Project Report

on

<u>Smart Irrigation System</u>

Submitted in partial fulfillment of the requirements

of the degree of

Bachelors of Engineering

by

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Under the Guidance of

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Chandigarh University (CU)

Mohali, Punjab (India)

First Year
(2020-2024)

CERTIFICATE

This is to certify that the project entitled **“Smart Irrigation System”** is a bonafide work of, **Harsh Tandiya** (20BCS9693)**, Paras Guglani**(20BCS9403)**, Pushp Ranjan**, (20BCS9692)**, Rohan Ghosh**(20BCS9671)
submitted to the Chandigarh University in partial fulfillment of the requirement for the award of the degree of **“Bachelor of Engineering”** in “**Computer Science Engineering”**.

(Dr. Meenakshi)

Project Report Approval for B.E.

This Project report entitled ***Smart Irrigation System*** by Harsh Tandiya, Paras Guglani, Pushp Ranjan, Rohan Ghosh is approved for the degree of Bachelor of Computer Science Engineering.

Examiners

Guide

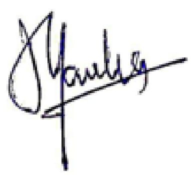
Dr. Meenakshi

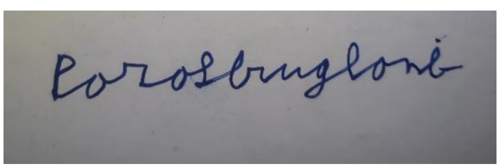
Date: 13-05-2021

Place: Chandigarh University, Mohali

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.





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Date: 13:05:20

ABSTRACT

India is an agricultural-based country. Our forefathers completely depended on agricultural harvesting for food. Agriculture is a source of livelihood for majority of Indians and has a great impact on the economy of the country. But there are many hurdles that a farmer has to face before he reaps a good harvest. One of the many hurdles is irrigation. In case of inadequate rainfall, irrigation becomes difficult. As our planet endures irreversible changes due to climate change, water scarcity is a rising issues in many places all around the globe. This has led the farmers to turn towards technology to develop smart ways to perform irrigation. Irrigation management is a very complex decision-making process to determine when and how much water to apply to a growing crop to meet specific requirements. Irrigation management is very crucial, as even a small mishap can damage crops throughout the field, leading to a huge loss for the farmer. The main problem faced regarding irrigation is the uniformity for giving water to the crops. For example, if a farmer is far from the agricultural land due to any emergency, he may not notice the timings of irrigation which may lead to irregularity and unhealthy crops. This calls for a need automation of irrigation process for proper yield and regular handling of irrigation system. Automation will also open doors for remote handling of the crop management including irrigation and many other processes involved in growing a crop. This project describes how irrigation can be handled smartly using IOT.

This is a low-cost alternative solution for traditional water management the age old irrigation systems. Our project uses the traditional drip irrigation system and combines it with the modern age automation technology. This helps the farmers to remotely control the water supply of their crops and read all type of statistics

regarding the crops and the soil they are planted in. This setup comes with a soil moisture sensor which makes the farmer aware of the soil conditions, whether the soil is either too dry or too moist or anything in between. This way, the farmer gets a whole lot statistics and whole range of control over the moisture and crops which will enable them to yield better crops and also manage it better.
This project probes into the design of the automated irrigation system based on Arduino. This embedded project is to design and develop a low-cost feature that is based on an embedded platform for the water irrigation system. The project uses temperature and soil moisture sensors to detect the water quantity present in agriculture. The project uses an Arduino microcontroller which is a controller to process the information.

The function of this Smart Water Irrigation System is to detect moisture content of the soil and sprinkle water with respect to the requirements of the soil. This will automate the whole irrigation process, making the life of farmers a little easier. Water conservation will also be huge with this, as no water is being poured without reason, only required amount is poured. This project will be a great help in field of agriculture.

