DIY PROJECT REPORT

on

SMART IRRIGATION SYSTEM FOR SMALL INDOOR GARDENS

By

GROUP 5

Madhumitha Katreddy

Pavit Kumar Sidhu(20BT30018)

Sparsha Sherke

Kriti Bhardwaj (20CS30028)

Priyanshi Dixit(20CS10047)

INDEX

1. PROBLEM STATEMENT

It is important to focus on some vital characteristics such as the appropriate amount of electricity as well as water supply and a suitable schedule for irrigation of plants.We are facing problems in meeting these standards because of our fast and restricted lifestyles. Building a smart irrigation system for a small indoor garden project looks into developing an automated irrigation system that could be controlled automatically.It minimizes manual intervention in watering operations with increasing watering speed and preserving plants from fungi.

2. MOTIVATION

In the absence of residents of a home, it is necessary to have an automatic system to keep the indoor plants well irrigated. For this purpose, we need an irrigation system which will be "smart", i.e. able to monitor the level of soil moisture using sensors, and when the reading is below a threshold, it should trigger a small pump to carry water stored in a small tank to sprinkle on the plants and the soil, until the moisture level reaches optimal level. Having automatic garden watering systems frees up some precious time of an individual’s day to concentrate on other things and makes life easier.

Fig. Irrigation in small garden

3. OBJECTIVES

The objectives to be considered are:

- Simplify the irrigation system by installing and designing the whole irrigation system.
- Save energy, which allows the application of smart irrigation systems to be used in other applications.
- Optimize water consumption
- Fully Automated System
- Decrease the cost of operation.
- Make system easy to be used by consumers

4. INTRODUCTION

In our modern lifestyle we all have a small indoor garden in our apartment in order to have a little greenery in our polluted environment .But due to the time constraints of people , they are unable to take care of their plants manually which is compromising the life of green plants in homes. In dry areas or in case of inadequate rainfall, irrigation becomes difficult. So, it needs to be automated for proper yield and handled remotely for plants' water needs. Increasing energy costs and decreasing water supplies point out the need for better water management. Irrigation management is a complex decision making process to determine when and how much water to apply to growing plants to meet specific management objectives. So,efficient water management plays an important role in the indoor irrigated system.Nowadays some systems use technology to reduce the number of workers or the time required to water the plants.

Fig. Smart Irrigation System

5. SMART IRRIGATION SYSTEM

Smart irrigation systems are a combination of an advanced technology of sprinklers with nozzles that improve coverage and irrigation controllers that are watering and water conservation systems that monitor moisture-related conditions on your property and automatically adjust watering to optimal levels. Our focus is on moisture-based smart irrigation technology smart irrigation. Many factors must be taken into account for the proper installation of a smart irrigation system as follows :

1. Landscape beds on separate zones from
2. Sprinkler pressure and its placement
3. Nozzle selection of the sprinkler
4. Condition of the components, soil type and plant requirements

Fig. Smart Irrigation System

6. WHAT'S SMART ABOUT IT?

We are using an Arduino microcontroller to control and sense the things in the projects such as sensor or measure the moisture in the soil using soil moisture sensors.The soil moisture sensor is a sensor that measures moisture content when it comes in contact with moisture.When the moisture is more,then the value of resistance will decrease and when the moisture is less , then the resistance value is more.So we have to first calibrate the sensor into the different moisturizing condition of the water . Now we write the code according to the value.

