SMART PLANT MONITORING SYSTEM

Project report submitted in partial fulfillment of the requirement for the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATIONS

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DECLARATION

This is to certify that the work which is being presented in B.Tech Minor Project Report entitled "**Smart Plant Monitoring System**", submitted by "**Divya Singh**", in partial fulfillment of the requirements for the award of degree of **Bachelor of Technology** in **Electronics & Communication Engineering** and submitted to the Department of Electronics & Communication Engineering of Jaypee Institute of Information Technology, Noida is an authentic record of my own work carried out during a period from January 2023 to May 2023 under the supervision of **"Ms. Monika Singh"**, ECE Department. The matter presented in this report has not been submitted by me for the award of any other degree l sew here.

Divya Singh (20102019)

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

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I wish to thank all the staff of Electronics and Communication Department for providing me all support whenever needed.

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1.

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CHAPTER 1

INTRODUCTION

OBJECTIVE

The global spread of COVID-19 has caused a sense of alarm and uncertainty among the general people. People have numerous questions and are unsure of what steps to take to protect themselves and their families. Additionally, COVID-19 myths, rumours, and misinformation have spread just as swiftly as the virus itself. Hotlines for public health and patient communication systems are currently handling a lot more calls than usual, which is taxing the capacity of the available resources. To free up human resources to tackle more challenging issues in the fight against this pandemic, health organisations must automate as many of the answers to these questions as they can.

1.1 OVERVIEW

A significant gap in the turnover of the agriculture industry is today's greatest crisis. The majority of the significant losses in agriculture, whether they be material or monetary, are related to the health and quality of the crops. A loss could occur if it turns out that the crops weren't up to par. We must keep crops in top condition and maintain their quality in order to stop this. For a farmer with big lands, it is practically impossible to supervise and maintain this. But at the moment, this is handled by hand. There is a danger in this; many of the labourers are preferring to work at white collar jobs, and as a result, there is a large deficiency in manpower. This makes automated farming a necessary part of the future. The greatest cause for the crops being not on par is improper irrigation (other than natural calamities). If the irrigation issues are resolved, most of the problem is solved. Hence this is the pinnacle point that needs to be renovated with technology. Automating this part of the process will be extremely beneficial to farmers. The automatic plant irrigation system will lessen the workload for farmers and help to ensure that the farmlands are always properly irrigated. Most farmers worldwide struggle to preserve their crops using appropriate irrigation techniques but are unable to do so. With the aid of this method, farmers will be able to irrigate their lands without the need for additional labour, even by themselves. The system's user-friendly, straightforward circuitry will make the user feel at ease using it. All that is required from the user is to establish the circuit, add the sensors, and connect the pump to the circuit. The system will begin operating as soon as it is powered on and won't require a trigger to keep it going.

1.1.1 Problem domain

For continuously increasing demand and decrease in supply of food necessities, it’s important to rapid improvement in production of food technology. Agriculture is only the source to provide this. This is the important factor in human societies to growing and dynamic demand in food

production. Agriculture plays the important role in the economy and development, like India. Due to lack of water and scarcity of land water result the decreasing volume of water on earth, the farmer use irrigation. Irrigation may be defined as the science of artificial application of water to the land or soil that means depending on the soil type, plant are to be provided with water.

