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COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
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ARDUINO BASED AUTOMATIC PLANT IRRIGATION SYSTEM WITH MESSAGE ALERT

A MINOR PROJECT- I REPORT

Submitted by

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BACHELOR OF ENGINEERING

in

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

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BONAFIDE CERTIFICATE

Certified that this **18ECP103-Minor Project I** report **AUTOMATIC WATER IRRIGATION SYSTEM USING ARDUINO** is the bonafide work of **HARISH.R (927622BEC068), KISHORE KUMAR.A.R (927622BEC101), MARAN.S (927622BEC117), MOWLIDHARAN.S (927622BEC125)** who carried out the project work under my supervision in the academic year **2023-2024 – EVEN.**

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This report has been submitted for the **18ECP104L – Minor Project-I** final review held at M. Kumarasamy College of Engineering Karur on _____

_____

PROJECT COORDINATOR

INSTITUTION VISION AND MISSION

Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

M1: Produce smart technocrats with empirical knowledge who can surmount the global challenges.

M2: Create a diverse, fully -engaged, learner -centric campus environment to provide quality education to the students.

M3: Maintain mutually beneficial partnerships with our alumni, industry and professional associations

DEPARTMENT VISION, MISSION, PEO, PO AND PSO

Vision

To empower the Electronics and Communication Engineering students with emerging technologies, professionalism, innovative research and social responsibility.

Mission

M1: Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.

M2: Inculcate the students in problem solving and lifelong learning ability.

M3: Provide entrepreneurial skills and leadership qualities.

M4: Render the technical knowledge and skills of faculty members.

Program Educational Objectives

PEO1: **Core Competence:** Graduates will have a successful career in academia or industry associated with Electronics and Communication Engineering

PEO2: **Professionalism:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of Electronics and Communication Engineering.

PEO3: **Lifelong Learning:** Graduates will contribute to the social needs through lifelong learning, practicing professional ethics and leadership quality

Program Outcomes

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

PSO1: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.

PSO2: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrial expectations.

Abstract	**Matching with POs,PSOs**
<<Abstract keywords>>	**<<PO1, PO2, PO3, PO4, PO5, PO6,PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2>>**

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ABSTRACT

Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim / objective of this report is to propose IoT based Smart Farming System assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT based Smart Farming System being proposed via this report is integrated with Arduino Technology mixed with different Sensors and a Wifi module producing live data feed that can be obtained online from Thingsspeak.com. The product being proposed is tested on Live Agriculture Fields giving high accuracy over 98% in data feeds.

The objectives of this report is to proposed IoT based SmartFarming System which will enable farmers to have live data of soil moisture environment temperature at very low cost so that live monitoring can be done. The structure of the report is as follows will cover over of overview of IoT Technology and agriculture-concepts and definition, IOT enabling technologies, IOT application in agriculture, benefits of IOT in agriculture and IOT and agriculture current scenario and future forecasts will cover definition of IOT based smart farming system , the components and modules used in it and working principal of it. Will cover algorithm and flowchart of the overall process carried out in the system and its final graphical output consist of conclusion, future scope and references.

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LIST OF ABBREVIATIONS

ACRONYM		ABBREVIATION
CLS	-	Common Language Specification
CPU	-	Central Processing Unit
WSN	-	Wireless Sensor Network
WIU	-	Wireless Information Unit
WSU	-	Wireless Sensor Units

CHAPTER 1

INTRODUCTION

1.1 PROJECT DETAILS

Internet of things IOT consists of two words Internet and Things .The term things in IOT refers to various IOT devices having unique identities and have capabilities to perform remote sensing , actuating and live monitoring of certain sort of data.IOT devices are also enable to have live exchange of data with other connected devices and application either directly or indirectly , or collected data from other devices and process the data and send the data to various servers. The other term internet is define as Global communication Network connecting Trillions of computers across the planets enabling sharing of information .Thus the IOT can be define as:"A dynamic Global Network Infrusture with self configuring capabilities based on standard and inter operable communication to protocol where physical and virtual things have identities, physical attributes ,and virtual personalities and use intelligent interfaces and are seamlessly integrated into the information network ,often communicate data associated with user and their environment." An ideal IOT device consists of various interfaces for making connectivity to other devices which can either be wired or wireless. Any IOT based device consists of following components: • I/O interface for Sensors. • Interface for connecting to Internet. • Interface for Memory and Storage. •Interface for Audio/Vide.