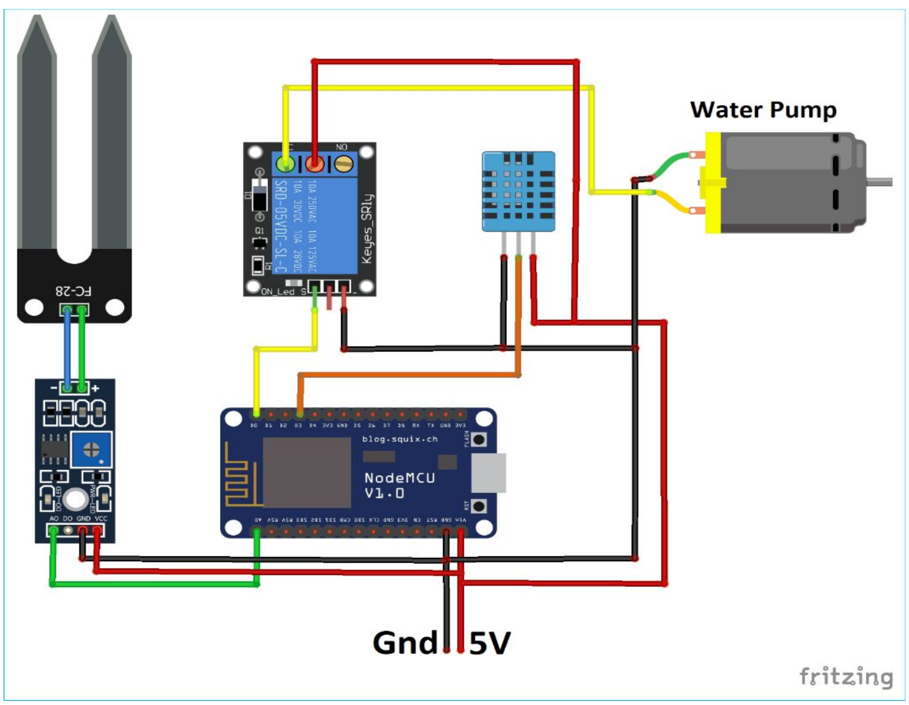

Fig. Arduino based Irrigation System

7. FLOW CHART

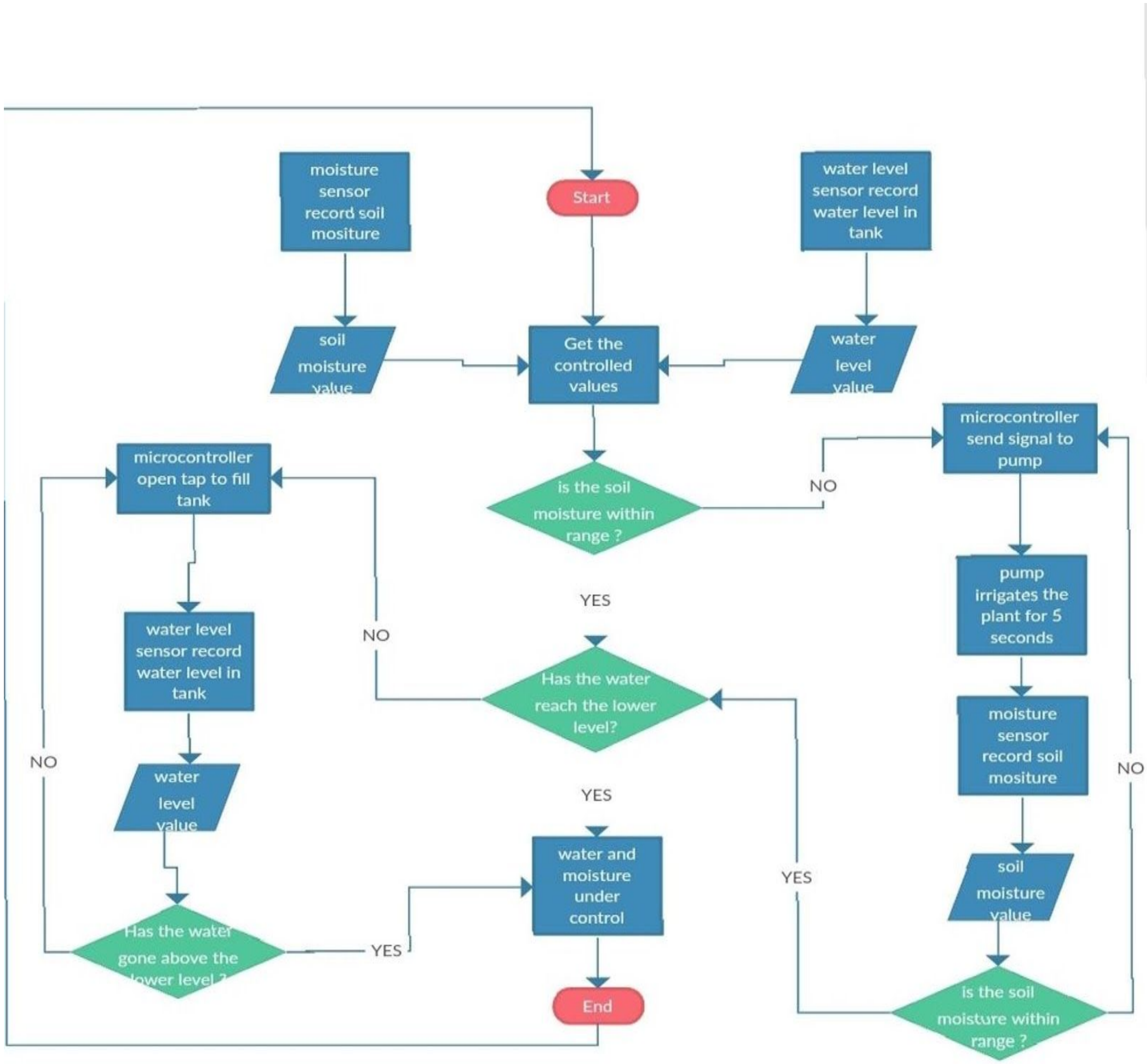

Fig. Flow Chart

8. COMPONENTS REQUIRED

8.1 Arduino

Arduino is an open source physical computing platform based on a simple input/output board and a development environment that implements the Processing language (www.processing.org). Arduino can be used to develop standalone interactive objects or can be connected to software on your computer. Arduino Software comes with an IDE(Integrated Development Environment) that helps writing, debugging and burning programs into Arduino. The IDE also comes with a Serial Communication window through which you can easily get the serial data from the board.

