A REPORT ON AUTOMATIC IRRIGATION SYSTEM

A Micro Controllers and Embedded Systems Project Report

Submitted in partial fulfillment of the requirements for

the award of the Degree of

Bachelor of Technology
In
Electronics and Communication Engineering
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CERTIFICATE

This is to certify that the Micro Controllers and Embedded System Project Report entitled **"Automatic Irrigation System"** is a Bonafide record of work carried out by O.Chandrika(21481A04G8), L.VijayKumar(21481A04D2), M.Srinivas(21481A04E2) B.Leena(20481A0436) under my guidance and supervision in partial fulfillment of the requirements for the award of degree of Bachelor Of Technology **in Electronics and Communication Engineering** by **Jawaharlal Nehru Technological University, Kakinada.**

E. Vargil Vijay
Project Guide

Dr. B. Rajasekhar
Head of the Department

Acknowledgement

We wish to express our gratitude to those who extended their valuable co-operation and contribution towards the successful completion of this project. We would like to thank my project guide **E. Vargil Vijay, (Assistant Professor),** for his valuable time and continued assistance in the completion of the project. Without their support and guidance, it would not have been possible for this project to have materialized and taken a concrete shape.

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We would like to take this opportunity to express our profound sense of gratitude to our beloved

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Abstract

In this project an automation of farm irrigation and soil moisture control by Arduino using soil moisture sensor. This automatic irrigation system senses the moisture content of the soil and automatically switches the pump when the power is on. A proper usage of irrigation system is very necessary because the main reason is the shortage of land reserved water due to lack of rain, spontaneous use of water and as a result substantial amounts of water go wasted. For this reason, we use this automatic plant watering and soil moisture monitoring system and this system is extremely useful in all climatic conditions. India is the agriculture-based country

Our most of peoples are completely depended on the agricultural harvesting. Agriculture is a source of employment of majority Indians and has great impact on the economy of the country. In dry areas or in case of lacking rainfall, irrigation becomes difficult. So, it needs to be automated for proper watering a plant and handled remotely by farmer. When the soil goes dry, the pump will start watering. The implementation aims to reduce water use and automatic irrigation can be used for saving time and low power monitor devices.

The aim of the implementation of this project was to demonstrate that automatic plant irrigation can be used to reduce water use and save time.

Table of Content

CHAPTER 1

INTRODUCTION

The main aim of this project was to provide water to the plants or gardening automatically using microcontroller (Arduino Uno). We can automatically water the plants when we are going on vacation or not, we must bother my neighbors, Sometimes the neighbors do too much watering and the plants end up dying anyway. There are timer-based devices available in India which waters the soil on set interval. They do not sense soil moisture and ambient temperature to know if the soil needs watering. Assimilation is an artificial application of water to the land or soil used to help grow agricultural crops, maintain landscapes, and re vegetation of disturbed soils in dry areas and during inadequate rainfall. When a zone comes on, the water flows through the lateral lines and ends up at the irrigation electrode (drip) or mechanical device heads. Several sprinklers have pipe thread inlets on the lowest that permit a fitting and the pipe to be connected to them.

The sprinklers are usually used in the top of the head flush with the ground surface. As the method of dripping will reduce huge water losses it became a popular method by reducing the labor cost and increasing the yields. When the components are activated, all the components will read and give the output signal to the controller. 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, and serial monitor windows.

There are many systems available to water savings in various crops, from basic ones to more technologically advanced ones. For instance, in one system plant watering status was monitored and irrigation scheduled based on temperature presents in soil content of the plant.

1.2 Aim of the Project:

The aim of this project is to Detect the Moisture Content in Soil Particles and then Sprinkle the Required amount of water on the top of the soil.

1.3 Objective

The main Objective of this Project is to Make an automatic control system for watering the plants. System controlled by using moisture sensor, relay module and the Arduino. • Check the moisture content in the soil, by referring moisture sensor signal Arduino start to work.