1.2 IOT AND ENABLING TECHNOLOGIES

Internet of Things has a strong backbone of various enabling technologies- Wireless Sensor Networks, Cloud Computing, Big Data, Embedded Systems,

Security Protocols and Architectures, Protocols enabling communication, web services, Internet and Search Engines. Wireless Sensor Network (WSN): It consists of various sensors/nodes which are integrated together to monitor various sorts of data. Cloud Computing: Cloud Computing also known as on-demand computing is a type of Internet based computing which provides shared processing resources and data to computers and other devices on demand. It can be in various forms like IAAS, PAAS, SAAS, DAAS etc. Big Data Analytics: Big data analytics is the process of examining large data sets containing various forms of data types i.e. Big Data to uncover hidden patterns, unknown correlations, market trends, customer preferences and other useful business information. Communication Protocols: They form the backbone of IOT systems to enable connectivity and coupling to applications and these protocols facilitate exchange of data over the network as these protocols enable data exchange formats, data encoding and addressing. Embedded Systems: It is a sort of computer system which consists of both hardware and software to perform specific tasks. It includes microprocessor/microcontroller, RAM/ROM, networking components, I/O units and storage devices.

1.3 OVERVIEW OF THE PROJECT DEFINITION

IOT BASED SMART FARMING SYSTEM IOT based SMART FARMING SYSTEM is regarded as IOT gadget focusing on Live Monitoring of Environmental data in terms of Temperature, Moisture and other types depending on the sensors integrated with it. The system provides the concept of Plug & Sense‖ in which farmers can directly implement smart farming by as such putting the System on the field and getting Live Data feeds on various devices like Smart Phones, Tablets etc. and the data generated via sensors can be easily shared and viewed by agriculture consultants anywhere remotely via Cloud Computing

technology integration. The system also enables analysis of various sorts of data via Big Data Analytics from time to time.

CHAPTER-2

LITERATURE SURVEY

2.1 Overview

Irrigation is most important for high yield of the farm. Today, by using WSN technology it is possible to monitor and control the environmental conditions as soil moisture, temperature, wind speed, wind pressure, salinity, turbidity, humidity etc for irrigation. Automated irrigation performed by using solenoid valve and pump. Solenoid valve is an electromechanical valve used with liquid controller to control an electronic current through solenoid which is a coil of wire that uses to control the state of the valve according to need of irrigation.

2.2 SURVEY OF PREVIOUS WORKS

M.Nesa Sudha et al., 2011 proposed a TDMA based MAC protocol used for collect data such as soil moisture and temperature for optimum irrigation to save energy. MAC protocol plays an important role to reduce energy consumption. Two methods used for energy efficiency as Direct Communication method and aggregation method. Direct Communication method provides collision free transmission of data, because all the sensor nodes send data directly to the base station without the need of header node. This method is better where the base station is near but it is not optimum where the base station is far because sensor nodes consume more energy during transmission of data and if there is much data to the sensor node, sensor nodes quickly damaged. The data aggregation method is better to use rather than direct communication method. The sensor node senses the data and send to the head node. The head node collects data from the entire sensor node, performs aggregation using various aggregation techniques, and then sends data to the base station. Thus by using aggregation method overall energy consumption reduce of the network. The simulation result show that aggregation method provide better performance rather than direct communication method. It

provides 10% increase in residual energy and 13% increase in throughput. Sensor nodes consume more energy while transmitting data. AnujNayak et al., 2014 describe that sensor nodes batteries are charged by using harnessing wind energy. A routing algorithm named DEHAR is proposed to extend overall batteries power. The proposed method is efficient where the amount of sensor nodes very low because of latency experienced due to synchronous sleep scheduling. A small band belt used to harness wind energy to sensor nodes. Wind belt is aero elastic flutter, which is capable for harnessing wind energy. Harnessing wind energy is a renewable energy source. However, the main problem using harnessing wind energy is the unreliability as the power of the wind is not permanent.