Input Voltage Limits : 6-20 V, Operating Voltage 5V, Digital i/O Pins : 14, Analog Input pins : 6

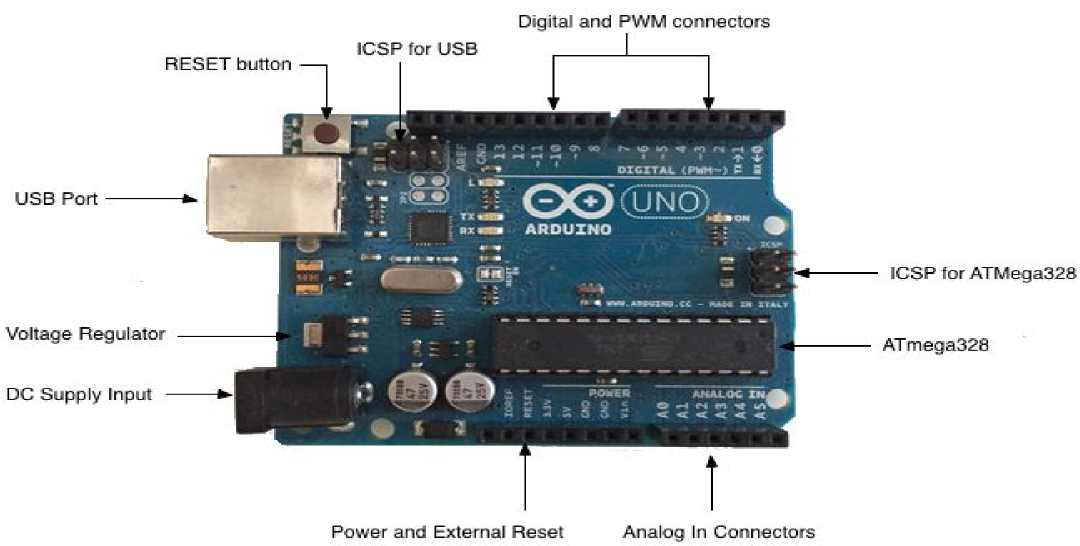

Fig.Arduino board

8.2 Moisture Sensor and LM393

Soil moisture is an important component in the atmospheric water cycle, both on a small agricultural scale and in large-scale modelling of land/atmosphere interaction. The soil moisture sensor is one kind of sensor used to gauge the volumetric content of water within the soil. These sensors measure the volumetric water content not directly but with the help of some other rules of soil like dielectric constant, electrical resistance, otherwise interaction with neutrons, and replacement of the moisture content. The LM393 driver is a dual differential comparator which compares the sensor voltage with a fixed 5V supply voltage.It has four pins-