1.4 Software Required:

- **Arduino IDE:**

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Fig.1.1 Arduino IDE Icon

- **Proteus software:**

The proteus design suite combines each of use with a powerful feature set to enable the rapid, design, test and layout of professional printed circuit board.

Fig.1.2 Proteus software Icon

CHAPTER 2

Overview of Arduino

An Arduino board is an open-source platform used for building electronics projects. Arduino is a programmable circuit board which we can write a program based on your projects. Arduino program will be uploading with IDE (Integrated Development Environment) software that runs on your computer, it is used to write and upload computer code to the Arduino physical board. Arduino language is merely a set of C/C++ functions that can be called from your code.

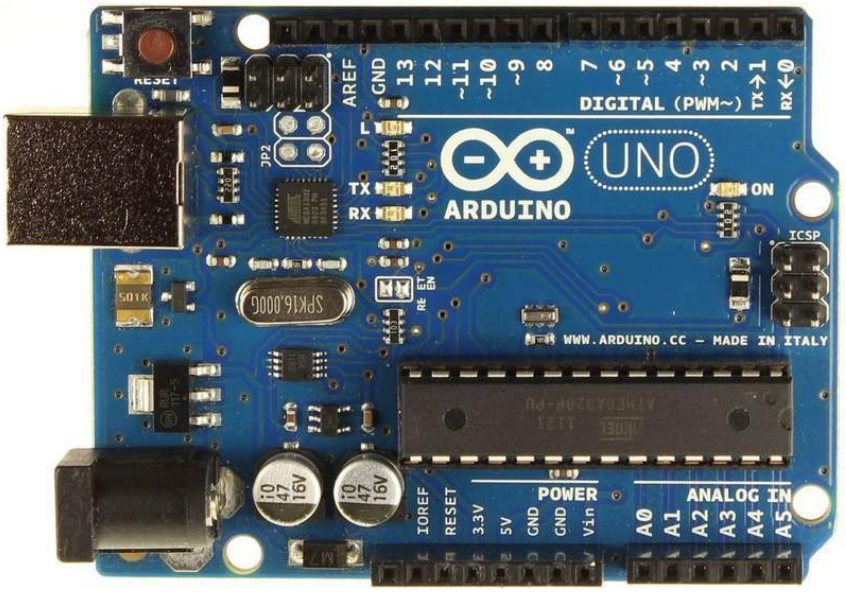

Fig.2 Arduino Uno R3 board

Arduino has special Features of:

- Inexpensive
- Cross-platform
- Simple, clear programming environment
- Open source and extensible software

CHAPTER 3
Block Diagram and Explanation

3.1 Block Diagram

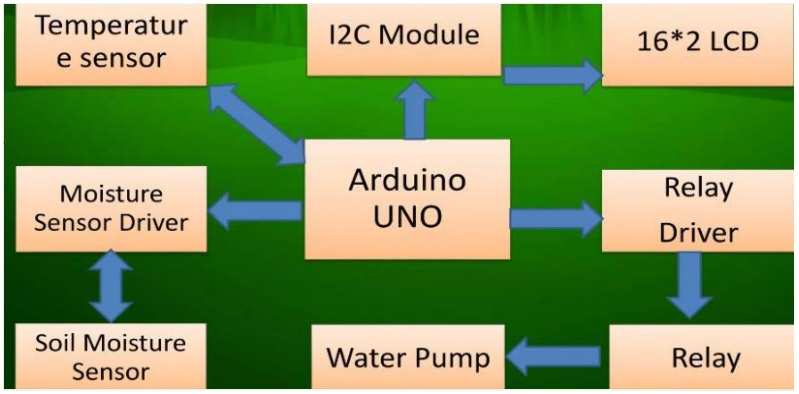

Fig.3 Block Diagram for the Project

3.2 Block Diagram Explanation

Soil moisture sensors are connected to Arduino board for analog input, so we can get temperature content present in soil. Vcc pins are connected through 5V Arduino pins. GND pin represents ground to connect all components. D7 is known as a digital pin, so it relates to transistors to amplify low power. Motor driver module VCC pin connected through D13 pin of Arduino board, based on temperature monitor it pass the current to the motor pump, D7 pin is used for Ground. We can write values as output. D7 connected through resistors 1k, and same connection goes through transistors for low amplifying current. In transistor has three pins which we called Emitter, base and collector.