Man Zhang et al., 2012 analysis the temporal and spatial variability of soil moisture for the realization of variable irrigation and for improve yield in the farm. Temporal variability adopts the changes of soil moisture at the place where the sensor nodes installed and analyze soil moisture variation at different times according to season. Spatial variability analyses calculate all parameter of soil moisture as average, maximum, minimum in whole area. The temporal variability curve has drawn according to measure data. It showed that the corn was in severe water stress state during the completely monitoring period.

Joaquin Gutierrez et al., 2013 proposed an irrigation system that uses photovoltaic solar panel to power system because electric power supply would be expensive. For water saving purpose, an algorithm developed with threshold value of temperature and soil moisture programmed into a micro controller gateway. The system has a full duplex communication links based on internet cellular interface using GPRS based on mobile data for graphically display and stored in a database server.The automation irrigation system consists of two components were WSU and WIU. Wireless Sensor Units (WSU) components were used for minimize power consumption because microcontroller is well suited by its lower power current in sleep mode. Wireless Information Unit (WIU) transmits soil moisture

and temperature data to a web server using GPRS module. The WIU identify recorded and analyzed received temperature and soil moisture data collected by WSU. WIU functionality is bases on microcontroller that programmed to perform different task as to download the date and time information from web server and compare the temperature and soil moisture value with maximum soil moisture and minimum temperature value so that irrigated pumps activated.

SherineM.AbdEl-kader et al., 2013 proposed APTEEN (Periodic Threshold oldsensitive Energy-Efficient sensor Network) protocol. APTEEN is a Hierarchical based routing protocol in which nodes have grouped into clusters. Each cluster has a head node and head node is responsible for broadcast data to the base station. APTEEN broadcast parameters attribute, which is a set of physical parameters, in which the user is interested to obtain info, Thresholds value as Hard Threshold and Soft Threshold, Schedule as TDMA schedule uses to assign slots to save energy, which provide collision free transmission. It controls the energy consumption by changing threshold values and count time. The performance of proposed protocol is better than LEACH on average 79% and by LEACH-C on average 112%.

B. Balaji Bhan et al., 2014 proposed a system to develop WSN based soil moisture controllers that determine the water requirement by comparing soil moisture with predefined threshold value. An intelligent remote system consists of wireless sensor nodes and computer system in which data is transmitted to a server system from where the data accessed by individuals for decision making for automated control of irrigation for the yield productivity. Field validation tests routinely performed on different soils to measure the soil moisture, water amount in soil for efficient irrigation system. If the stored data does not match with the soilmeasured data, an interrupt sent to the pressure unit and stop irrigation automatically. SbrineKhriji et al., 2014 describe different type of sensor nodes for real monitoring and control of irrigation system. Each node consists of B mote and actuator. TelosB mote is an ultralow power wireless module for monitoring applications.

Soil nodes used to measure the soil moisture weather nodes used to measure environmental parameter and actuator used for controlling the opening of valves for irrigation. The system has cost efficient and reduce the power consumption The experimental result shows that the plants are well irrigate and if there is any change in threshold value the system alert to farmer about the problem to take the appropriate decision.

Yunseop Kim et al., 2008 represents real time monitoring and control of variable rate irrigation controller. The sensor nodes measure environmental parameter and transmit data to base station where base station process data through a user-friendly decision making program and all data commands send to irrigation control station. The Irrigation control station sends machine location using GPS to the base station, send control signal back to irrigation control.