- VCC - For power
- A0-Analog output
- D0- Digital Output
- GND- Ground

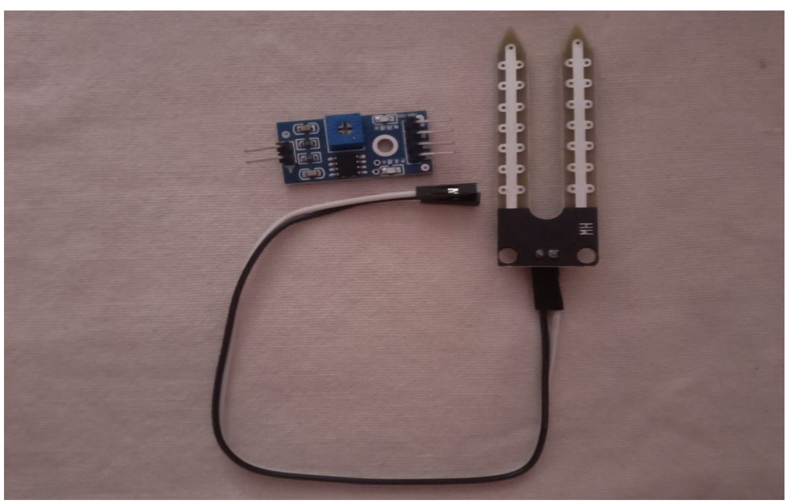

Fig. Moisture sensor and LM393

8.3 Relay

A relay is an electrically operated switch(5 V). The main operation of this device is to make or break contact with the help of a signal without any human involvement in order to switch it ON or OFF.

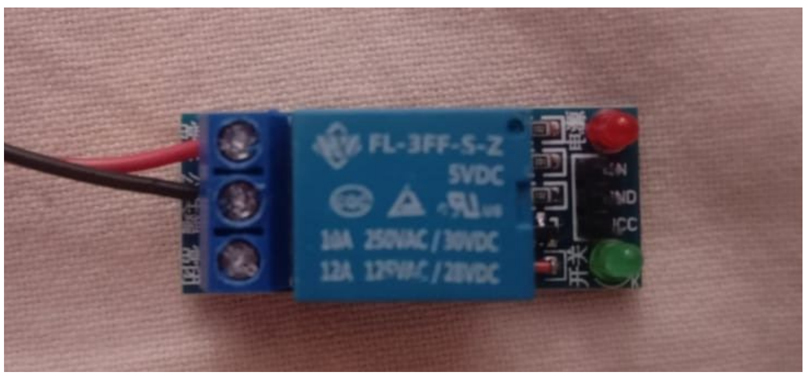

Fig. Relay Switch

8.4 Breadboard

A breadboard is used to make up temporary circuits for testing or to try out an idea. No soldering is required so it is easy to change connections and replace components. The top and bottom rows are linked horizontally all the way across as shown by the red and black lines on the diagram. The power supply is connected to these rows, + at the top and 0V (zero volts) at the bottom.

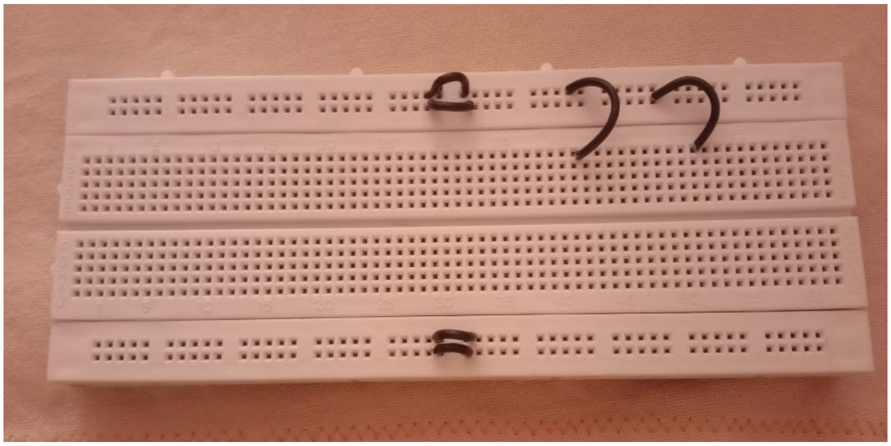

Fig.Breadboard

8.5 Water Level Switch

A float switch detects the level of a liquid in a tank or container. It floats on top of the liquid surface and acts as a mechanical switch as the liquid level goes up or down. They control devices like pumps (pump water in or out), valves , or alarms to notify users.

