A Project Report

on

AUTOMATED DRIP IRRIGATION SYSTEM

Submitted in partial fulfillment of the
requirement for the award of the degree of

B. Tech. Computer Science and Engineering

GALGOTIAS UNIVERSITY
(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

Under The Supervision of
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CANDIDATE'S DECLARATION

We hereby certify that the work which is being presented in the project, entitled **"AUTOMATED DRIP IRRIGATION SYSTEM"** in partial fulfillment of the requirements for the award of the B. Tech. Computer Science Engineering submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of October, 2021 to December, 2021, under the supervision of Mr. Gautam Kumar Assistant Professor, Department of Computer Science and Engineering, of School of Computing Science and Engineering, Galgotias University, Greater Noida.

The matter presented in the project has not been submitted by us for the award of any other degree of this or any other places.

Sarthak Luthra, 19SCSE1180075
Shahreen Ali, 20SCSE1180053

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Mr. Gautam Kumar
Assistant Professor

CERTIFICATE

The Final Project Viva-Voice examination of Sarthak Luthra: 19SCSE1180075 and Shahreen Ali: 20SCSE1180053 has been held on_____and his/her work is recommended for the award of B. Tech. Computer Science and Engineering.

Signature of Examiner(s) **Signature of Supervisor(s)**

Signature of Project Coordinator **Signature of Dean**

Date: December, 2021
Place: Greater Noida

Acknowledgement

This is a matter of great privilege for all of us to submit this project entitled **"Automated Drip Irrigation System"**. We take pleasure in expressing our deep sense of gratitude for providing necessary guidance to **Mr. Gautam kumar** in the department of Computer Science and Engineering at Galgotias University, Greater Noida for her kind and constant encouragement made it possible for us to complete this project work.

He has given us pragmatic sense to look into the matter and we are also highly obliged for his persistence in making the project complete. It gives us great pleasure to extend our sincere thanks to our colleagues, who helped us directly or indirectly to complete the project.

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Sarthak Luthra

Shahreen Ali

Abstract

Taking in consideration the present scenario, the scarcity of water is an issue we need to rectify as soon as possible. Our research idea aims to bring a change and to help preserve water. In the agriculture field, drip irrigation is the most sufficient method for proper growth while saving water. In the system being developed, the water will be provided according to the moisture of the soil. Arduino with smart sensors will help to achieve this task. A soil moisture sensor will determine the texture of the soil and accordingly the servo motor will release water from the tank into the particular tubes. This is an innovation to the most efficient and appropriate irrigation method. Hence, reducing wastage of water resources by following latest technological trend.

Keywords: ***Arduino, motor servo, agriculture, smart devices, soil moisture sensor.***

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Acronyms

WSN	Wireless Sensor Network
SMS	Short Message Service
LCD	Liquid Crystal Display
IDE	Integrated Development Environment
USB	Universal Serial bus
SIM	Subscriber Identity/Identification Module

CHAPTER-1 Introduction

The rapid increase in the food demand requires improvement in the current food production technology. The whole process of crop growth requires continuous monitoring of humans. This monitoring is not possible at all times and requires skilled farm workers. Our research idea solves this problem and is a suitable one which helps to irrigate the crops hence, minimizing human intervention.

Drip irrigation is the most efficient and appropriate irrigation method adopted to reduce the wastage of water resource with competitive low cost. It is also called drop by drop irrigation and underground irrigation. It functions as its name imply. The water is conveyed under pressure through a pipe system to the fields, where it drips slowly onto the soil through emitter or drippers, which are located close to the plants. It has the ability to irrigate irregular shaped fields without considering levelling of the field. Automated drip irrigation system is an innovation in the existing drip irrigation method, developed using advanced communication technology. The system will monitor soil moisture and its texture using sensors. The sensed information is display and taken into account, the system is integrated with a microcontroller which regulates the functionality of water pump to release water through pipes (which is a part of the system).

The soil moisture sensor used is LM393 driver, the value of this sensor varies from 0-1023 where 0 is moist condition and 1023 is very dry condition. The most popular microcontroller Arduino Uno is used for processing the information gathered (by sensors) and regulating the water pump. To have a good system for irrigation the microcontroller also checks for the availability of water using water level sensor. If the water is available, only then the pump is turned on and is turned off when the soil gets the sufficient amount of water.

The pump is driven by a relay driver which will notify with a sound if water is unavailable. Sensed information is displayed on LCD screen.