Thus the “Automated Irrigation system based on soil moisture using Arduino” has been designed and tested successfully. It has been developed by integrated features of all the hardware components used.

CHAPTER 4
Working Title Explanation

Components Required

- Arduino Uno – 1
- Soil Moisture Sensor -1
- Resistors - 1kohm - 1
- Potentiometer - 1KOhm - 2
- Inductor - 27uH - 1
- Capacitor - 100uf - 1
- Temperature Sensor (LM 35)- 1
- Relay - 1
- Transistor (BC547) - 1
- Motor - 1
- 16x2 Alphanumeric LED Display
- Water Level Sensor-1

4.1 Arduino Uno

Arduino board is an open-source platform used for building electronics projects. Arduino is a programmable circuit board which we can write a program based on your projects. Arduino program will be uploading with IDE (Integrated Development Environment) software that runs on your computer, it is used to write and upload computer code to the Arduino physical board. Arduino language is merely a set of C/C++ functions that can be called from your code.

Fig.4.1 Arduino Uno

4.2 Soil Moisture Sensor

Soil moisture sensors measure the humidity of water content in soil. Since the direct hydrometric measuring of free-soil wetness needs removing, drying, and coefficient of a sample.

Fig.4.2 Soil Moisture Sensor

4.3 Resistors

A Resistor is an electrical device may be a passive two-terminal electrical part that implements resistance as a circuit component. In electronic circuits, resistors unit of measurement accustomed reduce current flow, alter signal levels, divide voltages, bias active components, and terminate transmission lines, among completely different uses.

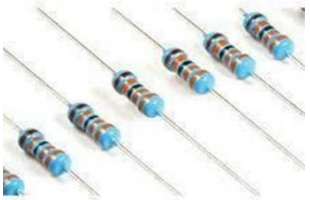

Fig.4.3 Resistor

4.4 Potentiometer

A potentiometer (also known as a pot or potmeter) is defined as a 3 terminal variable resistor in which the resistance is manually varied to control the flow of electric current,

A potentiometer acts as an adjustable voltage divider.

Fig.4.4 Potentiometer

4.5 Inductor

An Inductor, also called a coil, choke, or reactor, is a passive two-terminal electrical component that stores energy in a magnetic field when electric current flows through it, An Inductor typically consists of an insulated wire wound into a coil.

Fig.4.5 Inductor

4.6 Capacitor

A Capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals.

The effect of a capacitor is known as capacitance. While some capacitance exists between any two electrical conductors in proximity in a circuit, a capacitor is a component designed to add capacitance to a circuit. The capacitor was originally known as a condenser.

Fig.4.6 Capacitor

4.7 Temperature Sensor (LM 35)

LM35 is a precession Integrated circuit Temperature sensor, whose output voltage varies, based on the temperature around it. It is a small and cheap IC which can be used to measure temperature anywhere between -55°C to 150°C. It can easily be interfaced with any Microcontroller that has ADC function or any development platform like Arduino

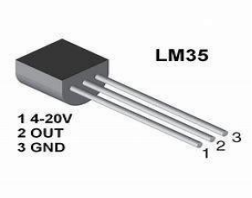

Fig.4.7 Temperature Sensor (LM 35)

4.8 Relay

A relay is an electrically operated switch. Several relays use a magnet to automatically operate a switch, however alternative operation principles are used, like solid state relays. Relays are used wherever it's necessary to regulate a circuit by a separate low-power signal, or wherever many circuits should be controlled by one signal. The essential relays were handled in long distance communication circuits as amplifiers, they unbroken the signal coming back in from one circuit and re-transmitted it on another circuit.