Keywords: Soil moisture sensors, IOT, Arduino, Android, Microcontroller

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Chapter 1

Introduction

By using the concept of modern irrigation system, a farmer can save water up to 50%. This concept depends on two irrigation methods those are: conventional irrigation methods like overhead sprinklers, flood type feeding systems i.e. wet the lower leaves and stem of the plants. The area between the crop rows become dry as the large amount of water is consumed by the flood type methods, in which case the farmer depends only on the incidental rainfalls. The crops are been infected by the leaf mold fungi as the soil surface often stays wet and is saturated after irrigation is completed. Overcoming these drawbacks new techniques are been adopted in the irrigation techniques, through which small amounts of water applies to the parts of root zone of a plant. The plant soil moisture stress is prevented by providing required amount of water resources frequently or often daily by which the moisture condition of the soil will retain well. The diagram below shows the entire concept of the modern irrigation system. The traditional techniques like sprinkler or surface irrigation requires / uses nearly half of water sources. Even more precise amounts of water can be supplied for plants. As far as the foliage is dry the plant damage due to disease and insects will be reduced, which further reduces the operating cost. The dry rows between plants will leads to continuous federations during the irrigation process. Fertilizers can be applied through this type of system, and the cost required for will also reduce. The erosion of soil and wind is much reduced by the recent techniques when compared with overhead sprinkler systems. The soil characteristics will define the form of the dripping nature in the root zone of a plant which receives moisture.

As the method of dripping will reduce huge water losses it became a popular method by reducing the labour cost and increasing the yields. When the components are activated, all the components will read and gives the output signal to the controller, and the information will be displayed to the user (farmer). The sensor readings are analog in nature so the ADC pin in the controller will convert the analog signals into digital format. Then the controller will access information and when the motors are turned on/Off it will be displayed on the LCD Panel.

Chapter 2

Review of Literature

It is a simple project more useful in watering plants automatically without any human interference. We know that people do not pour the water on to the plants in their gardens when they go to vacation or often forget to water plants. As a result, there is a chance to get the plants damaged. This project is an excellent solution for such kind of problems. Many irrigation systems exit such as,

1. Monitoring of rice crops using GPRS and wireless sensors for efficient use of water and Electricity.

2. Wireless Sensor Based Remote Monitoring System for Agriculture Using ZigBee and GPS.

3. Design of Embedded System for the Automation of Drip Irrigation.

4. A Survey of Automated GSM Based Irrigation System.

5. Wireless Sensor Networks Agriculture: For Potato Farming.

6. Design and Implementation of GSM based Irrigation System Using ARM7.

7. Automated Irrigation System Using a Wireless Sensor Network and GPRS Module.

8. Automated Irrigation System Using Solar Power.

9. Review for ARM based agriculture field monitoring system.

10. Automatic Irrigation Control by using wireless sensor networks.

11. Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network.