Fiona Regan et al., 2009develop heterogeneous real time water monitoring network system to monitor water quality parameter such as pH, temperature, turbidity and conductivity. The implementation of intelligent sensors incorporating TEDS (Transducer Electronic Data Sheet) which is a machinereadable specification of the sensor characteristics, enable sensors to interfaced with the system in a plug and play fashion. PSOC system used to create generic sensor interface. The plug and play capabilities enabled by the developed WSN platform allow for integration of any commercially available water quality sensors. PSOC plug and play system capable of transmitted data to the sensor that processed data for transmission to the web.

Joaquin Gutierrez et al., 2015 represents that the sensors use Smartphone to capture and process images of soils. Images can be capture to estimate 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 a field. An Android app used for connectivity such as Wi-Fi. Android app wakes up the Smartphone by using given parameters. In-built camera takes an RGB picture of

the soil through an anti-reflective glass window to take estimation of wet and dry area. The mobile app enables the Wi-Fi connection of Smartphone to transmit the estimation value to the gateway via a router node for control an irrigation water .

CHAPTER-3

Aim And Scope of the presentinvestigation

3.1 Aim of the project:

Since nowadays, in the age of advanced technology and electronics, the life style of the human should me smart, simpler, easier and much more convenient. So, therefore; there is a need for many automated systems in human's daily life routine to reduce their daily activities and jobs. Here an idea of one such system named as automatic plant watering system is very useful. As many people are facing a lot of problem watering the plants in the garden, especially when they away from the home. This model uses sensor technologies with microcontroller in order to make a smart switching device to help millions of people. In its most basic form, system is programmed in such a way that soil moisture sensor which senses the moisture level from the plant at particular instance of time, if moisture level of the sensor is less than the specified value of threshold which is predefined according to the particular plant than the desired amount of water is supplied to plant till it's moisture level reaches to the predefined threshold value. System involves humidity and temperature sensor which keep tracks the current atmosphere of the system and has an influence when watering happens. Solenoid valve will control the water flow in the system, when Arduino reads value from moisture sensor it triggers the solenoid valve according to the desired condition.

3.2 Existing System

During day to day activities many people often forget to water their plants and thus it becomes challenging for them to keep their plants healthy and alive. Also it is a challenge for farmers to maintain their fields and manage watering of plants during shortage of water. Based on the above background, we thought that it is necessary to implement the automated system which will take care of plants. In the existing system we can't automatically water the plants and we need to be there at every situation in order to detect the moisture of soil which is burden to us and time taking process.

3.3 PROPOSED SYSTEM

Automatic watering of plants is based on Internet Of Things(IOT).In this proposed system we use Arduino uno software and hardware, Soil moisture sensor, Rechargable Battery, Relay Module, Dc motor. The sensors automatically checks the soil moisture and based on some threshold value if soil is dry then it waters the

CHAPTER-4

MATERIALS AND METHODS

4.1 ARDUINO UNO:-

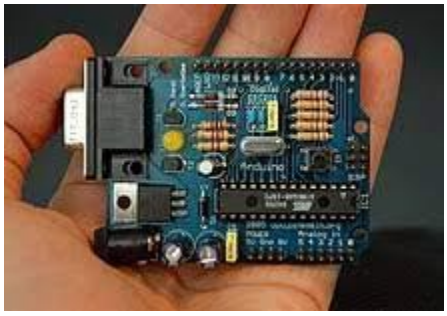


Fig:4.1 :arduino uno Arduino

UNO is a microcontroller board it has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connec-tion, a power jack, an ICSP header, and a reset button. It con-tains everything needed to support the microcontroller; simp-ly connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started

4.1.1 ARDUINO

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be stand-alone, or they can communicate with software running on your computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handy board, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers, but

it offers some advantage for teachers, students, and interested amateurs over other systems:

• **Inexpensive** - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50.

• **Cross-platform** - The Arduino software runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

• **Simple, clear programming environment** - The Arduino programming environment is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with the look and feel of Arduino

• **Open source and extensible software**- The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.