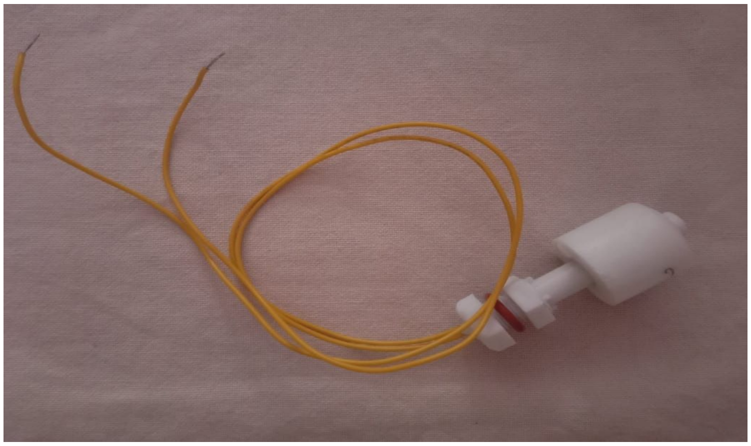

Fig. Water level switch

8.6 Sprinkler

An irrigation sprinkler (also known as a water sprinkler or simply a sprinkler) is a device used to irrigate agricultural crops, lawns, landscapes, golf courses, and other areas. Irrigation sprinklers can be used for residential, industrial, and agricultural usage. It is useful on uneven land where sufficient water is not available as well as on sandy soil. The perpendicular pipes, having rotating nozzles on top, are joined to the main pipeline at regular intervals. When water is pressurized through the main pipe it escapes from the rotating nozzles. It gets sprinkled on the crop.

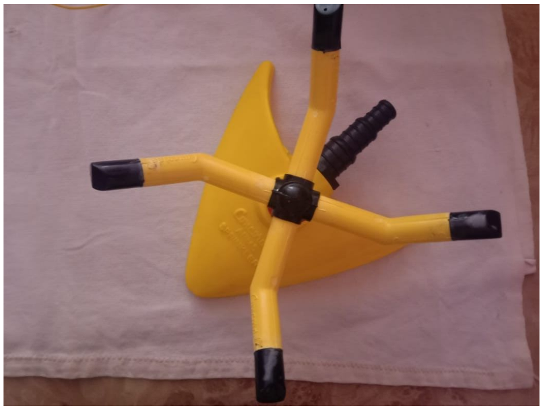

Fig. Sprinkler

8.7 LCD Screen

A liquid-crystal display (LCD) is a flat-panel display. LCDs are available to display arbitrary images or fixed images with low information content. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

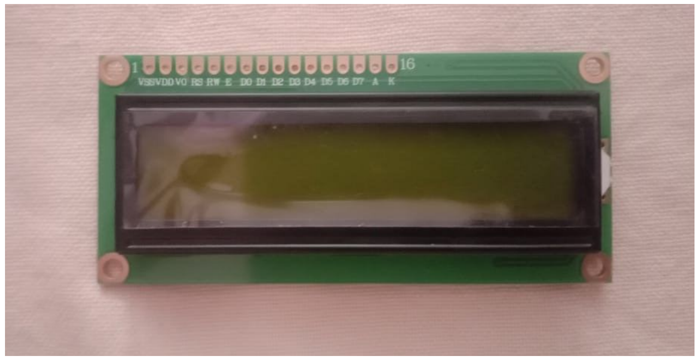

Fig. LCD screen

8.9 Jumper wire

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple.

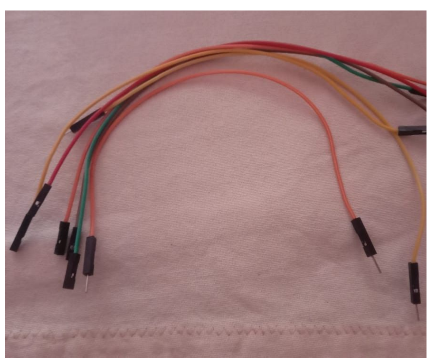

Fig. Jumper wires

8.10 Water Pump

This is lightweight, small size, high efficiency, low consumption and low noise water pump used for water supply. It can be controlled from a microcontroller Arduino using the DC Motor Drivers or one of the Relay Boards. It can be operated from a 2.5 ~ 6V power supply. It can take up to 120 liters per hour with very low current consumption of 220mA. Just connect a tube pipe to the motor outlet, submerge it in water and power it.