From massive agribusiness players like Cargill to small organic farmers, growers all over the world are using the Internet of Things to reduce their consumption of water and fertilizers, cut waste and improve the quality or yield of their products. Examples range from tracking microclimates across cropland, to closely monitoring temperature changes and humidity levels as perishable goods move from field to warehouse to store in order to extend their shelf life and eliminate waste. California's recent historic drought forced many growers to search for ways of using less water. Tech providers are helping them with tools such as drone imagery and soil sensors, which measure real-time conditions. According to The Nature Conservancy, such precision agriculture can enable farmers to cut water and fertilizer use by up to 40 percent, without reducing yields. By improving the irrigation efficiency in agricultural sector, this industry become more competitive and sustainable. Also, in dry areas, where there is no sufficient rainfall, proper irrigation is not possible. Hence by using this irrigation system by monitoring the moisture content of soil are can meet the water requirements necessary for the field. To save effort of farmers, the important considerations are water and time. In present condition, they need to wait until field is fully watered. This restricts them to do other activities. This idea is not only meant for farmers but also for watering the plants. In our present era, the farmers are irrigating their crops at regular interval of time. The techniques they use will consume more water by creating water logging and results in water wastage. This system that we designed will completely eliminate the stress of manual Labour. Two types of soils have been tested and it will only work when the soil condition is dry. Agriculture is the backbone of all developed countries. It uses 85% of available fresh water resources worldwide and this percentage continues to be dominant in water consumption because of population growth and increased food demand. Due to this efficient water management is the major concern in many cropping systems in arid and semi- arid areas. NodeMCU based Smart Irrigation System helps the farmer by checking the moisture of the soil and if the moisture is below the level then automatic water is irrigated. Over irrigation occurs because of poor distribution or management of waste water, chemical which lead to water pollution. Under irrigation leads to increase soil salinity with consequent buildup of toxic salts on the soil surface in areas with high evaporation. To overcome these problems and to reduce the man power Iot Based Smart Irrigation System has been used.

1.2 AIM OF THE PROJECT

The motivation for this project came from the countries where economy is based on agriculture and the climatic conditions lead to lack of rains & scarcity of water. Our country mostly depends on agriculture. The farmers working in the farm lands are solely dependent on the rains and bore wells for irrigation of the land. Even if the farm land has a water-pump, manual intervention by farmers is required to turn the pump on/off whenever needed. The project aim is to detect the dryness in soil using sensors and provide water to the plants appropriately. This project helps to maintain the plants quite easily. In this project we are detecting soil moisture and need for Irrigation. The Aim of our project is to minimize this manual intervention by the farmer. Automated Irrigation system will serve the following purposes:

1) As there is no un-planned usage of water, a lot of water is saved from being wasted.
2) The irrigation is done only when there is not enough moisture in the soil and the sensors decide when the pump should be turned on/off. This saves a lot time for the farmers. This also gives much needed rest to the farmers, as they don't have to go and turn the pump on/off manually.

This Project is for the academic year 2022-2023 in partial fulfillment of the requirement for the Vth semester minor-project in ECE.

1.3 PROBLEM STATEMENT

The automatic plant irrigation system will lessen the workload for farmers and help to ensure that the farmlands are always properly irrigated. Most farmers worldwide struggle to preserve their crops using appropriate irrigation techniques but are unable to do so. With the aid of this method, farmers will be able to irrigate their lands without the need for additional labour, even by themselves. The system's user-friendly, straightforward circuitry will make the user feel at ease using it. All that is required from the user is to establish the circuit, add the sensors, and connect the pump to the circuit. The system will begin operating as soon as it is powered on and won't require a trigger to keep it going.

CHAPTER 2

BACKGROUND

2.1 EXISTING SYSTEM

The continuous increasing demand of food requires the rapid improvement in food production technology. In a country like India, where the economy is mainly based on agriculture and the climatic conditions are isotropic, still we are not able to make full use of agricultural resources.
The main reason is the lack of rains & scarcity of land reservoir water. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Another very important reason of this is due to unplanned use of water due to which a significant amount of water goes to waste.
The existing system of manual irrigation is very inefficient in regard to solving these issues. In modern drip irrigation systems, the most significant advantage is that water is supplied near the root zone of the plants drip by drip due to which a large quantity of water is saved. At the present era, the farmers have been using irrigation techniques in India through manual control in which farmers irrigate the land at the regular intervals. This process sometimes consumes more water or sometimes the water reaches late due to which crops get dried. Water deficiency can be detrimental to plants before visible wilting occurs. Slowed growth rate, lighter weight fruit follows slight water deficiency. This problem can be perfectly rectified if we use automatic irrigation system in which the irrigation will take place only when there will be acute requirement of water.

2.2 PROPOSED SYSTEM

All the lands to be irrigated manually are automatically irrigated by this system. When compared to the previous system where farmers need to frequently and constantly keep monitoring the field for signs of dryness, this system will reduce the time needed to be spent on monitoring the field. It greatly diminishes the need for manpower by a great value. This system will be able to function even when the owner is unavailable for a small period of time, hence ensuring proper irrigation even in the absence of people. Also water will not be wasted during traversal.