• **Open source and extensible hardware** - The Arduino is based on Atmel's ATMEGA8 and ATMEGA168/ATMEGA2560 microcontrollers. The plans for the modules are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

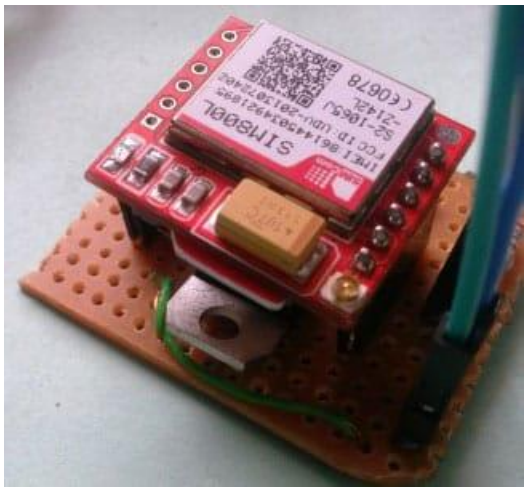
4.2 GSM Module:

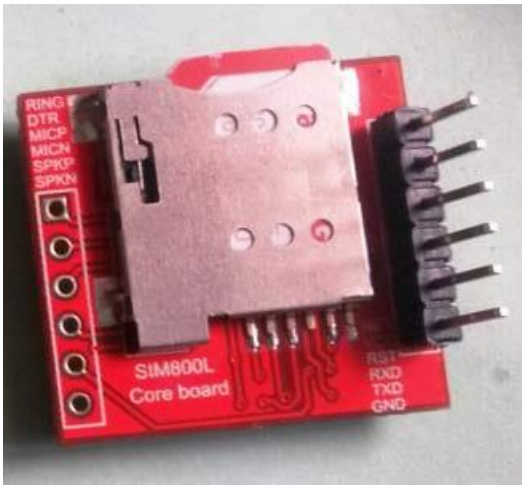
Here we have used TTL SIM800 GSM module. The SIM800 is a complete Quad-band GSM/GPRS Module which can be embedded easily by customer or hobbyist. SIM900 GSM Module provides an industry-standard interface; the SIM800 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data with low power consumption. The design of this SIM800 GSM Module is slim and compact. It is easily available in the market or online from eBay.

Quad - band GSM/GPRS module in small size.

GPRS Enabled

TTL Output





4.1.2 OVERVIEW:-

The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards. You can find here your board warranty informations. Getting Started You can find in the Getting Started section all the information you need to configure your board, use the Arduino Software (IDE), and start tinker with coding and electronics. Need Help?

- On the Software on the Arduino Forum.
- On Projects on the Arduino Forum.

- On the Product itself through our Customer Support .

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Table no:4.1.2:ARDINO UNo

4.1.3 BASIC ARDUINO CODE DEFINITIONS:

#include <SoftwareSerial.h>

// Pin definitions

const int moistureSensorPin = A0; // Analog pin connected to the soil moisture sensor

