

VISVESVARAYA TECHNOLOGICAL UNIVERSITY

JNANA SANGAMA, BELAGAVI – 590 01



PROJECT REPORT ON

“SMART AGRICULTURAL MONITORING SYSTEM PROJECT”

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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

Certificate

This is to certify that

Shakuntala hosamani, Sounalya kulakarni, Sushma dhari, tejaswini parappanavar has satisfactorily completed the Project work entitled “ **SMART AGRICULTURAL MONITORING SYSTEM** ” prescribed by the Visvesvaraya Technological University, Belgaum for VIII semester Electronics & Communication Engineering during the academic year 2020-2021.

Signature of the Guide

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Signature of the Principal

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ABSTRACT

Agriculture is an integral part of Indian economy. Over 60% of Indian population based upon agriculture and one third of the income of nation arises from agricultural practices. Hence it plays a vital role in the development of the country. Various issues related to farming is continuously hampering the development of the country. Possible solution for these problems is to opt for modernized agriculture that Comprises of Modern trends. Hence, agriculture can be made smart using IOT and other technologies. Smart agriculture increases crop yield, decreases water wastage and Imbalanced use of fertilizers. The highlighting feature of this project is that it measures the different agricultural parameters of affecting the yield and it also uses GPS Module to get the information about the location. Secondly it sends all the data to the cloud where it can be further analysed. Thirdly this project also contains an android Mobile app providing an easy access of information to the farmer. Moreover this project presents a Smart irrigation system that optimizes water usage.

1.CHAPTER-I : INTRODUCTION

1.1 OVERVIEW

The objectives of this report is to proposed IOT based Smart Agricultural Monitoring 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: chapter I 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. Chapter II will cover definition of IOT based smart agricultural monitoring system , the components and modules used in it and working principal of it. Chapter III will cover algorithm and flowchart of the overall process carried out in the system and its final graphical output .chapter IV consist of conclusion, future scope and references.

1.2 IOT TECHNOLOGY AND AGRICULTURE

1.2.1 IOT: CONCEPT AND DEFINITION

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 Infrastructure 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/Video.

IOT devices can be of various forms like wearable sensors, smart watches, IOT smart home monitoring, IOT intelligent transport systems, IOT smart health devices etc.