Chapter 3

Report on the Present Investigation

3.1 Materials Used:

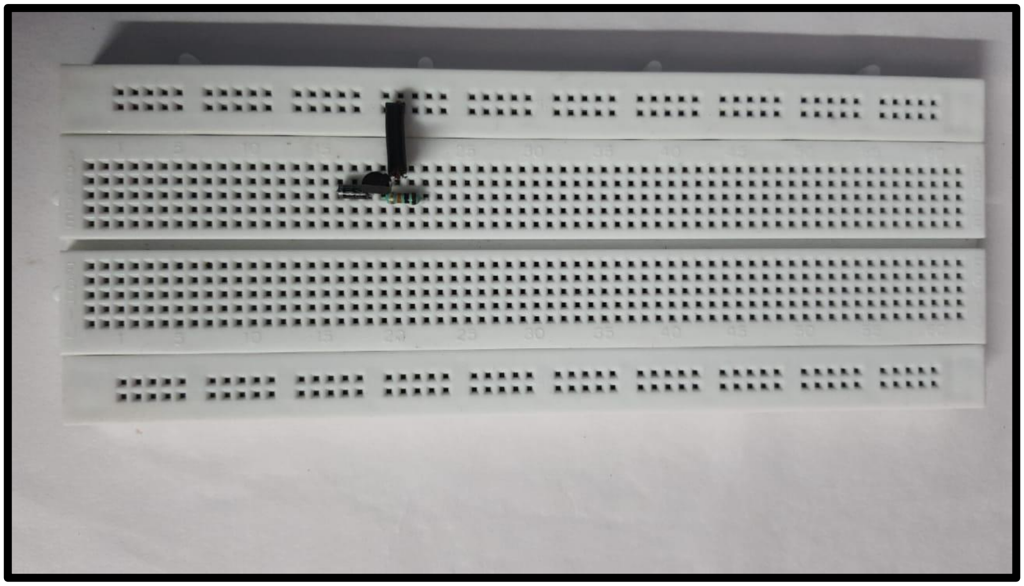

Fig1: Breadboard

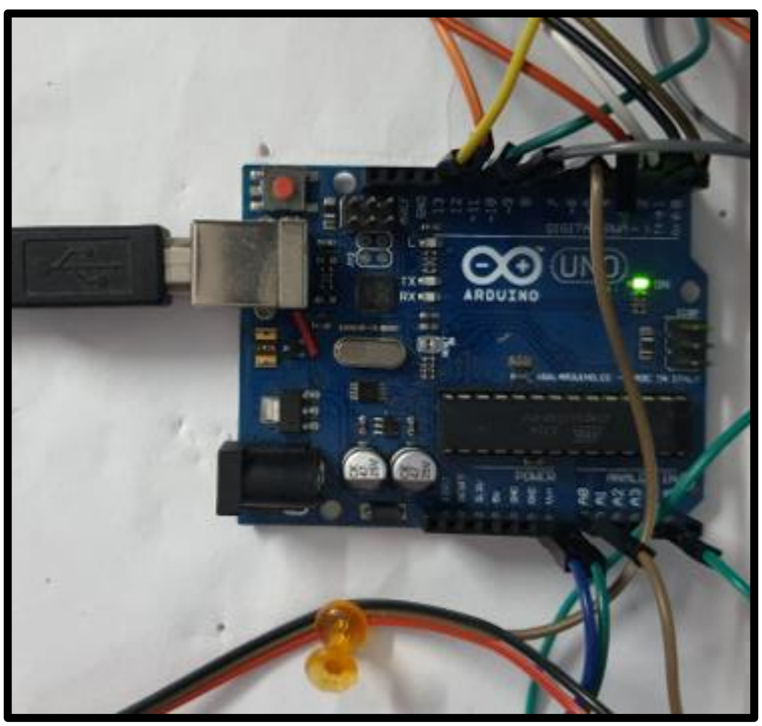

Fig2: Arduino

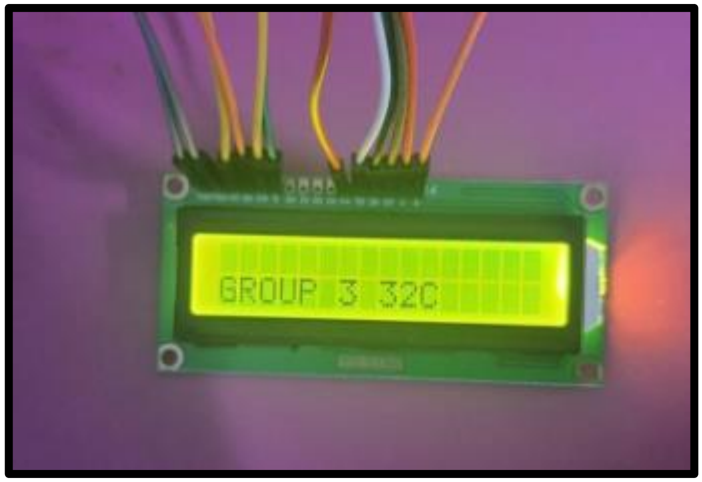

Fig3: LCD

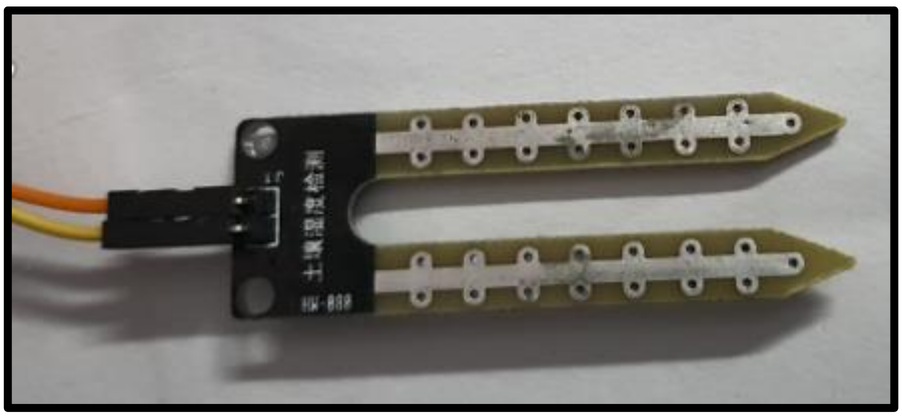

Fig 4: Soil Moisture Sensor

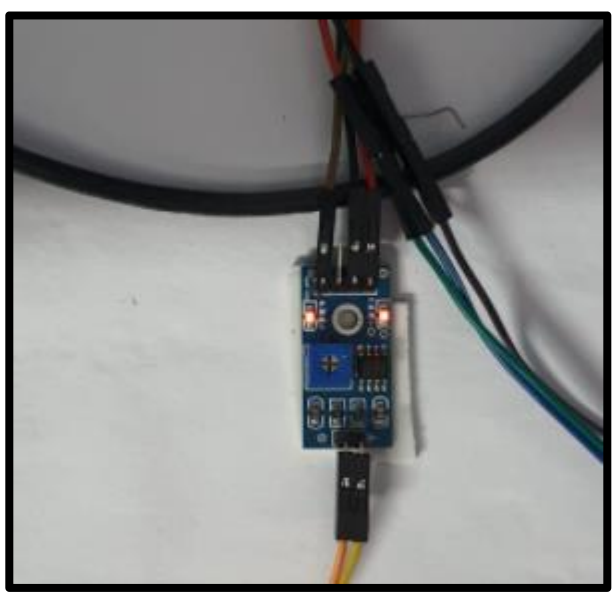

Fig5: Soil Moisture Sensor LM393 Driver

Fig 6: Water Level Sensor

3.2 Program code:

```
#include <LiquidCrystal.h>

#define NOTE_C4 262

#define NOTE_D4 294

#define NOTE_E4 330

#define NOTE_F4 349

#define NOTE_G4 392

#define NOTE_A4 440

#define NOTE_B4 494

#define NOTE_C5 523

int temp;
```

```
int M_Sensor = A0;

int W_led = 7;

int P_led = 13;

int Speaker = 9;

int val;

int cel;

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