Fig.4.8 Relay

4.9 Transistor (BC547)

The BC547 transistor is an NPN transistor. A transistor is nothing but the transfer of resistance which is used for amplifying the current. A small current of the base terminal of this transistor will control the large current of emitter and base terminals. The main function of this transistor is to amplify as well as switching purposes. The maximum gain current of this transistor is 800A.

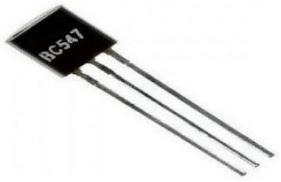

Fig.4.9 Transistor (BC547)

4.10 Motor

An AC motor is an electrical motor driven by an Associate in alternating current (AC). In figure: 5, The AC motor normally consists of two basic components, an outdoor stationary stator coil having coils furnished with AC to supply a rotating flux, and an indoor rotor connected to the output shaft manufacturing a second rotating flux. The rotor flux could also be made by permanent magnets, reluctance striking, or DC or AC electrical windings.

Fig.4.10 Motor Pump

4.11 16x2 Alphanumeric LED Display

16×2 LCD is named so because; it has 16 Columns and 2 Rows. There are a lot of combinations available like 8×1, 8×2, 10×2, 16×1, etc. but the most used one is the 16×2 LCD. So, it will have (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots.

Fig.4.11 16x2 Alphanumeric LED Display

4.12 Water Level Sensor

Proteus L5 WiFi Water Level Sensor is designed to detect water/ liquids when it hits and pushes the float switch up. After you have completed the Wi-Fi Setup process outlined in the Quick Start Guide, Position the float switch at the height of water/ liquid that you want to be notified.