const int relayPin = 7; // Digital pin connected to the relay module

```
const int SIM800_TX = 2;          // Arduino RX, SIM800 TX
const int SIM800_RX = 3;          // Arduino TX, SIM800 RX

// Threshold value for soil moisture level
int moistureThreshold = 500; // Adjust based on calibration

SoftwareSerial sim800(SIM800_TX, SIM800_RX);

String phoneNumber = "+919360480748"; // Authorized phone number
bool pumpManualOverride = false;
bool pumpStatus = false; // false = OFF, true = ON

void setup() {
  pinMode(moistureSensorPin, INPUT);
  pinMode(relayPin, OUTPUT);
  digitalWrite(relayPin, LOW); // Start with the relay off

  Serial.begin(9600);   // For debugging via serial monitor
  sim800.begin(9600);   // Initialize SIM800 module

  // Wait for SIM800 module to initialize
  delay(1000);

  // Set SMS mode to text
  sim800.println("AT+CMGF=1");
  delay(1000);
  // Set SMS to show immediately
```

```
  sim800.println("AT+CNMI=1,2,0,0,0");
  delay(1000);
}

void loop() {
  int moistureLevel = analogRead(moistureSensorPin); // Read the moisture level
  Serial.print("Moisture Level: ");
  Serial.println(moistureLevel); // Print the moisture level for debugging

  if (sim800.available() > 0) {
    String sms = sim800.readString();
    Serial.println("SMS Received: " + sms);

    if (sms.indexOf(phoneNumber) >= 0) {
      if (sms.indexOf("PUMP ON") >= 0) {
        digitalWrite(relayPin, HIGH); // Turn on the pump
        pumpStatus = true;
        pumpManualOverride = true;
        Serial.println("Pump turned ON via SMS");
      } else if (sms.indexOf("PUMP OFF") >= 0) {
        digitalWrite(relayPin, LOW); // Turn off the pump
        pumpStatus = false;
        pumpManualOverride = true;
        Serial.println("Pump turned OFF via SMS");
      } else if (sms.indexOf("STATUS") >= 0) {
        sendSMS(phoneNumber, "Moisture Level: " + String(moistureLevel));
```

```
    }
   }
  }

  if (!pumpManualOverride) {
   if (moistureLevel < moistureThreshold && !pumpStatus) {
    digitalWrite(relayPin, HIGH); // Turn on the relay (and the motor)
    pumpStatus = true;
    sendSMS(phoneNumber, "No Water. Pump turned ON");
    Serial.println("Pump ON due to low moisture");
   } else if (moistureLevel >= moistureThreshold && pumpStatus) {
    digitalWrite(relayPin, LOW); // Turn off the relay (and the motor)
    pumpStatus = false;
    sendSMS(phoneNumber, "Pump turned OFF");
    Serial.println("Pump OFF due to sufficient moisture");
   }
  }

  delay(1000); // Wait for a second before taking another reading
}

void sendSMS(String number, String text) {
  sim800.print("AT+CMGS=\"");
  sim800.print(number);
  sim800.println("\"");
  delay(100);
  sim800.println(text);
```

```
  delay(100);
  sim800.println((char)26); // ASCII code of CTRL+Z
  delay(1000);
}
```

input: A pin mode that intakes information.

output: A pin mode that sends information.

HIGH: Electrical signal present (5V for Uno). Also ON or True in boolean logic.

LOW: No electrical signal present (0V). Also OFF or False in boolean logic.

digitalRead: Get a HIGH or LOW reading from a pin already declared as an input.

digitalWrite: Assign a HIGH or LOW value to a pin already declared as an

Reset	3v3	5v	Gnd	Vin	Analog In	RX/TX	Digital	PWM(~)	AREF

output.

analogRead: Get a value between or including 0 (LOW) and 1023 (HIGH). This allows

you to get readings from analog sensors or interfaces that have more than two states.

analogWrite: Assign a value between or including 0 (LOW) and 255 (HIGH). This

allows you to set output to a PWM value instead of just HIGH or LOW.

PWM: Stands for Pulse-Width Modulation, a method of emulating an analog signal

through a digital pin. A value between or including 0 and 255. Used with analogWrite

4.1.4 ARDUINO UNO PIN TYPE DEFINITIONS: (TAKE A LOOK AT YOUR ARDUINO BOARD)

Resets Arduino sketch on board	3.3 volts in and out	5 volts in and out	Ground	Voltage in for sources over 7V (9V - 12V)	Analog inputs, can also be used as Digital	Serial comm. Receive and Transmit	Input or output, HIGH or LOW	Digital pins with output option of PWM	External reference voltage used for analog