void setup(){

  lcd.begin(16, 2);

  lcd.clear();

  pinMode(13,OUTPUT);

  pinMode(7,INPUT);

  pinMode(9,OUTPUT);

  Serial.begin(9600);

  lcd.setCursor(0,1);

  lcd.print("GROUP 3 32C");

  delay(2000);

  lcd.clear();

  lcd.setCursor(0,0);
```

```
    lcd.print("AUTOMATIC");

    lcd.setCursor(0,1);

    lcd.print("IRIGATION SYSTEM");

    delay(2500);

    lcd.clear();

    delay(1000);}

void loop(){

  lcd.clear();

  int Moisture = analogRead(M_Sensor);

  Serial.println(Moisture);

 if (Moisture> 200){

        lcd.setCursor(0,0);

        lcd.print("DRY SOIL");

       if (digitalRead(W_led)==1){

         digitalWrite(13, HIGH);

         lcd.setCursor(0,1);

         lcd.print("PUMP:ON");}

       else{

         digitalWrite(13, LOW);
```

```
   lcd.setCursor(0,1);

   lcd.print("PUMP:OFF");

   lcd.setCursor(11,0);

  lcd.print("WATER");

  lcd.setCursor(11,1);

  lcd.print("LOW");

     tone(Speaker, NOTE_C4, 500);

     delay(500);

     tone(Speaker, NOTE_D4, 500);

     delay(500);

     tone(Speaker, NOTE_E4, 500);

     delay(500);

     tone(Speaker, NOTE_F4, 500);

     delay(500);

     tone(Speaker, NOTE_G4, 500);

     delay(500);}}

if (Moisture>= 70 && Moisture<=200){

 lcd.setCursor(0,0);

lcd.print("MOIST SOIL");
```

```
    //lcd.setCursor(11,1);
    //lcd.print("SOIL");
    digitalWrite(13,LOW);
    lcd.setCursor(0,1);
    lcd.print("PUMP:OFF");}
 if (Moisture < 70){
   lcd.setCursor(0,0);
    lcd.print("SOGGY SOIL");
    digitalWrite(13,LOW);
    lcd.setCursor(0,1);
    lcd.print("PUMP:OFF");}
delay(1000);}
```

3.3: **SCHEMATIC DIAGRAM**:

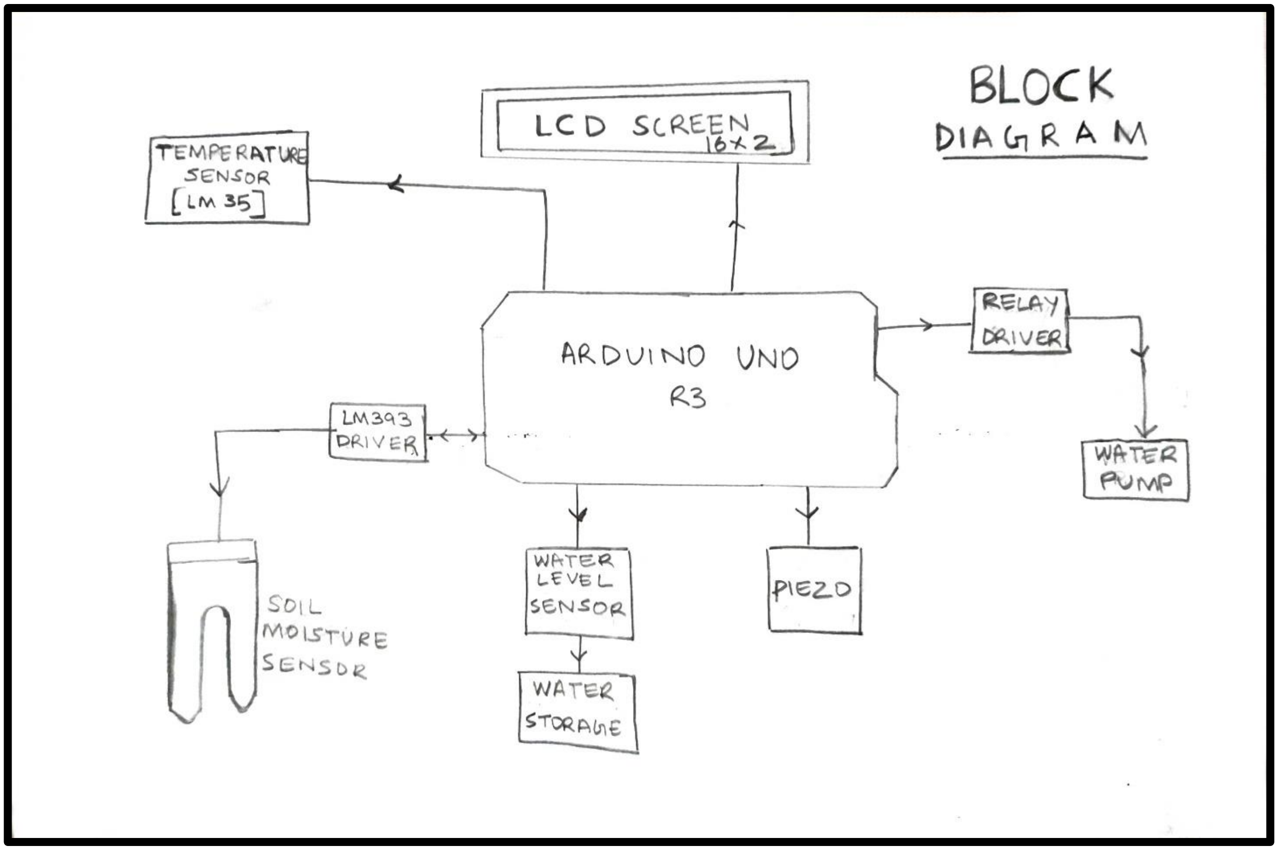

Fig7: Block Diagram of the Circuit

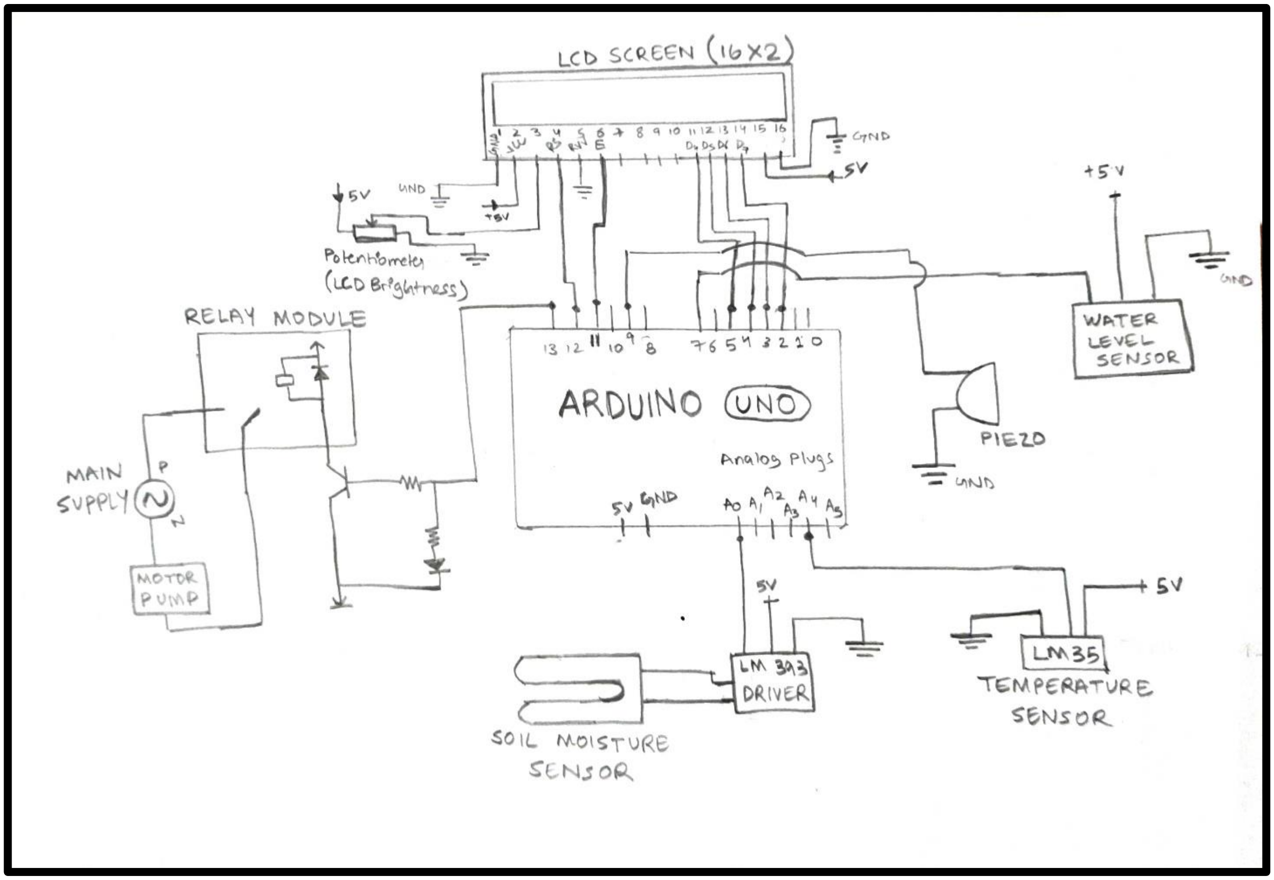

Fig 8: Circuit Schematic Diagram of the System