In recent times, the farmers have been using irrigation technique through the manual control in which the farmers irrigate the land at regular intervals by turning the water-pump on/off when required. This process sometimes consumes more water and sometimes the water supply to the land is delayed due to which the crops dry out. Water deficiency deteriorates plants growth before visible wilting occurs. In addition to this slowed growth rate, lighter weight fruit follows water deficiency. This problem can be perfectly rectified if we use Automated Irrigation System in which the irrigation will take place only when there will be intense requirement of water, as suggested by the moisture in the soil.

Fig.1

Fig.2

CHAPTER 3

PROJECT DEVELOPMENT

3.1 HARDWARE REQUIREMENTS

The hardware components required for the project are listed as follows:

Table 3.1 List of Components

S.NO.	Component Type	Component
1	Microcontroller	NodeMCU ESP8266
2	Sensor	Moisture sensor
3	Switch	Relay Module
4	Motor	DC Motor Pump
5	Wires	Female/Male wire
6	Board	BreadBoard

3.1.1 NodeMCU – ESP8266

- Operating Voltage: 2.5 to 3.3V
- Operating current: 800 mA
- 3.3V 600mA on-board voltage regulation
- ESP8266 comes up with 2 switches one is **reset** and another one is **flash** button, **Reset** button is used to reset NodeMCU and **flash** button is used to download and is used while upgrading the firmware. The board has build in LED indicator which is connected to D0 pin.
- The NodeMCU board also contains a CP2102 USB to UART module to convert the data from USB to serial so that it can be controlled and programmed via computer.
- The esp8266 has 4 **power** pins: One **VIN** pin for input power supply and three **3.3V** pins for output power supply. Even if 5V regulated supply is given through VIN, the voltage regulator will decrease it to 3.3v during output.
- The esp8266 has 3 **GND** pins which indicate ground supply. Generally, the negative terminals are connected to these pins.

- Esp8266 NodeMCU has 17 **GPIO** pins which can be assigned to various functions such as UART, PWM, I2C,IR and Button via programming. When configured as an input pin, the GPIO pins can also be set to edge-trigger or level-trigger to generate CPU interrupts.
- ESP8266 NodeMCU has 2 **UART** interfaces, i.e. UART0 and UART1, which offer asynchronous communication, and may communicate at up to 4.5 Mbps. TXD0, RXD0, RST0 & CTS0 pins can be used for communication. It supports fluid control. However, TXD1 pin features only data transmit signal so, it's usually used for printing log.
- ESP8266 has two **SPI** in slave and master modes. These SPIs also support the following general features: 4 timing modes of the SPI format transfer. Up to 64-byte FIFO buffer.
- Esp8266 has a **secure digital I/O** interface which is used directly control the SD cards.
- Esp8266 has 4 channels of Pulse width modulation **(PWM)**. The output can be controlled via programming and is frequently used for driving motors and LEDs. The frequency ranges from 100Hz to 1KHz.
- There are three **control** pins on the esp8266: The enable pin (EN), the reset pin (RST) and the wake pin.
- The esp8266 chip works when the enable pin is high. When the enable pin is low, the chip works on minimum power.
- The **reset** pin is used to reset the esp8266 chip.
- The **wake** pin is used to wake up the chip from deep sleep mode.

In this circuit, the Soil sensor is connected to the A0 pin of NodeMCU. LDR sensor is connected to the D1 pin, and the Relay module is connected to the D0 pin of NodeMCU. Solenoid Valve is connected to the relay module, so whenever NodeMCU generates a trigger, it will sprinkle water.