Table no.-4.1.4 uno pin Type

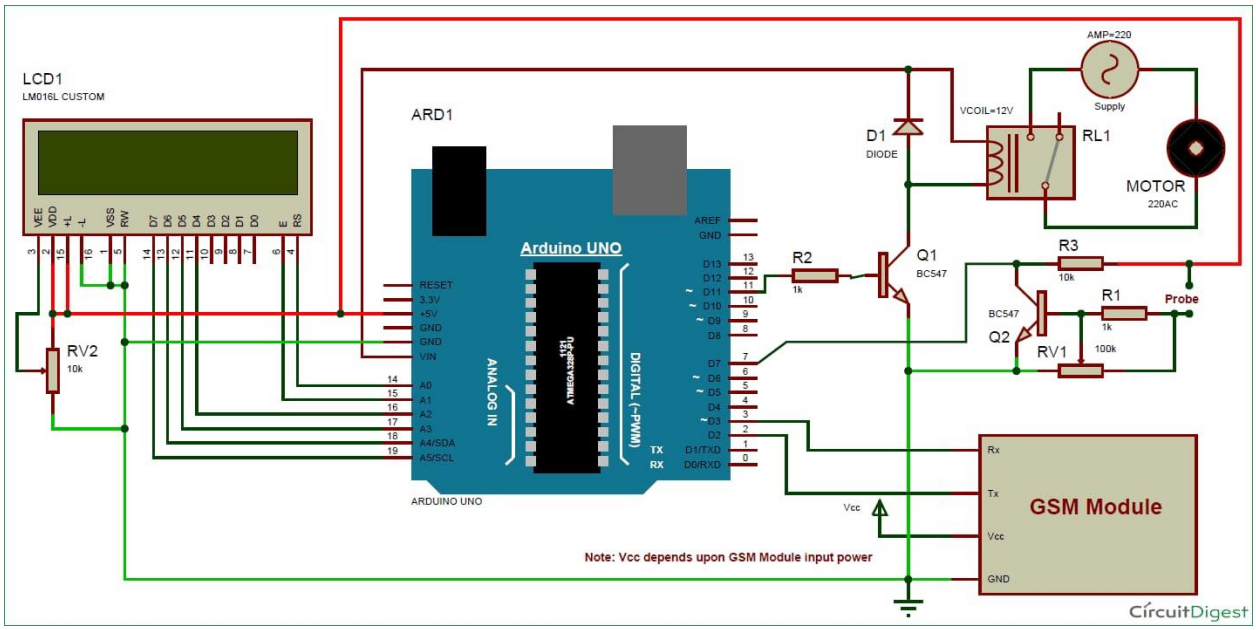
4.1.5 BASIC ARDUINO PIN REFERENCE SHEET

These boards below use the same micro-controller, just in a different package. The Lilypad is designed for use with conductive thread instead of wire and the Arduino Mini is simply a smaller package without the USB, Barrel Jack and Power Outs. Other boards in the

Together a voltage divider:-

It's really pretty easy. Here is a schematic and explanation detailing how

BLOCK DIAGRAM:



CHAPTER -5

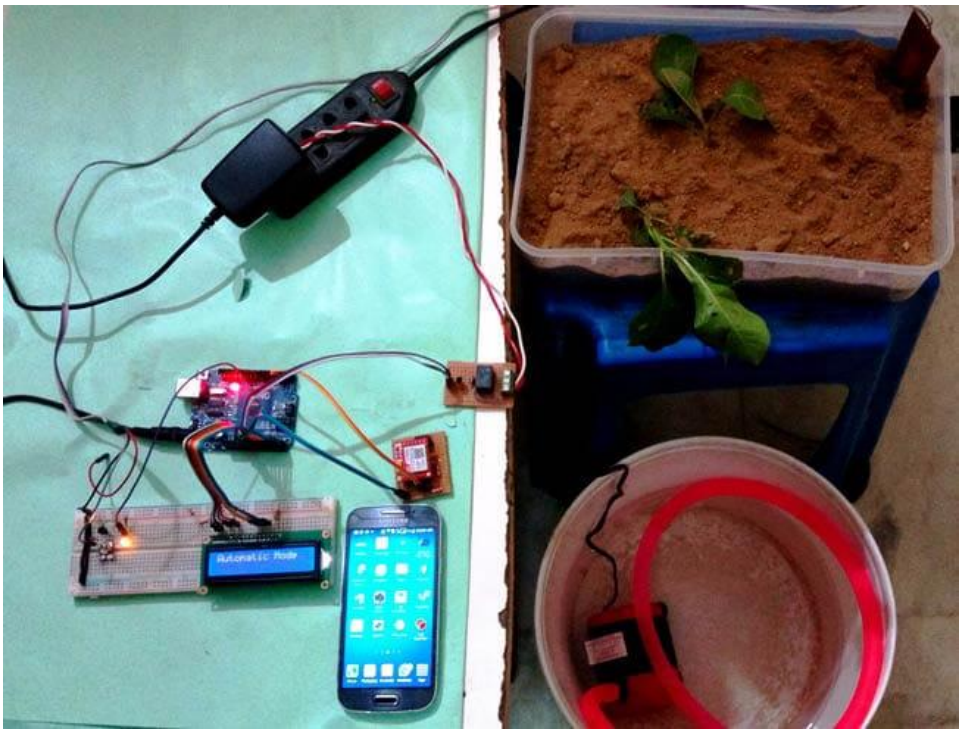
PERFORMANCE ANALYSIS

5.1 Overview

Whenever me and my family go for vacations, I used to get worried about my plants because they need water on regular basis. I gone through several options to solve this problem as plants need water according to the moisture level of soil. So I have made Automatic Plant Watering System Using Arduino UNO.

In this system, soil moisture sensor senses the moisture level of the soil. If soil will get dry then sensor senses low moisture level and automatically switches on the water pump to supply water to the plant. As plant get sufficient water and soil get wet then sensor senses enough moisture in soil. After which the water pump will automatically get stopped.

I have used a selfmade water pump in this system using 5volt DC motor. I could use 12volt water pump in the system but to operate this, it will require a relay module. So, to reduce all these hardware complexity, I made DC motor based water pump using diode, transistor and registers combined circuit which operates DC motor according to the Arduino code.



CHAPTER-6

SUMMARY AND CONCLUSION

6.1 SUMMARY

Soil Moisture has been proposed using Arduino and Cloud Computing. The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture. The IoT based smart farming System being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results.

6.2 CONCLUSION

An automatic plant irrigation system using Arduino is designed in this project. The prototype of the model worked properly when tested on different soils. The components that we use in the system are readily available and easy to operate. Thus, this system acts as an effectual method of irrigation. It is far better than the manual irrigation process which requires a lot of manpower and time. By using the app, the farmer can operate the system from distant places. The farmer can utilize this time in other significant activities. Also, the major issue of water scarcity is dealt with. No amount of water is wasted in the process of irrigation. Thus, this system can be very useful in areas where water is in short supply. As the required amount of water is provided to the crop, the crop growth is better. Farmers can thus benefit from the enhanced crop yields. The project is tested for different types of soils and it works properly. The future work of the system can include the addition of temperature sensors and a more powerful motor to pump water to the fields. Thus, the large-scale implementation of the project can also be done.

REFERENCES

[1] Davicurone, Emanuele Lindo Secco, Laura Caldani (2012), Assessment of sensing fire fighters uniforms for physiological Parameters measurement in harsh environment, IEEE Transactions on information technology in biomedicine, vol. 16, no.3. pp. 29–33.

[2] R. Paradiso, G. Lorigavol (2005), A wearable healthcare system based on knitted integrated sensors, IEEE Transactions on Information Technology in Biomedicine, Vol. 2, issue 3, page no. 337–344.

OUTCOME

Arduino sends soil moisture sensor information to registered mobile number. User can switch ON and OFF pump motor by SMS. All this information will be displayed on LCD. By sending request SMS to GSM modem user can get sensors status immediately.