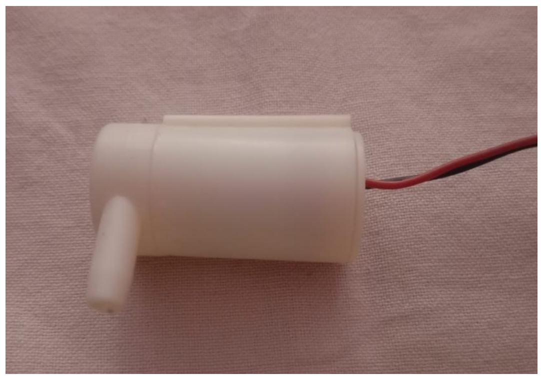

Fig. Water Pump

9. CONNECTION DETAILS

ARDUINO PINS
0__________________N/C
1__________________N/C
2__________________LCD-14
3__________________LCD-13
4__________________LCD-12
5__________________LCD-11
6__________________N/C
7__________________WATER_LEVEL_STATUS_LED
8__________________N/C
9__________________SPEAKER
10_________________N/C
11_________________LCD-6
12_________________LCD-4
13_________________PUMP_STATUS_LED)_AND_TO_RELAY
A0_________________SOIL_MOISTURE_SENSOR
A4_________________LM35

LCD-1______________GND
LCD-5______________GND
LCD-2______________+Vcc
LCD-3______________LCD_BRIGHTNESS*/

10. CODES INVOLVED

```
#include <LiquidCrystal.h> //LCD Library

#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 M_Sensor = A0;
int W_led = 7;
int P_led = 13;
int Speaker = 9;

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);

   lcd.setCursor(0,0);
   lcd.print("Project By:");
   lcd.setCursor(0,1);
   lcd.print("Group 5");
   delay(1000);
   lcd.clear();

    lcd.clear();
   lcd.setCursor(0,0);
   lcd.print("Project Topic:");
   lcd.setCursor(0,1);
   lcd.print("Smart Irrigation System");
   delay(1000);
}
```

```
void loop()
{

  lcd.clear();
  int Moisture = analogRead(M_Sensor); //Read Moisture Sensor Value
  lcd.setCursor(0,0);

  if (Moisture> 700)   // for dry soil
  {
        lcd.setCursor(11,0);
        lcd.print("DRY");
        lcd.setCursor(11,1);
        lcd.print("SOIL");
       if (digitalRead(W_led)==1) //test the availability of water in storage
       {
         digitalWrite(13, HIGH);
         lcd.setCursor(0,1);
         lcd.print("PUMP:ON");
       }
       else
       {
         digitalWrite(13, LOW);