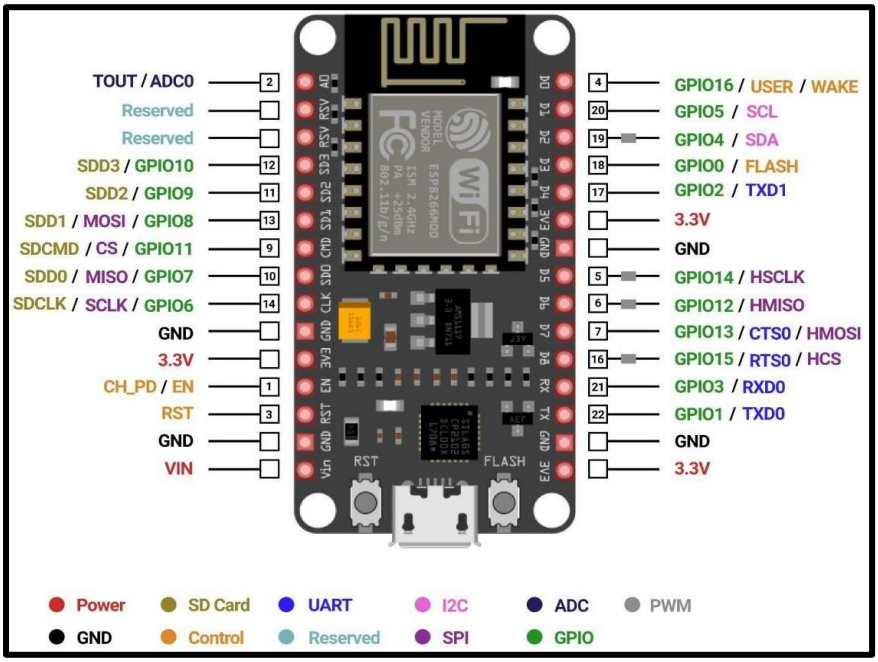

Fig.3 NodeMCU -ESP8266

3.1.2 Soil Moisture Sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

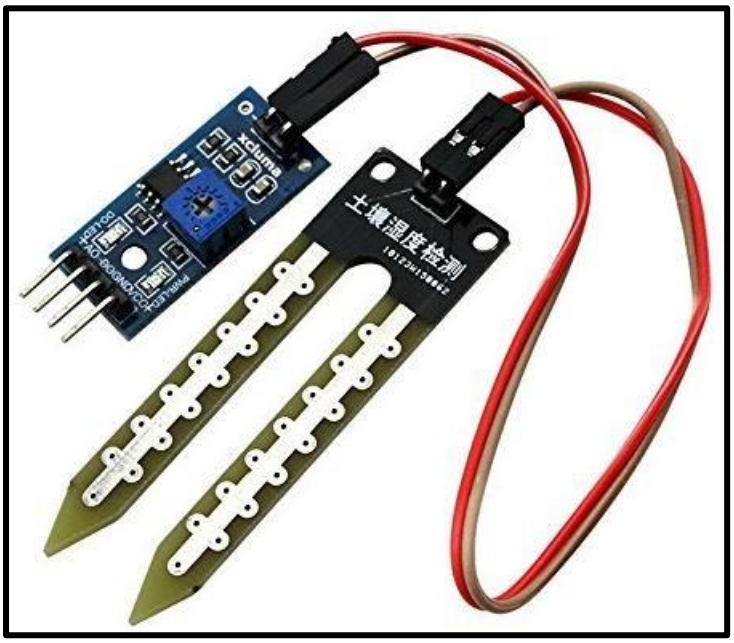

Fig .4 Soil Moisture Sensor

3.1.3RELAY BOARD

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.
Electromagnetic relays are those relays which are operated by electromagnetic action. Modern electrical protection relays are mainly micro-processor based, but still electromagnetic relay holds its place. It will take much longer time to be replaced the all electromagnetic relays by micro-processor based static relays.