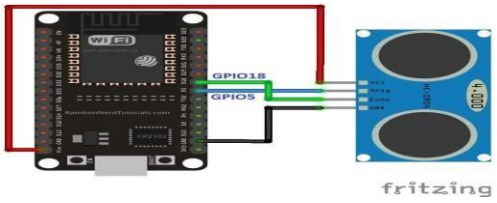

Fig.4.12 Water Level Sensor

CHAPTER 5
Circuit Diagram & Explanation

5.1 Circuit

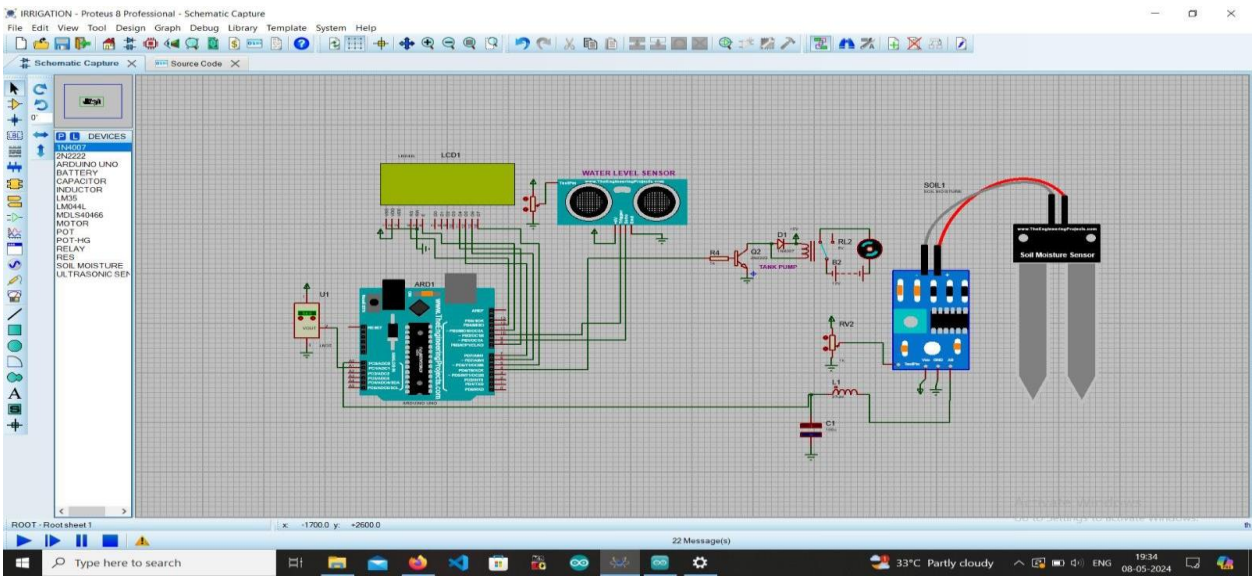

Fig.5 Circuit Connections

5.2 Circuit Explanation

The soil moisture sensor module is connected to the Arduino Uno board. The module has three pins: VCC, GND, and AO (analog output). VCC and GND are connected to 5V and GND pins of the Arduino board, respectively. The AO pin is connected to an analog input pin of the Arduino board (such as A0). The relay module is also connected to the Arduino board. The module has three pins: VCC, GND, and IN. VCC and GND are connected to 5V and GND pins of the Arduino board, respectively. The IN pin is connected to a digital output pin of the Arduino board (such as pin 7). When the soil moisture level is below a certain threshold (determined by the code), the voltage output of the soil moisture sensor module increases. The Arduino reads this voltage using the analog input pin and compares it with the threshold value. If the value is below the threshold, the Arduino sends a signal to the relay module through the digital output pin to activate the water pump. The water pump is connected to the relay module. When the relay module receives a signal from the Arduino, it switches on the water pump. The pump starts irrigating the plants until the soil moisture level reaches the desired level. Once the desired level is reached, the Arduino turns off the pump by sending a signal to the relay module.

Overall, this circuit ensures that the plants are watered only when the soil moisture level is below the desired level, saving water and ensuring optimal plant growth.

CHAPTER 6
Source Code

6.1 Code:

```
#include<LiquidCrystal.h>
#define echo 9
#define trigger 10
#define tank_pump 4

#define moisture_sensor A0 #define
tempPin A1
long duration; int
distance;
int moisture_value; int
distance_percent; int
moist_percent; float temp;
LiquidCrystal lcd(12,11,8,7,6,5);


void setup1()
{
pinMode(tempPin, INPUT);
Serial.begin(9600);
}

void loop1()
{
temp = analogRead(tempPin); temp =
(temp *5.0*100.0)/1024.0;
Serial.println(temp);
delay(100);
}



//LCD DISPLAY
void setup ()
{
lcd.begin(20,4); Serial.begin(9600);
pinMode(echo,INPUT);
pinMode(moisture_sensor,INPUT);
```

```
 pinMode(trigger,OUTPUT);
 digitalWrite(trigger,LOW);
 pinMode(tank_pump,OUTPUT);
digitalWrite(tank_pump,LOW);
lcd.setCursor(0,0);
lcd.print("WELCOME");
lcd.setCursor(0,1);
lcd.print("AUTOMATED IRRIGATION");
lcd.setCursor(0,2);
lcd.print("SYSTEM");
delay(500);
lcd.clear();
 }

 // WATER LEVEL SENSOR.
 void loop()
 {
 digitalWrite(trigger,LOW);
 delayMicroseconds(2);
  digitalWrite(trigger,HIGH);
 delayMicroseconds(10);
  digitalWrite(trigger,LOW);
  duration=pulseIn(echo,HIGH);
 distance=duration*0.017;
 distance_percent=map( distance,0,1023,0,100);
 moisture_value= analogRead(moisture_sensor);
 moist_percent=map(moisture_value,0,1023,0,100);
 condition();
 loop1();
 }


 //MAIN WORKING
 void condition()
 {
 if (distance_percent>50 && moist_percent<70)
 { LCD_3();
 digitalWrite(tank_pump,LOW);
 delay(500);
 }
 else if (distance_percent<65 &&moist_percent>85)
                                                    {
```

```
LCD_2();
digitalWrite(tank_pump,HIGH);
delay(500);
}else if (distance_percent>65 &&moist_percent>85)
{ LCD_4();
digitalWrite(tank_pump,LOW);
delay(500);
}
else if (distance_percent<65 &&moist_percent<85)
{ LCD_1();
digitalWrite(tank_pump,HIGH);
delay(500);
}
}


//DIFFRENT LCD DISPLAY FUNCTIONS
void LCD_1()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("TANK LEVEL= ");
lcd.print(distance_percent);
lcd.print("%"); lcd.setCursor(0,1);
lcd.print("MOISTURE STATUS= ");
lcd.print(moist_percent);
lcd.print("%");lcd.setCursor(0,2);
lcd.print("TANK PUMP:");
lcd.print("ON");
}

void LCD_2()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("TANK LEVEL= ");
lcd.print(distance_percent);
lcd.print("%");
lcd.setCursor(0,1);
lcd.print("MOISTURE STATUS= ");
lcd.print(moist_percent);
lcd.print("%");
lcd.setCursor(0,2);
lcd.print("TANK PUMP:");
lcd.print("ON");
}
```

```
void LCD_3()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("TANK LEVEL= ");
lcd.print(distance_percent);
lcd.print("%"); lcd.setCursor(0,1);
lcd.print("MOISTURE STATUS= ");
lcd.print(moist_percent); lcd.print("%");
lcd.setCursor(0,2); lcd.print("TANK
PUMP:");
lcd.print("OFF");
}
void LCD_4()
{
lcd.clear();
lcd.setCursor(0,0);
lcd.print("TANK LEVEL= ");
lcd.print(distance_percent);
lcd.print("%"); lcd.setCursor(0,1);
lcd.print("MOISTURE STATUS= ");
lcd.print(moist_percent);
 lcd.print("%");
lcd.setCursor(0,2);
 lcd.print("TANK PUMP:");
lcd.print("OFF");
}
```