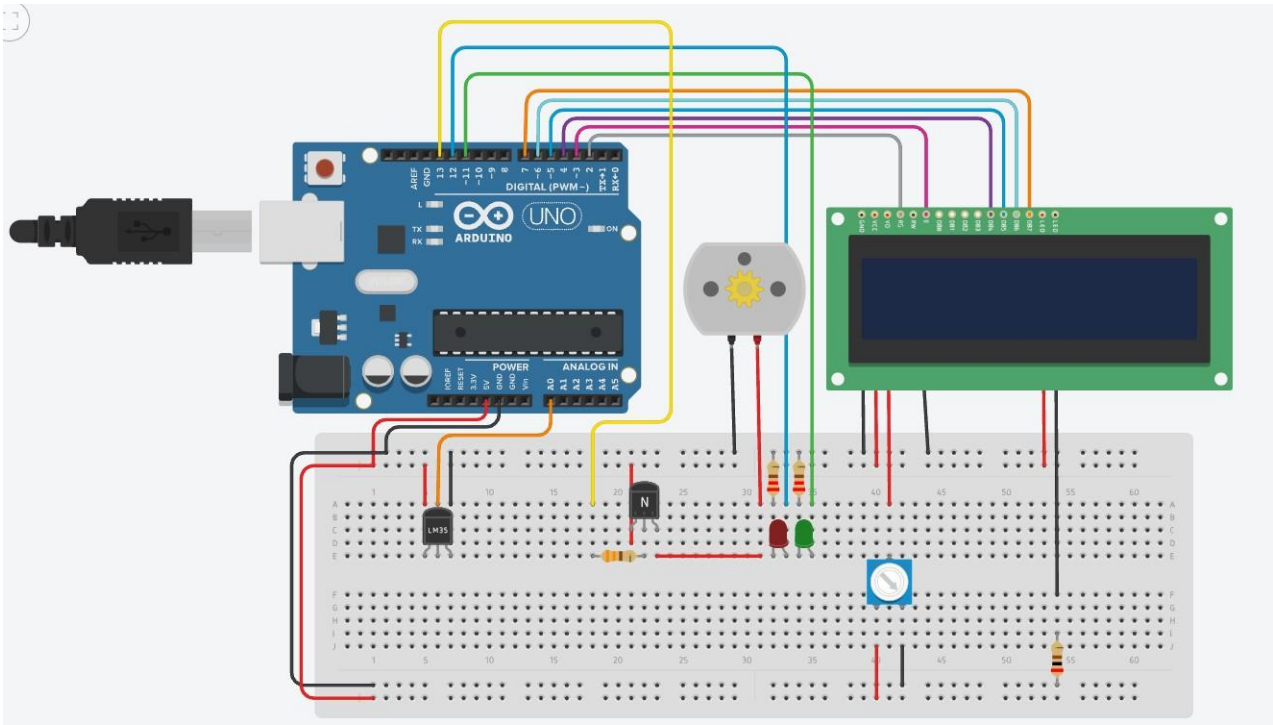

Fig. 1 Circuit Diagram

Figure 1, reveals the working of the system. The circuit diagram shows the actual electrical connections. The moisture and temperature sensors in the agriculture field are employed to sense the moisture and temperature levels of the soil. These sensors are integrated with a microcontroller which computes and process the sensed information. The transfer of the information takes place in the form of digital signals, processing which the microcontroller takes the action of regulating the water pump.

1.2. Tools and technology used

Arduino

It is an open-source platform used for building electronic projects. It consists of both a physical programmable circuit board and a piece of software, or IDE that runs on computer, used to write and upload computer code (a set of instructions to get a desired output) to the physical board. It uses a simplified version of C++, making it easier to learn to program. The code is loaded onto the physical board using an USB cable.

Fig. 2 Arduino UNO

Sensor

The sensor is an electronic equipment employed to identify and react to the natural phenomena and takes it as their input. The input such as moisture, temperature, light. The signals are generated as the output of the signal which is in the form of human-readable format to the specified location is transmitted through a network for further analysis. The sensors used in this project are temperature sensor and soil moisture sensor.