         lcd.setCursor(0,1);
         lcd.print("PUMP:OFF");

           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>= 300 && Moisture<=700) //for Moist Soil
  {
    lcd.setCursor(11,0);
   lcd.print("MOIST");
   lcd.setCursor(11,1);
   lcd.print("SOIL");
   digitalWrite(13,LOW);
   lcd.setCursor(0,1);
   lcd.print("PUMP:OFF");
 }

 if (Moisture < 300)  // For Soggy soil
 {

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

11. SCHEMATIC DIAGRAM

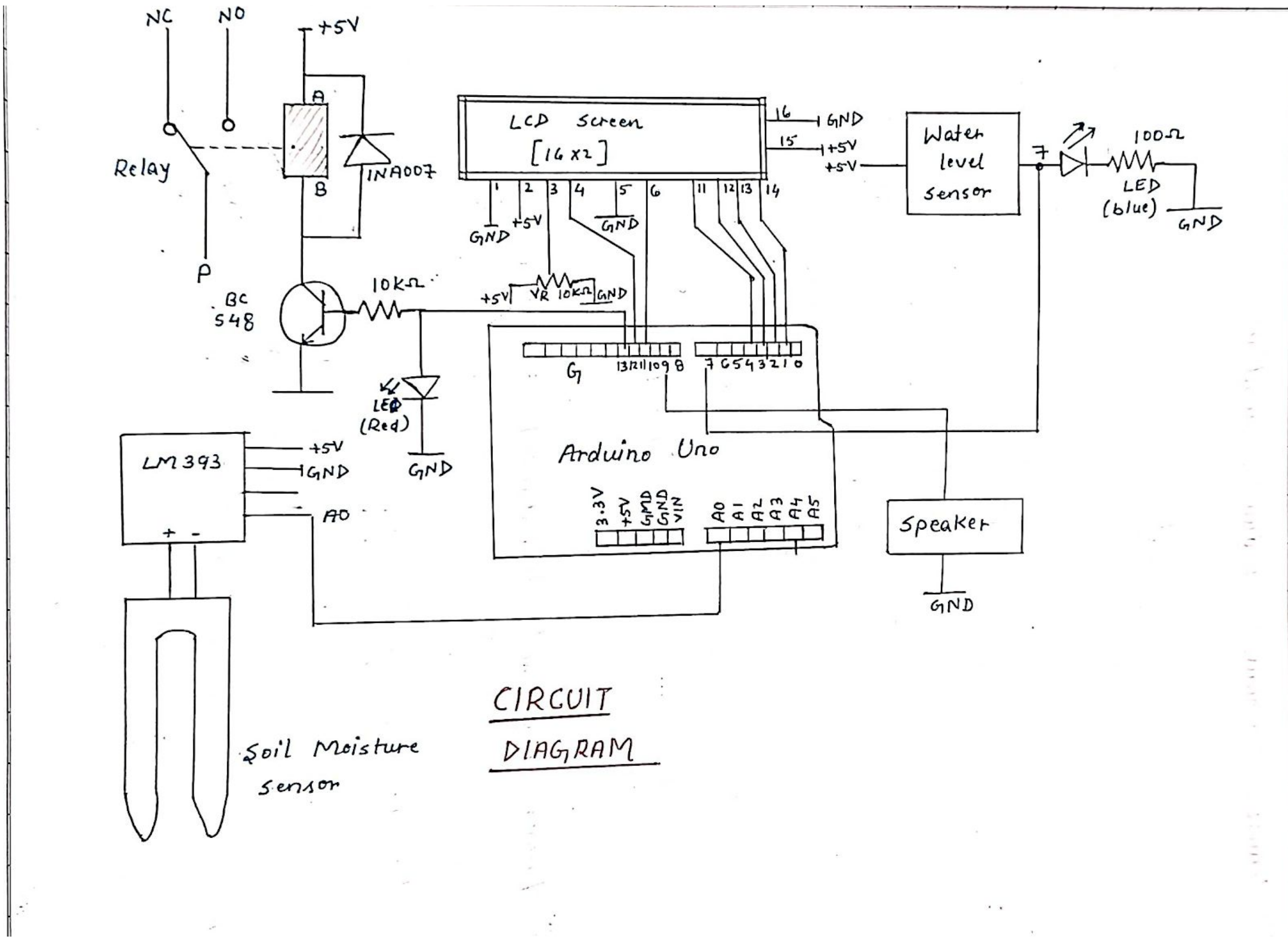

Fig. Schematic Diagram

12. HARDWARE SETUP

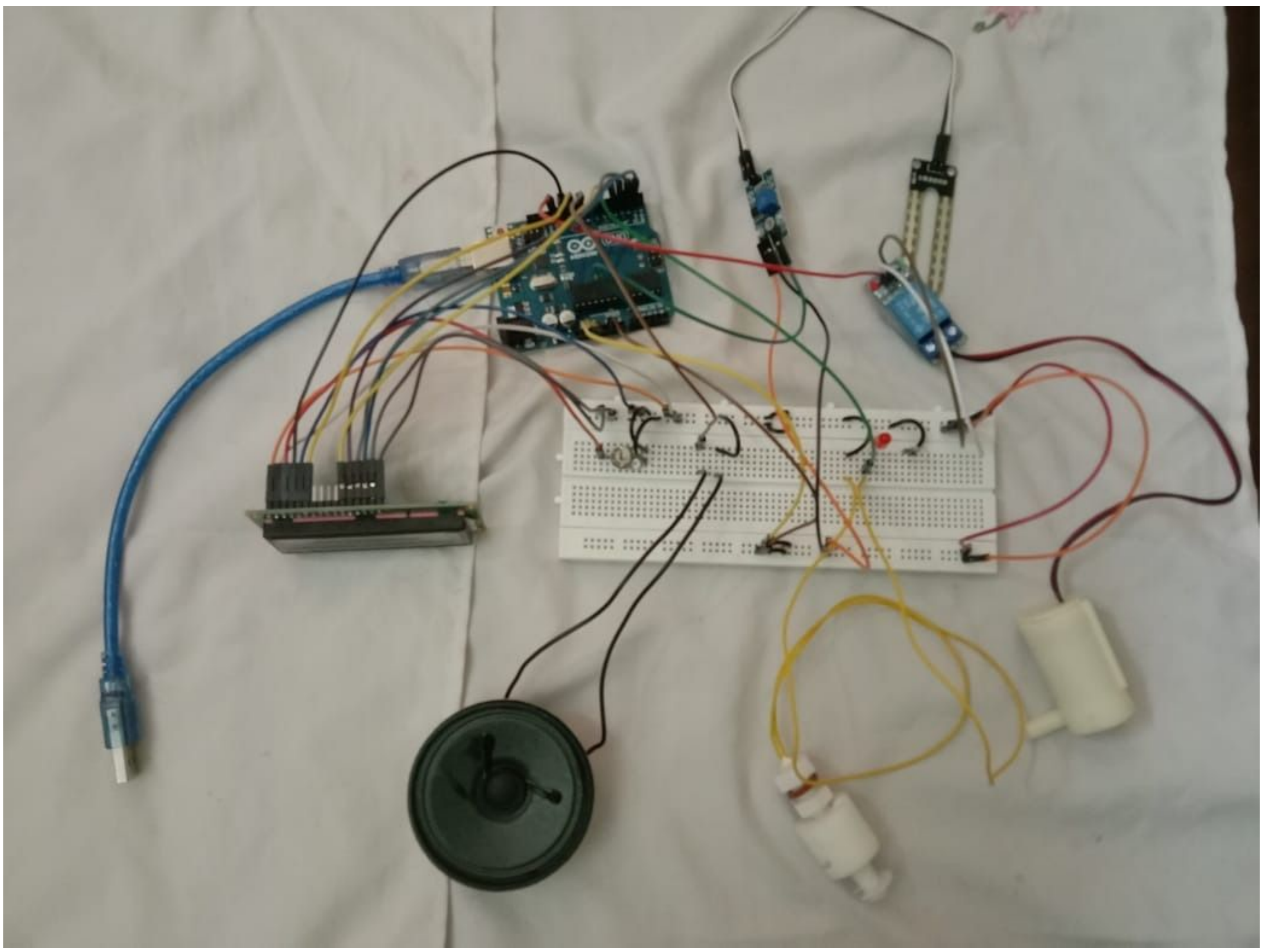

Fig. Hardware Connections

13 .WORK DONE

The project was completed in four weeks. Tasks performed in each week is as follows:

- **Week 1**: Collection of information about the project and components to be used for building smart irrigation systems.
- **Week 2**: Preparation of schematic of the project and arrangement of all the components.
- **Week 3**: Hardware connections were done but faced difficulty with the codes to be uploaded on Arduino.
- **Week 4**: Codes to be given to Arduino were finalised and executed the project successfully.

Work done by each member of the group is as follows:

- **Madhumitha Katreddy** -Preparing presentation for the project and collecting specific information
- **Sparsha Sherke** -
- **Pavit Kaur Sidhu** - Arranging and assembling all the components of the smart irrigation system.
- **Kriti Bhardwaj** - Collection of information on components to be used in the project , presentation of schematic, finalised the code to be uploaded and preparation of the final report for the project
- **Priyanshi Dixit** -Preparation of the final report,gathering knowledge about different components and finalised the code