CHAPTER 7

Result

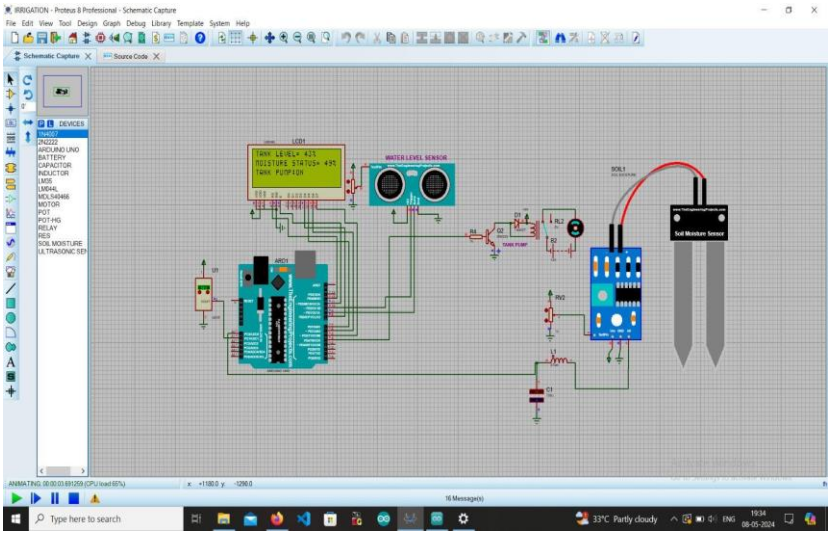

Fig. Circuit in Working Condition

CHAPTER 8

Conclusion

Thus the "**Automated Irrigation system using Arduino**" has been designed and tested successfully. It has been developed by integrated features of all the hardware components used. In this figure showing pin diagram of project. The presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Thus, the Arduino Based Automatic Plant Watering System has been designed and tested successfully. The system has been tested to function automatically. The moisture sensors measure the moisture level (water content) of the different plants.

If the moisture level is goes to be below the desired and limited level, the moisture sensor sends the signal to the Arduino board which triggers the Water Pump to turn ON and supply the water to respective plant using the Rotating Platform/Sprinkler. When the desired moisture level is reached, the system halts on its own and the water Pump is turned OFF.

Thus, the functionality of the entire system has been tested thoroughly and it is said to function successfully.

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