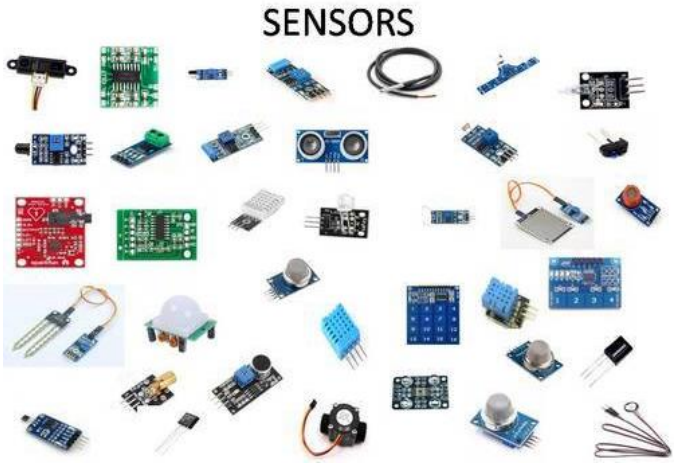

Fig.3 Sensors

Soil Moisture Sensor

The soil moisture sensor is used for measuring water content in the soil. It gathers the information by using properties such as, electrical resistance, dielectric constant or the capacitive resistance. It may vary based on the temperature conditions and type of soil. LM393 is the moisture sensor using in this project, which is a dual differential comparator that compares the sensor voltage with fixed 5V supply voltage.

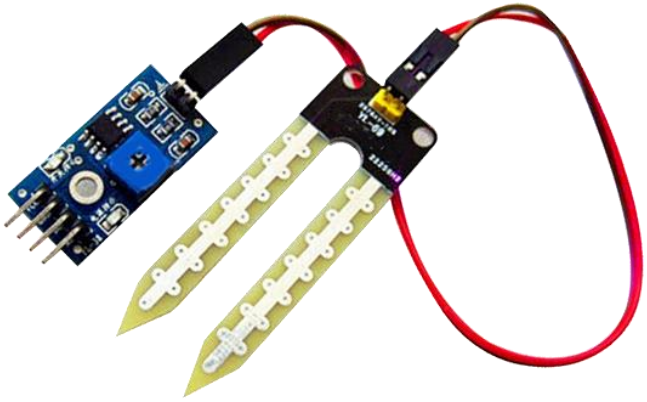

Fig. 4 LM393 Soil moisture sensor

Temperature Sensor

The temperature sensor senses the temperature from the various range of physical body. The sensing takes place in two ways either by direct or indirect method. In the direct method the source body makes a contact with the sensor while the indirect method is done without making contact with the source body instead it uses the radiating energy of the source. In this project we are using LM35 sensor which is a precision integrated-circuit temperature sensor, whose output voltage is linearly proportional to the Celsius temperature, ranging from -55 degrees to +120 degrees.

Fig. 5 LM35 Temperature Sensor

GSM Module

It is a hardware device that uses GSM mobile technology to provide a data link to a remote network. It requires a SIM to identify themselves to the network. It is used for two purposes, to send SMS using Arduino and GSM module – to a specified mobile number and to receive SMS using Arduino and GSM module – to the SIM card loaded in the module.

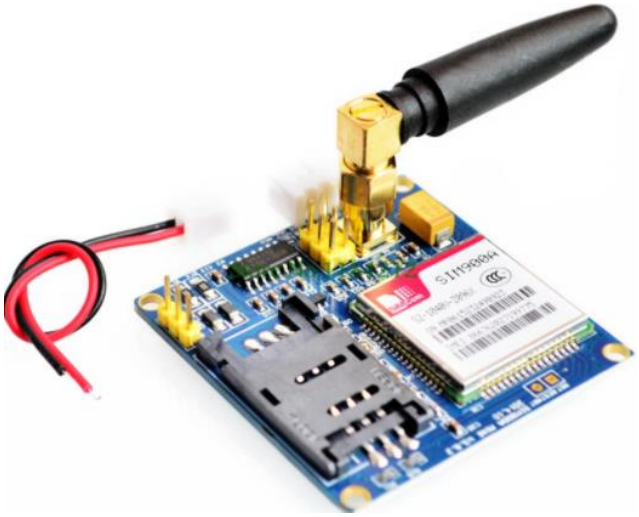

Fig. 6 GSM module

Relay Module

It is the device that open or closes the contacts to cause the operation of the other electric control. It detects the undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area through ON or OFF.

There is a water level switch used which contains a Reed-magnetic switch surrounded by a floating magnet. When water is available it conducts.

