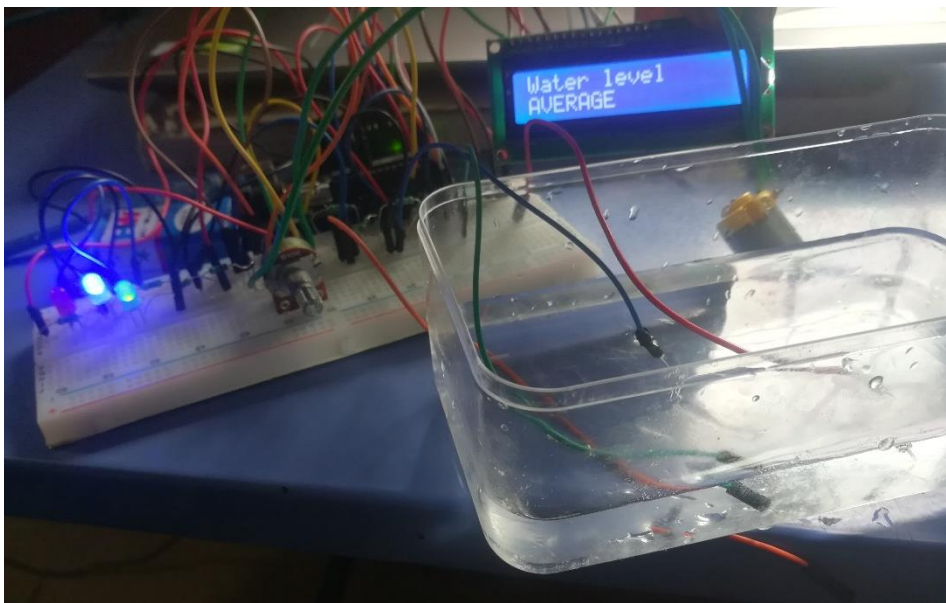
OUTPUT:



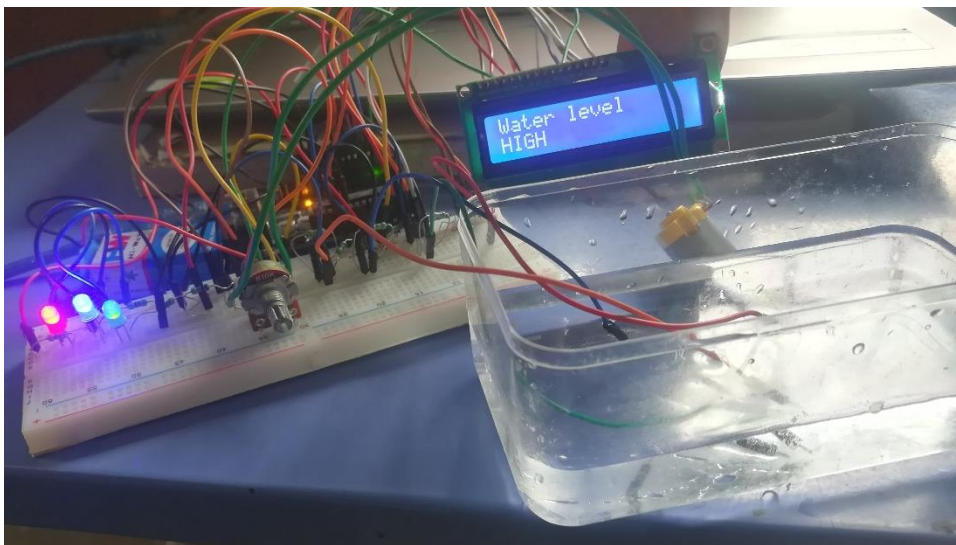
The output in the below image shows Low Water Level



The output in the below image show Average Water Level



The output in the below image show High Water Level



APPLICATIONS

- Automatic watering for plants
- Water Dispenser Machine
- Coffee/Tea Dispenser Machine
- Automatic Water Tap

CONCLUSION:

The project gives out the output on the LCD and LCD glows according to the level of the output. If the water level is high the Red Glows, if the water level is average the blue led glows and if the water level is low the green led glows and the motor rotates so that water can be filled into the tank and acts as a controller.

REFERENCES

- WIKIPEDIA
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- <https://www.electroschematics.com/arduino-water-level-indicator-controller/>
- <https://create.arduino.cc/projecthub/karthickcj0083/automatic-water-level-controller-b2508d>