1.2.2 IOT 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.

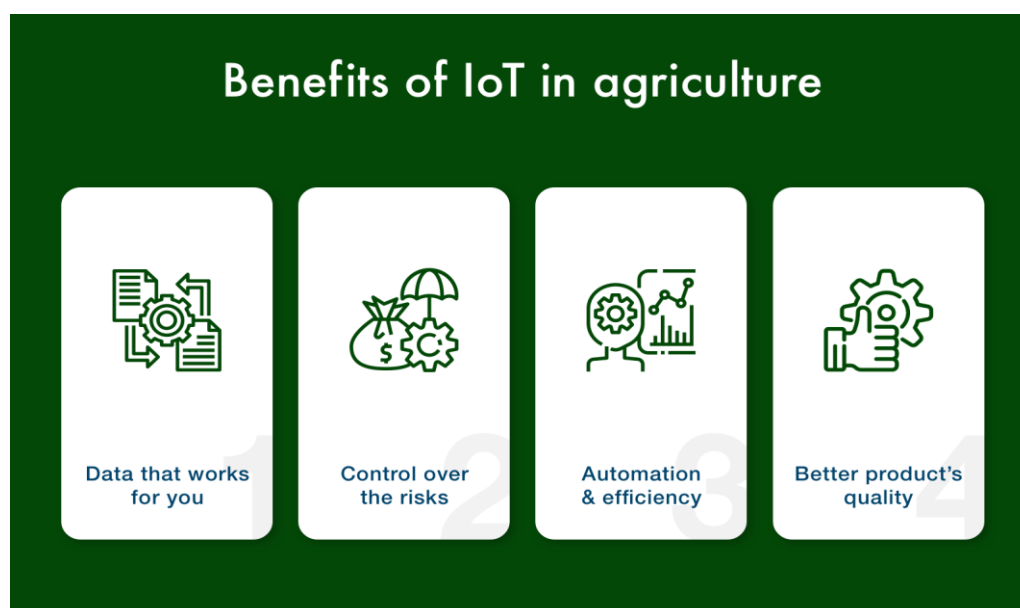
1.2.3 IOT APPLICATIONS IN AGRICULTURE

With the adoption of IOT in various areas like Industry, Homes and even Cities, huge potential is seen to make everything Intelligent and Smart. Even the Agricultural sector is also adopting IOT technology these days and this in turn has led to the development of “AGRICULTURAL Internet of Things (IOT)”

Table 1.1 Various projects and applications are integrated in Agricultural fields leading to Efficient management and controlling of various activities

Crop Water Management	In order to perform agriculture activities in inefficient manner, adequate water is essential. Agriculture IOT is integrated with Web Map Service (WMS) and Sensor Observation Service (SOS) to ensure proper water management for irrigation and in turn reduces water wastage.
Precision Agriculture	High accuracy is required is required in terms of weather Information which reduces the chances of crop damage. Agriculture IOT ensures timely delivery of real time data in terms of weather forecasting, quality of soil, cost of labour and much more to farmer.
Integrated Pest Management or Control (IPM/C)	Agriculture IOT systems assures farmers with accurate environmental data via proper live data monitoring of temperature , moisture, plant growth and level of pests so that proper care can
Food Production & Safety	Agriculture IOT system accurately monitors various parameters like warehouse temperature, shipping transportation management system and also integrates cloud based recording systems.
Other Projects Implemented Till Date	1. The Pheno net Project by Open IOT. 2. CLASS Equipment 3. Precision hawk's UAV Sensor Platform 4. Clean grow's Carbon Nano tube Probe 5. Temp utech's Wireless Sensor Monitoring.

1. 2. 4. BENEFITS OF IOT IN AGRICULTURE



The following are the benefits of IOT in Agriculture:

- IOT enables easy collection and management of tons of data collected from sensors and with integration of cloud computing services like Agriculture fields maps, cloud storage etc., data can be accessed live from anywhere and everywhere enabling live monitoring and end to end connectivity among all the parties concerned.
- IOT is regarded as key component for Smart agriculture as with accurate sensors and smart equipment's, farmers can increase the food production by 70% till year 2050 as depicted by experts
- With IOT productions costs can be reduced to a remarkable level which will in turn increase profitability and sustainability.
- With IOT, efficiency level would be increased in terms of usage of Soil, Water, Fertilizers, Pesticides etc.
- With IOT, various factors would also lead to the protection of environment.

2. CHAPTER II: OVERVIEW OF THE PROJECT

2.1 DEFINITION IOT BASED SMART AGRICULTURAL MONITORING SYSTEM

IOT based SMART AGRICULTURAL MONITORING SYSTEM is regarded as IOT gadget focusing on Live Monitoring of Environmental data in terms of Temperature, Water, soil 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 agriculture 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.

2.2 COMPONENTS AND MODULES

In this section, various components and Modules being used for IOT based SMART AGRICULTURAL MONITORING SYSTEM development is discussed:

2.2.1 ARDUINO UNO



Figure 2.1 ARDUINO UNO

The arduino uno R3 is a microcontroller board based on removable dual -inline-package at mega 328AVR micro controller. It as a 20 digital input\output pins and the arduino is a great tool for developing interactive objects. The arduino uno R3 board adds diode across the USB at mega reset pin pull -up resistor. The arduino uno R3 is the most advanced board

in the arduino world. Arduino serves many application such as motor control, sensor networks, etc. The arduino has an extensive support community which makes it very easy way to get started working.