Fig. 7 Relay Module

CHAPTER-2 Literature Survey

Manish Giri, Dnyaneshwar Natha Wavhal (2013) proposed that there has been a numerous research and development in the field of agriculture and it is increasing at a great rate. Drip irrigation has proved to be the most efficient and advantageous as it minimizes the wastage of water by drop by drop supplying water and fertilizers to the root zone. Microcontroller based drip irrigation system is proved to have major advancement in the field.[1]

Shaik Ameer et al., 2015 describes the use of solar power for an automatic irrigation system to supply required water to the pump set. Solar module used to convert sunlight to electricity. The electricity produced from sunlight can be stored in batteries.[2]

Hema N. et al., 2014 propose a technique to predict real-time local weather parameter of interpolation using Automated Weather Station. Using sparse WSN with soil moisture sensor, this paper provides error correction and accuracy about 99.59% for real time interpolated data. The system provides past, present predict and future predict using nearby ASW data and control the irrigation in conditions like rainfall.[3]

Joaquin Gutierrez et al., 2015 represents that the sensor uses Smartphone to capture and process images of soils. Images can be capture to estimate the water content of the soil. The router estimates the water content of the soil. The router node is used to forward collected values to the gateway that provide automatically pump the water to the crop in the field. An android app used for connectivity such as Wi-Fi. Android app wakes up the Smartphone by using given parameters.[4]

Alvindarjit Singh et al., 2010 represents the design of a system which takes soil samples when an event triggered with an outside event such as rain event. The system has variable sampling rates with interface to soil sensors and rain gauge. Wireless soil sensor network monitors an event of rain and soil moisture content. Such system consists of rain detection module and sensory module.[5]

CHAPTER-3 Working of Project

The aim of the system is to irrigate the land eliminating the manpower. This system is best suited for drip irrigation technique. It works by using soil moisture and temperature sensor LM35. A Wireless Sensor Network is set up in the field which take in account the temperature and moisture of the soil. The network is connected with Arduino Uno to process the sensed data from the sensors.

In the system, the connection between the microcontroller and the sensor is set up by connecting the ground of the microcontroller and the sensor, the power supply will be given to Arduino. The two sensors are dipped into the crop field for monitoring. Based on the moisture of the soil, if the moisture level is low (which means soil is dry) the following operations are carried out:

- Using relay module, the availability of water in the tank is checked.
- If the water is available, the pump turns ON and the water is supplied through the pipe.
- If the water is not available in the water tank, you will be notified with a sound.

The routine activity of the irrigation is sent to the user. It is made possible using GSM module.

3.2. Circuit connections

The Arduino connections are given below.

Arduino pins:

2 --- LCD-14

3 --- LCD-13

4 --- LCD-12

5 --- LCD-11

7 --- LED for water level status

9 --- Speaker

11 --- LCD-6

12 --- LCD-4

13 --- Pump status LED and to Relay

A0 --- Soil moisture sensor

A4 --- Temperature sensor

LCD-1 --- GND

LCD-5 --- GND

LCD-2 --- +Vcc

Refer to the circuit diagram to make the connections and better understanding of the system.

3.3. Microcontroller

The operations are executed by the microcontroller with the help of the sensed data. The data is sent at several time intervals in a day. The temperature is sensed in the analogue form which is converted to the digital form by the microcontroller itself. The motor is turned ON/OFF based on the command passed by the microcontroller, which depends on the moisture level. The moisture level is determined by the comparison in the sensed data and the pre-defined value.

3.4. Notification using GSM

First, boot the GSM module, insert a SIM card to it. Turn it ON using the adapter. Test it by making a call to a mobile number stored in that SIM card. Once, the network is established successfully, we have to connect it with Arduino.