14. SUMMARY

This project uses soil moisture sensors to detect the water quantity present in the soil. The project uses an Arduino microcontroller which is a controller to process the information. Different sensors (Soil Moisture, water level sensor) with different other devices (water pump, LCD, sprinkler, relay) have been used to make this project. Using Arduino proved profitable, it is able to control the whole system according to the provided code. Arduino boards are another device. The sensors used were perfect in detecting and sending signals to Arduino, to control the water pump.The purpose of the LCD screen monitor is to show the status of soil and water pump. Water will be supplied to the plants through the sprinkler. Pump will be turned off when soil has enough moisture. This way plants can be kept irrigated even if there is no one to look after at the garden.

15. CONCLUSION

With this project, we achieved successful results by testing out the moisture content in the soil using the soil moisture sensor and accordingly supplying water for plant irrigation through sprinklers. The aim of the implementation was to demonstrate that the automatic irrigation can be used to keep plants irrigated in the small indoor gardens.

The Arduino based automatic irrigation system is a simple and precise way of irrigation. Hence, this system is very useful as it reduces manual work of the humans and also helps in the proper utilization of resources. It eliminates the manual switching mechanism to ON/OFF the irrigation system as it is a fully automatic system controlled by Arduino. Fully automated gardens can be created using this principle in the right manner on a large scale.