2.2.2 WIFI MODULE-ESP 8266

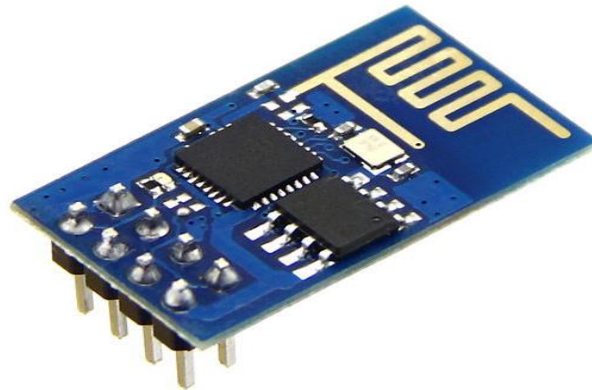


Figure 2.2 WIFI MODULE-ESP 8266

The WiFi module is used to send the sensor values to the remote server via a WiFi connection and IOT protocols. The ESP8266 is capable of either hosting an application or offloading all WiFi networking functions from another application processor. ESP8266 is an impressive low cost WiFi module suitable for adding WiFi functionality via UART serial communication. It includes 802.11 b/g/n protocol, WiFi direct (p2p) soft-AP integrated TCP/IP protocol stack.

2.2.3 SENSORS

2.2.3.1 TEMPERATURE SENSOR:

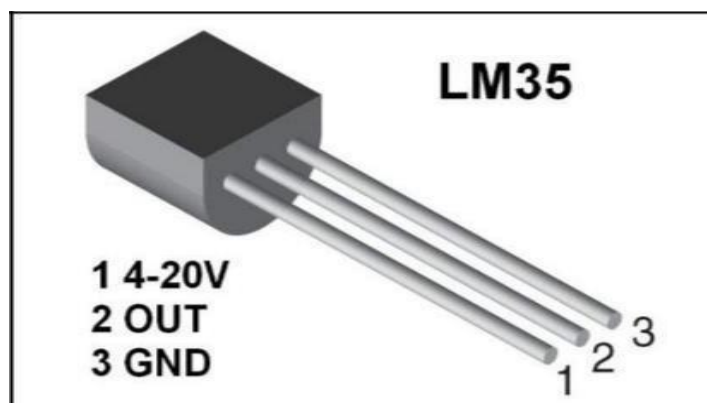


Figure 2.3.1 TEMPERATURE SENSOR-LM35

The temperature sensor measures the ambient temperature of the crop. If the ambient temperature is too hot then the fan is turned on by the controller in order to maintain the desired temperature for the crop. LM35 is an analog device since it gives an analog output.

The LM35 sensor is highly used because its output voltage is linear with the celsius scaling of temperature. It has a wide operating range. There are three terminals as VCC, Ground and the analog sensor.

2.2.3.2 SOILMOISTURESENSOR:

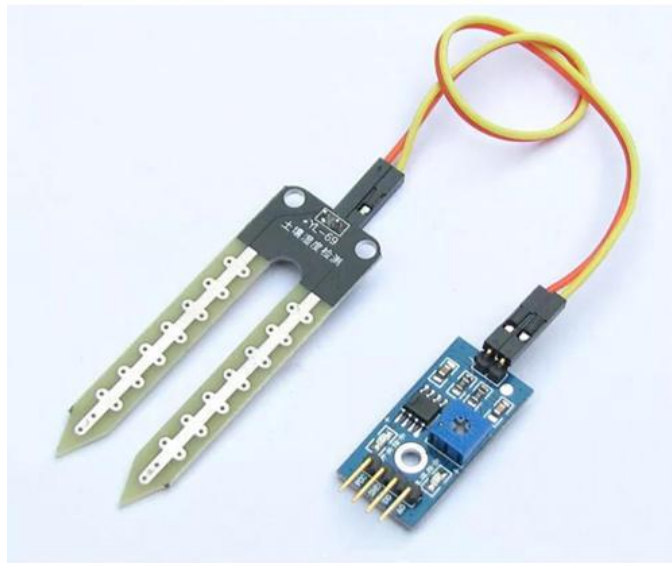


Figure 2.3.2 SOIL MOISTURE SENSOR

Soil moisture sensor is a simple device for measuring the moisture level in soil and similar materials. The more water that is in the soil or any other material means the better the conductivity between the pads will be and will result in lower resistance & higher signal out. To get the soil moisture sensor functioning we need to connect the VCC&GND pins to your arduino based device and you will receive a signal out which will depend on the amount of water in the soil.