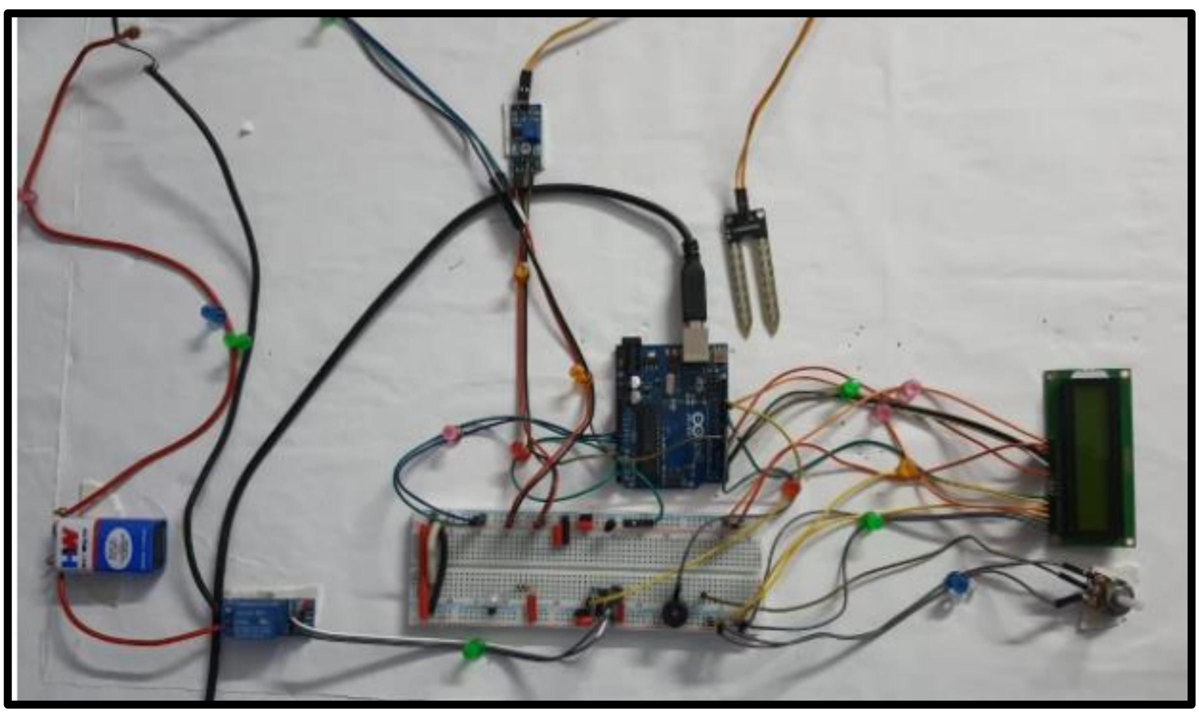

Fig 9: Hardware Model of the System

Chapter 4: Results and Discussions

After successful Hardware Implementation of the circuit diagram in outputs is obtained: -