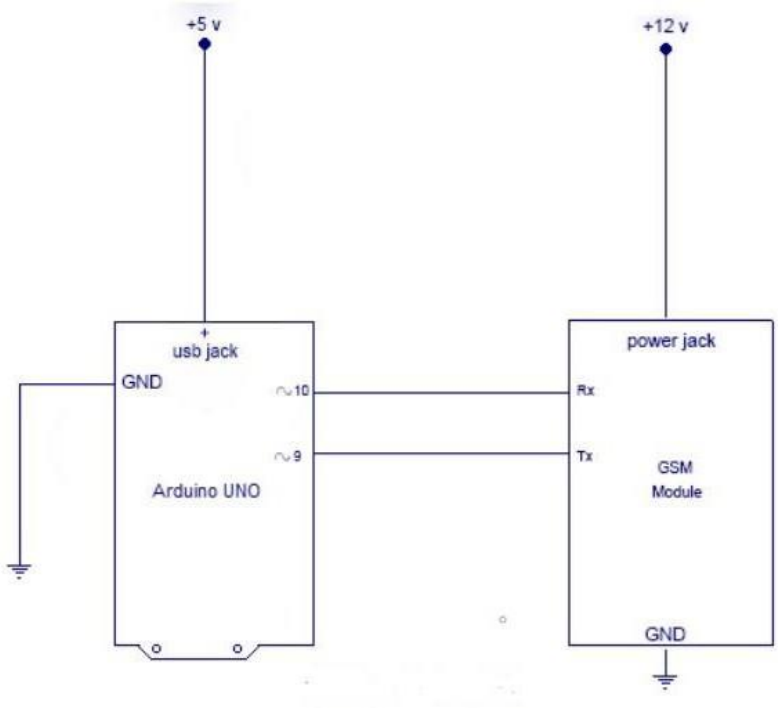

Fig. 8 GSM module connections

Two digital pins are used for serial communication [PWM enabled pins]. A library SoftwareSerial is used which enables serial data communication through other digital pins of Arduino. After successful setup, the microcontroller can send SMS alerts to the user. The daily monitored data and the irrigation actions done by the microcontroller are sent to the user.

Chapter-4: Results

4.1. Uploading the code to microcontroller

The Arduino code is written in C++ which contain some instructions and conditions according to which the hardware works. Steps to upload the code to Arduino are as follows:

1. Connect the Arduino board with a laptop via USB.
2. Select COM Port and your Arduino board from tools options.
3. Click upload button. Done.

Now, dip the sensors in the soil, for better results place it near the roots of a plant. Make sure all the connections are correct. Test the system in dry, soggy and moist conditions. The potentiometer can be varied to adjust the LCD brightness.

4.2 Source Code

```
#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 temp;
int T_Sensor = A4;
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);

    val = analogRead(T_Sensor); //Read Temperature sensor value
    int mv = ( val/1024.0)*5000;
    cel = mv/10;



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

     lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("Project By:");
    lcd.setCursor(0,1);
    lcd.print("Sandesh Hegde");
    delay(1000);
}

void loop()
{

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

  lcd.setCursor(0,0);
  lcd.print("TEMP:");
  lcd.setCursor(5,0);
  lcd.print(cel);
  lcd.setCursor(7,0);
  lcd.print("*C");

 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);
}
```

4.3 Output

Following snapshots show the system's working:

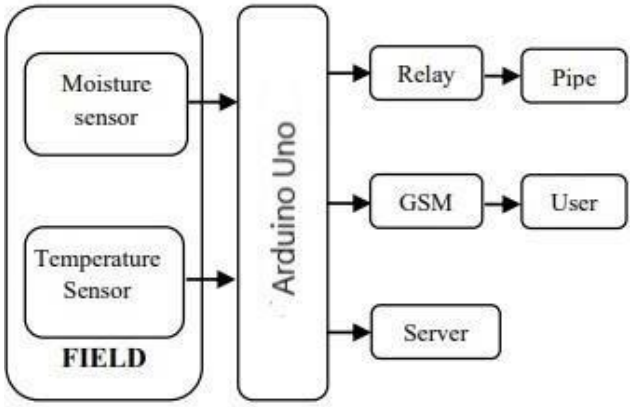

Fig. 9 System diagram

Fig. 10 Proposed system

CHAPTER-5: Conclusion and Future Scope

5.1. Conclusion

Agriculture sector is one of the most important industries contributing to the Indian economy. Irrigation plays an important role in crop growth. Drip irrigations techniques are already implemented and is used to save and regulate water in the fields. In this new era of automation and reducing human intervention, the automated drip irrigation system is proposed. This system will monitor the real-time conditions of the soil and further irrigation process will be carried out. It is a reliable and user-friendly system. The wireless server network makes this system possible and run efficiently. An add on to this system is the GSM module for communicating the status or the sensed data to a mobile number. So, the farmer can keep track when away from the field.

5.2 Future Scope

This system reduces the regular monitoring of the field. It can be further improved by utilizing other parameters such as nitrogen content and CO_2 level in greenhouse. The same information can be updated to the user. The WSN employed in this system can be updated to include more sensors. Hence, making the proposed system scalable.

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