- **COMPONENT INTERNAL STRUCTURE:**

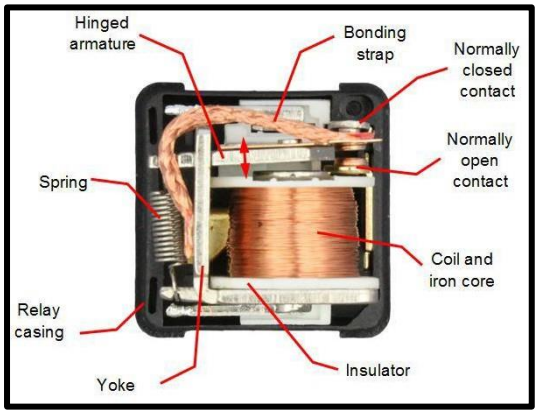

Fig.5 Relay internal structure

- **COMPONENT EXTERNAL STRUCTURE:**

Fig .6 Relay External Structure

3.1.3.3 OPERATIONAL DIAGRAM:

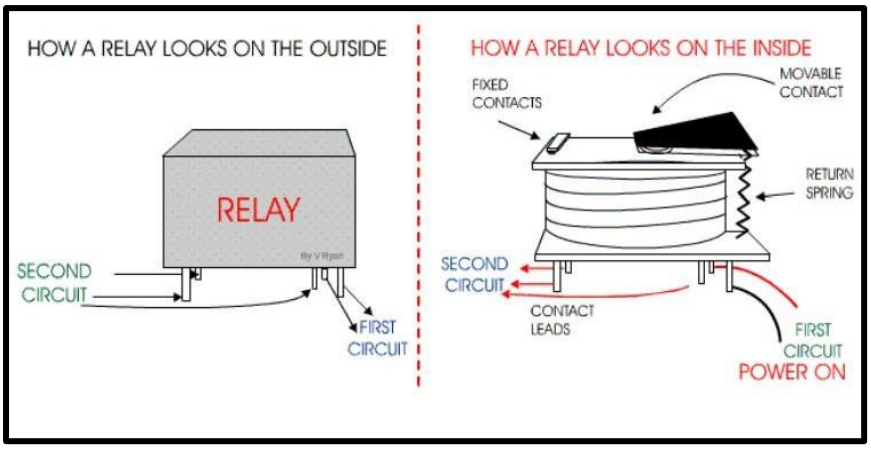

Fig.7 Relay operational diagram

3.1.4 DC MOTOR PUMP

A DC motor is any of a class of rotary electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings.A DC motor pump is essentially a DC Motor that is used to circulate water. The internal structure is the same. The DC motor is encased in a waterproof plastic casing and the shaft is used to drive an external arm that pumps water.The Pump requires a 5V supply, which can be easily provided by batteries or AC supply.

3.1.4. COMPONENT STRUCTURE:

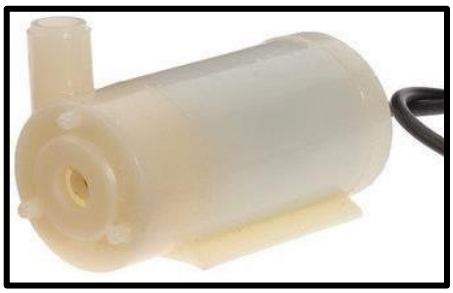

Fig.8 DC Motor Pump

3.1.5 Wires

Jumper wires are simply wire that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as ground or power. For this project two varieties of jumper wires were use Male to Male and Female to male.

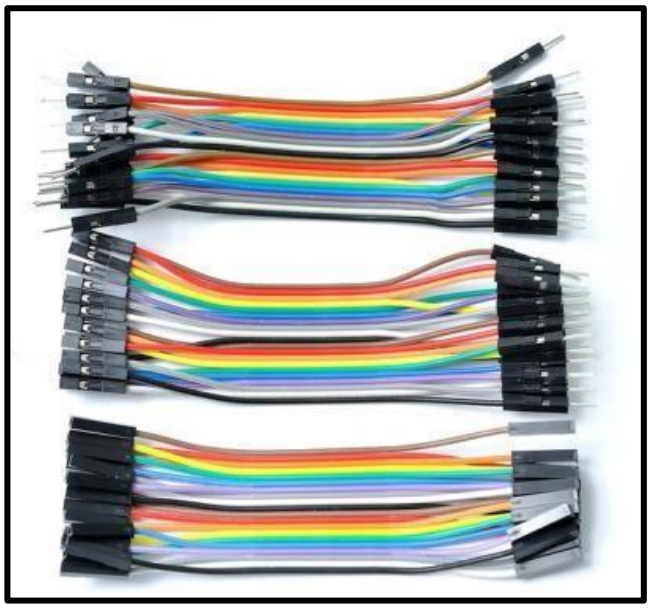

Fig.9 Jumper Wires

3.1.6 Breadboard

A breadboard, solderless breadboard, or protoboard is a construction base used to build semi- permanent prototypes of electronic circuits. Unlike a perfboard or stripboard, breadboards do not require soldering or destruction of tracks and are hence reusable. For this reason, breadboards are also popular with students and in technological education. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs).