1) When the soil is dry and water level is low then pump will not work as water level sensor will give input to Arduino that water is not available so pump will not start and Display will show following output:

Fig10: Dry Soil, Water Low

2) When the soil is moist. The pump will not work as soil moisture sensor will give input to Arduino that water is not required so pump will not start and Display will show following output:

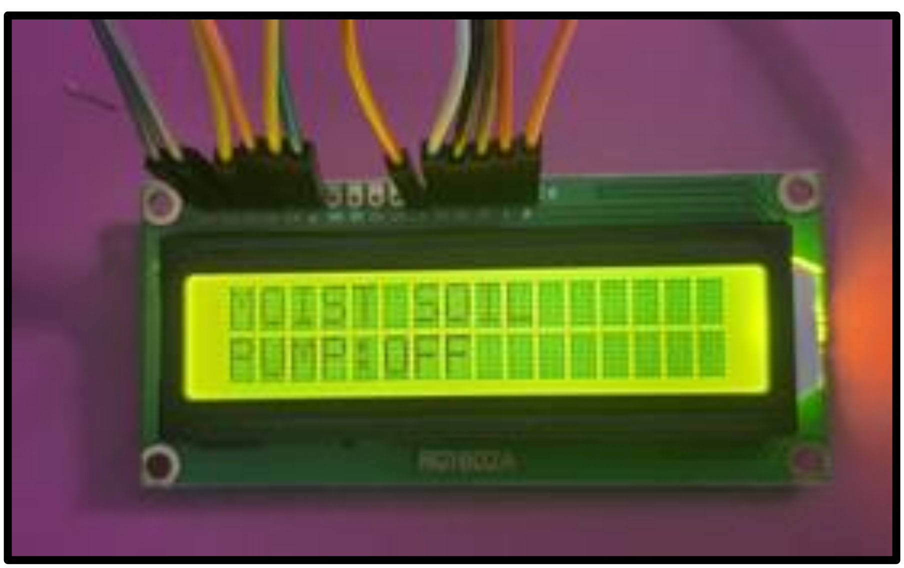

Fig11: LCD with Moist Soil, Pump OFF

3) When the soil is dry and water level is high then pump will work as water level sensor will give input to Arduino that water is required and available so pump will start and Display will show following output:

Fig12: LCD with Dry Soil, Pump on

Fig13: Output Screenshot on Serial Monitor

The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants. It also covers those farmers who are wasteful of water during irrigation. As water supplies become scarce and polluted, there is a need to irrigate more efficiently in order to minimize water use and chemical leaching. Recent advances in soil water sensing make the commercial use of this technology possible to automate irrigation management for vegetable production. However, research indicates that different sensors types perform under all conditions with no negative impact on crop yields with reductions in water use range as high as 70% compared to traditional practices.

Future Scope:

- Add IOT feature for data analysis and remote control.
- Integrate with Drip Irrigation and multiple sensors at different places on the field.
- Improvise on the sensor performance so that it can be implemented in deep soil.
- Use more reliable temperature sensors.
- Humidity control and temperature control for greenhouses.
- Water mineral content and fertilizer concentration analysis.

Chapter 5

Conclusions

Irrigation becomes easy, accurate and practical with the idea above shared and can be implemented in agricultural fields in future to promote agriculture to next level. The output from moisture sensor and level system plays major role in producing the output.

Thus the “AUTOMATIC IRRIGATION SYSTEM” (AIS) has been designed and tested successfully. It has been developed by integrating all the features of all the hardware components used the functionality of the entire system has been tested thoroughly and it is said to function successfully.

Chapter 6 References

ASME standard

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Pavithra D.S, M. S .Srinath, “GSM based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile”, IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) Vol 11, Issue I, Jul-Aug 2014, pp 49-55.

Bogena H R, Huisman J A, OberdÊrster C, etal. Evaluation of a low cost soil water content sensor for wireless network applications [J].Journal of Hydrology, 2007.

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- **https://www.arduino.cc/en/Reference/LiquidCrystal**

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