2.2.3.3 WATER LEVEL SENSOR:



Figure 2.3.3 WATER LEVEL SENSOR

The water level sensor is also some times referred water leak detection sensor. The water level sensor is a 3 pin module that outputs an analog signal that indicates the approximate depth of water submersion. Pure water is not conductive, it's actually the minerals and impurities in water that makes it conductive. The sensor outputs an analog voltage proportional to the amount of liquid exposed to it. Water sensor has 3 terminals - S, Volt(+) & GND(-).

2.2.4 OTHER COMPONENTS

2.2.4.1 LCD DISPLAY:

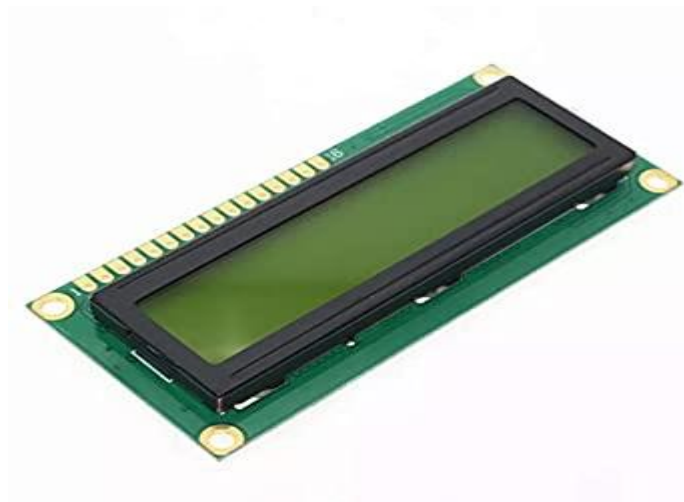


Figure 2.4.1 LCD DISPLAY

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits and devices like mobile phones etc. These displays are mainly preferred for multi segment light emitting diodes and 7 segments. The main benefits of using this LCD are inexpensive simple programmable and no limitations for displaying custom characters.

2.2.4.2 GSM MODEM:



Figure 2.4.2 GSM MODEM

A GSM modem can be dedicated from modem device with serial USB or Bluetooth connection or it can be mobile phone that provides GSM modem capabilities. The mobile operator charges for this message sending and receiving as it was performed directly on mobile phone. To perform these task a GSM modem must support on extended AT command set for sending/receiving SMS messages.