Compared to more permanent circuit connection methods, modern breadboards have high parasitic capacitance, relatively high resistance, and less reliable connections, which are subject to jostle and physical degradation. Signaling is limited to about 10 MHz, and not everything works properly even well below that frequency.

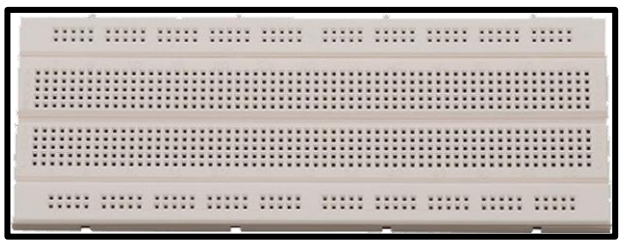

Fig.10 Breadboard

3.1.7 SOFTWARE

HOW BLYNK IOT WORKS

Blynk is an IoT analytics platform service that allows you to aggregate, visualize, and analyze live data streams in the cloud. You can send data to Blynk from your devices, create instant visualizations of live data, and send alerts using web services like Twitter and Twilio. **Blynk** is an open-source software written in Ruby which allows users to communicate with internet enabled devices. It facilitates data access, retrieval and logging of data by providing an API to both the devices and social network websites. Blynk was originally launched by ioBridge in 2014 as a service in support of IoT applications.

Blynk is a platform providing various services exclusively targeted for building IoT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts, ability to create plugins and apps for collaborating with web services, social network and other APIs. We will consider each of these features in detail below.

The core element of Blynk is a 'Blynk Channel'. A channel stores the data that we send to Blynk and comprises of the below elements:

- 8 fields for storing data of any type - These can be used to store the data from a sensor or from an embedded device.
- 3 location fields - Can be used to store the latitude, longitude and the elevation. These are very useful for tracking a moving device.
- 1 status field - A short message to describe the data stored in the channel.