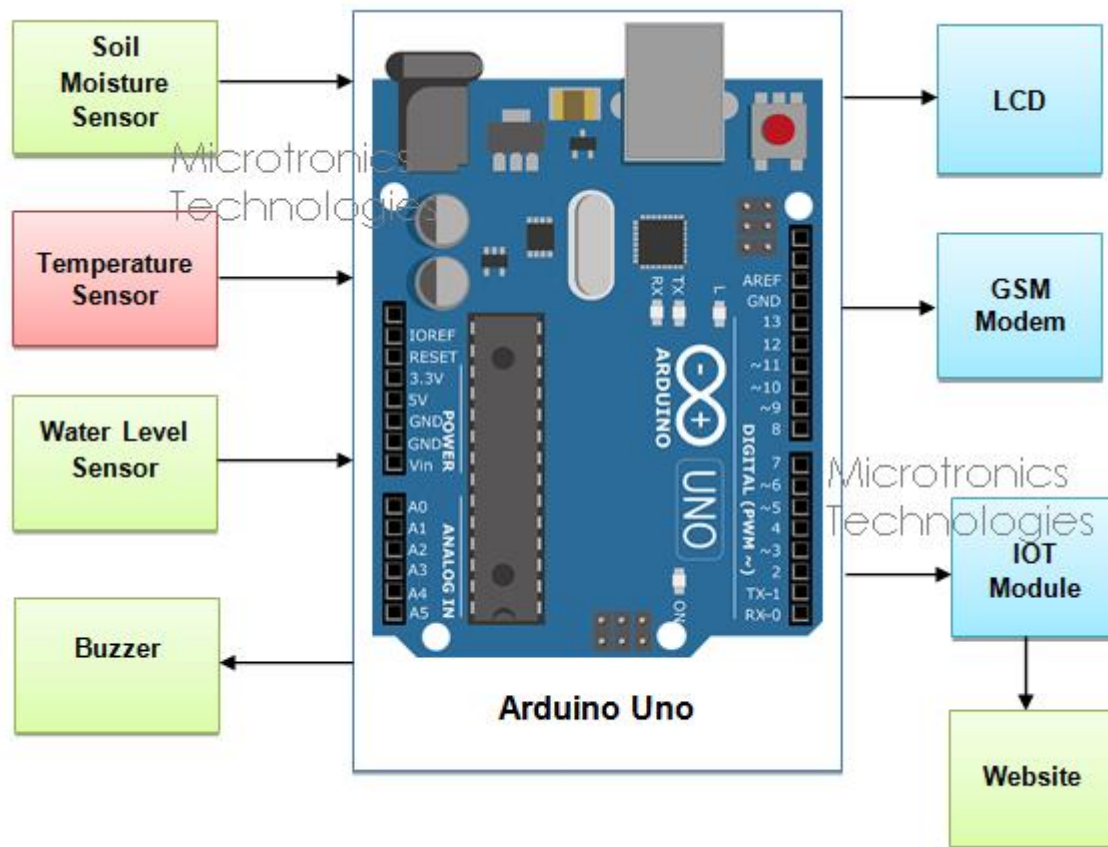
2.2.4.3 BUZZER:



Figure 2.4.3 BUZZER

The buzzer is a small yet efficient component to add sound feature to our projects / system. It is very small and compact 2 pin structure and it is widely used component in most electronic application. The ready made buzzer which will look bulkier than this will be produce a beep , beep beep sound. The typical uses of buzzer include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke. If any of sensors values crosses a certain predefined threshold then the buzzer is turned on to notify the users.

2.3 CIRCUIT DESCRIPTION & WORKING PRINCIPAL



For the purpose of increasing the efficiency and productivity of agricultural crops, an IOT based smart agriculture monitoring project using Arduino is proposed. The project consists of three sensors for the measurement of various parameters crucial for the crop. These sensors include a temperature sensor, a water level sensor, and a soil moisture sensor. The project also contains a GSM modem and a WiFi module. The project also includes output devices such as a dc motor, relays and a buzzer.

There are three sensors present in the circuit which are used for measuring the ambient temperature, water level of the crop and the soil moisture level. Based on the monitoring of these sensor values the smart agriculture monitoring system provides air and water to the crop. The data from the sensors is sent to an Arduino controller which stores and processes this data and then sends it to the IOT platform as well as GSM module. A WiFi module is interfaced with the Arduino which sends the sensor values to the remote IOT platform using WiFi connection. The GSM modem receives the sensor values from the Arduino board and sends these values to the user via SMS after every 5 minutes.

Some output devices are also connected to the Arduino outputs. These devices include DC motor, relays, and buzzer. If any of the sensor values crosses a certain predefined threshold then the buzzer is turned on to notify the user. One relay is connected to the fan while the other is connected to the water pump. If the ambient temperature is too hot then the fan is turned on by the controller in order to maintain the desired temperature for the crop. If the soil moisture level is low then the water pump is turned on by the Arduino controller to provide water to the crops. The crop status can be monitored remotely by means of a remote IOT platform.

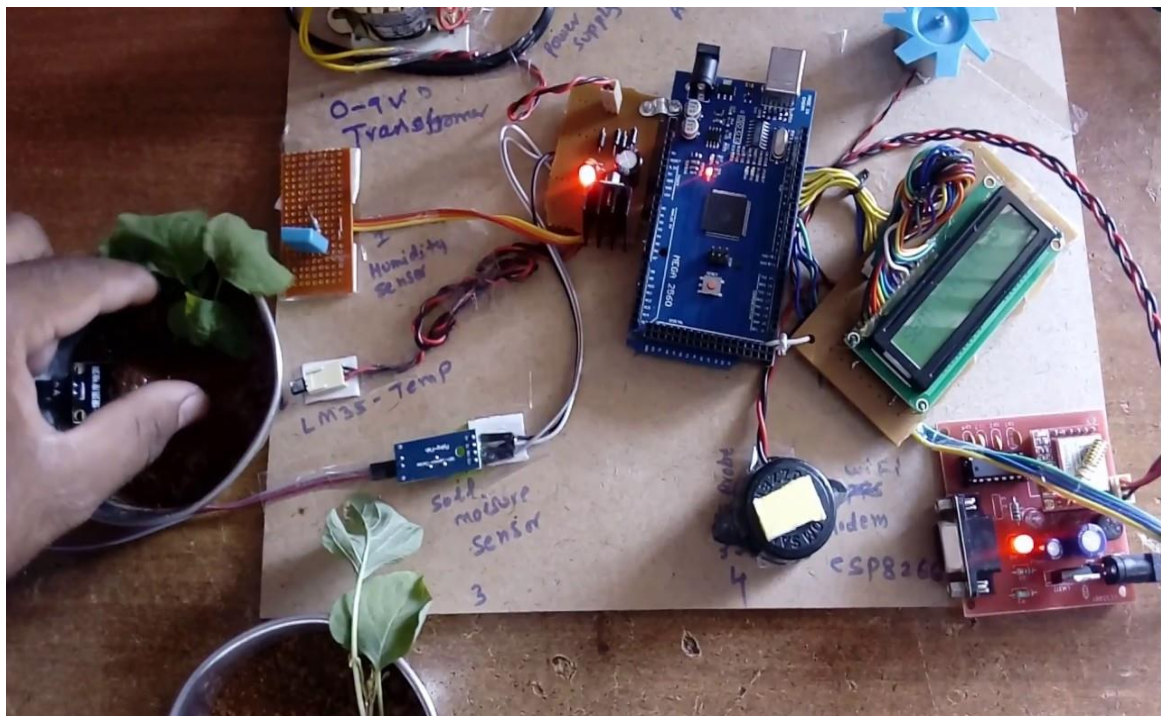


Figure 2.3.2 OVERALL CIRCUIT DESIGN

3 CHAPTER-III: ALGORITHMS & FLOWCHART

3.1 ALOGORITHM

THE ALGORITHM OF OVERALL PROCESS:-

STEP 1: START THE PROCESS

STEP 2: CONNECTED TO WIFI

STEP 3: READ TEMERATURE , WATER LEVEL & SOIL MOISTURE

STEP 4: GET TEMPERATURE , WATER LEVEL&SOIL MOISTURE VALUE S FROM
ANOLOG PINS

STEP 5: SEND DATA TO THINGSPEAK API

STEP 6: DELAY TO 10 SECONDS

STEP 7: REPEAT STEP 4, 5 & 6 UNTIL THE PROCESS END

STEP 8: END

3.2 FLOW CHART

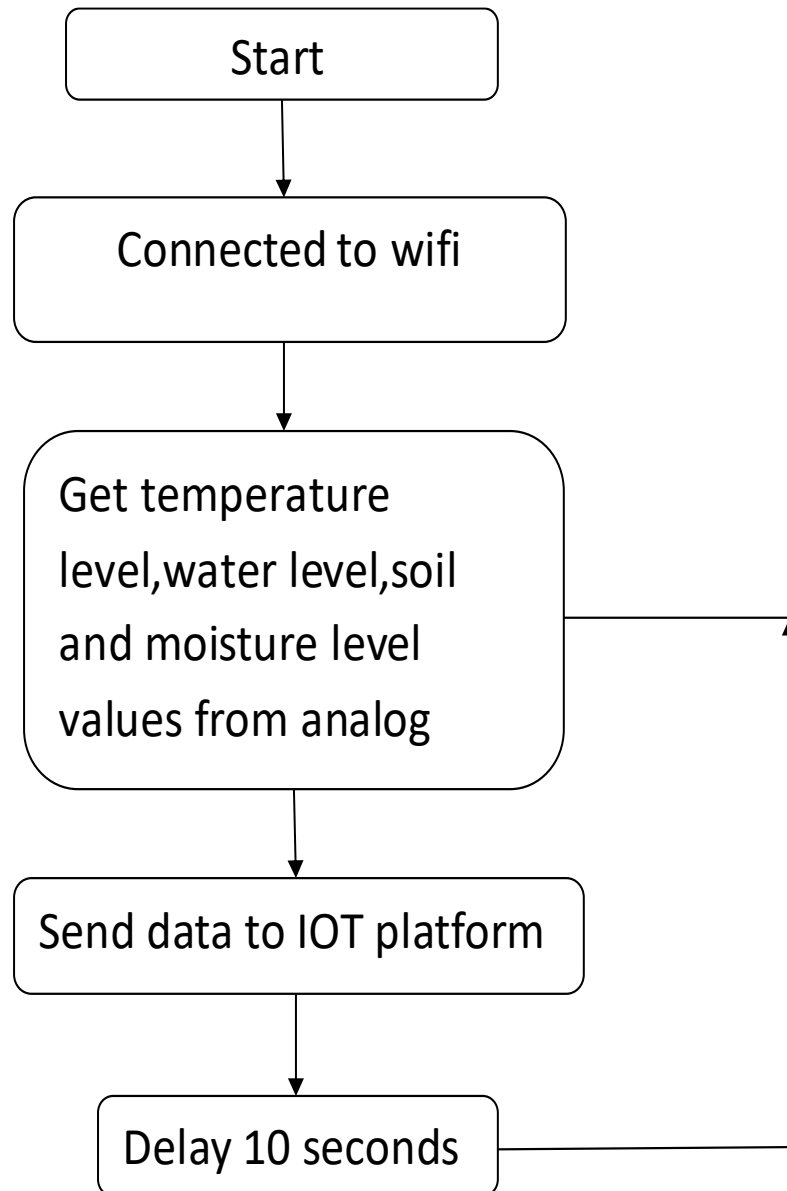


Figure 3.1 FLOWCHART OF OVERALL PROCESS

3.3 OUTPUT GRAPHS



Figure 3.1 output graphs

4 CHAPTER-IV:

4.1 APPLICATIONS

- The application of IOT in the agriculture industry has helped the farmer monitor the water tank levels in real time.
- Using this project, the status of crops can be viewed remotely on a smartphone or laptop using the internet.
- The project is built from easily available and reasonably priced components.
- This helps to keep the farmer up to date even when he is away.

4.2 ADVANTAGES AND DISADVANTAGES:

ADVANTAGES

- The project keeps the farmer updated regarding the status of the crop via SMS notification.
- This keeps the farmer update and conscious about the status of his crop.
- It allows farmer to maximize yields using minimum resources such as water fertilizers, seeds etc.
- It is cost effective method.
- It delivers high quality crop production.

DISADVANTAGES:

- The smart agriculture needs availability of internet continuously.
- Rural part of most of the developing countries do not fulfil this requirement. Moreover internet connection is slower.
- Need for each soil type is calibrated.

4.3 CONCLUTION:

IOT based SMART AGRICULTURAL MONITORING SYSTEM for Live Monitoring of Temperature, water level and Soil Moisture has been proposed using Arduino and Cloud Computing . The System has high efficiency and accuracy in fetching the live data of temperature, water level and soil moisture. The IOT based smart agricultural monitoring 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, water level and soil moisture with more than 99% accurate results.

4.4 FUTURE SCOPE:

Future work would be focused more on increasing sensors on this system to fetch more data especially with regard to Pest Control and by also integrating GPS module in this system to enhance this Agriculture IOT Technology to full-fledged Agriculture Precision ready product.

REFERENCE & SOURCES

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