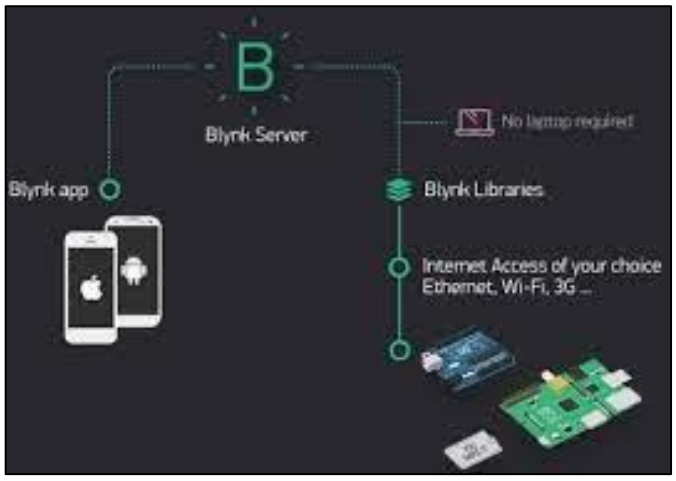

Fig.11 Blynk IOT Software

CHAPTER 4

SYSTEM DESIGN

4.1 FLOW CHART

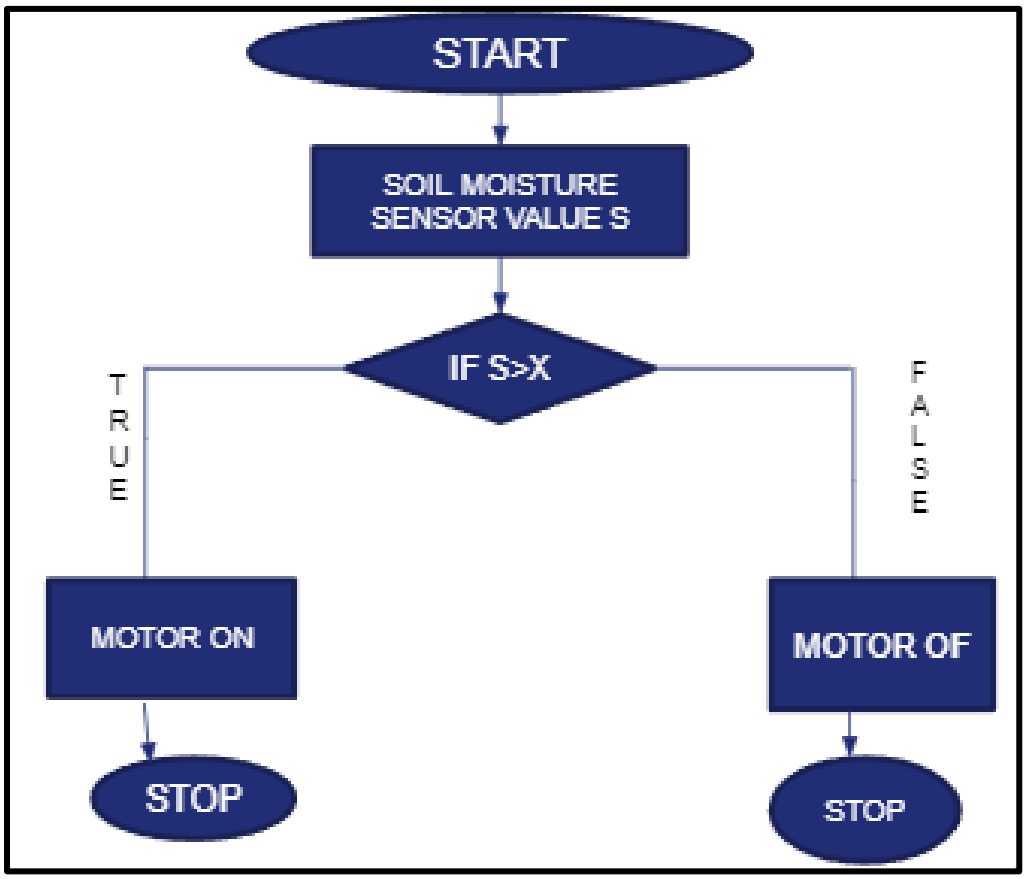

Fig.12 Flow chart of the circuit

4.2. FLOW DIAGRAM

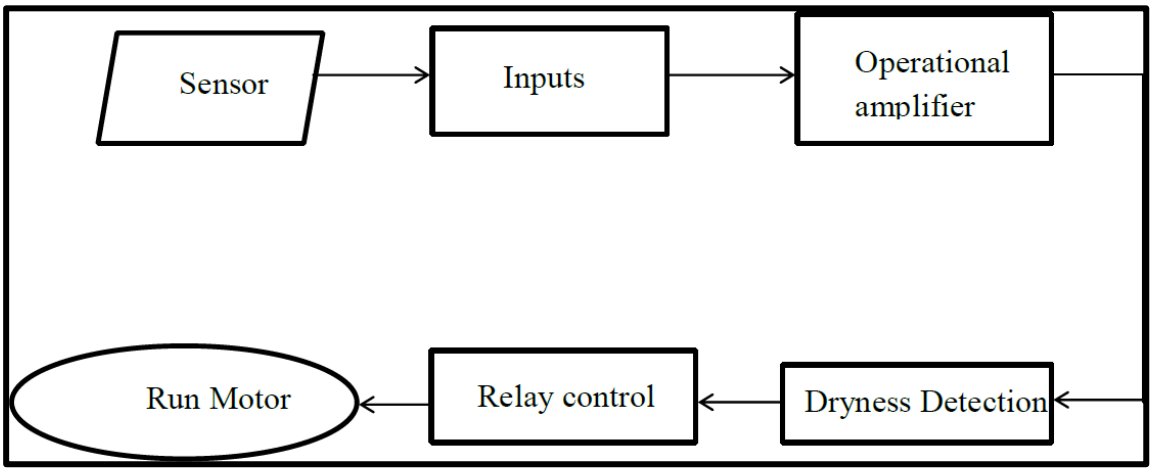

Fig.13 Flow diagram of the circuit

4.3 CIRCUIT DIAGRAM

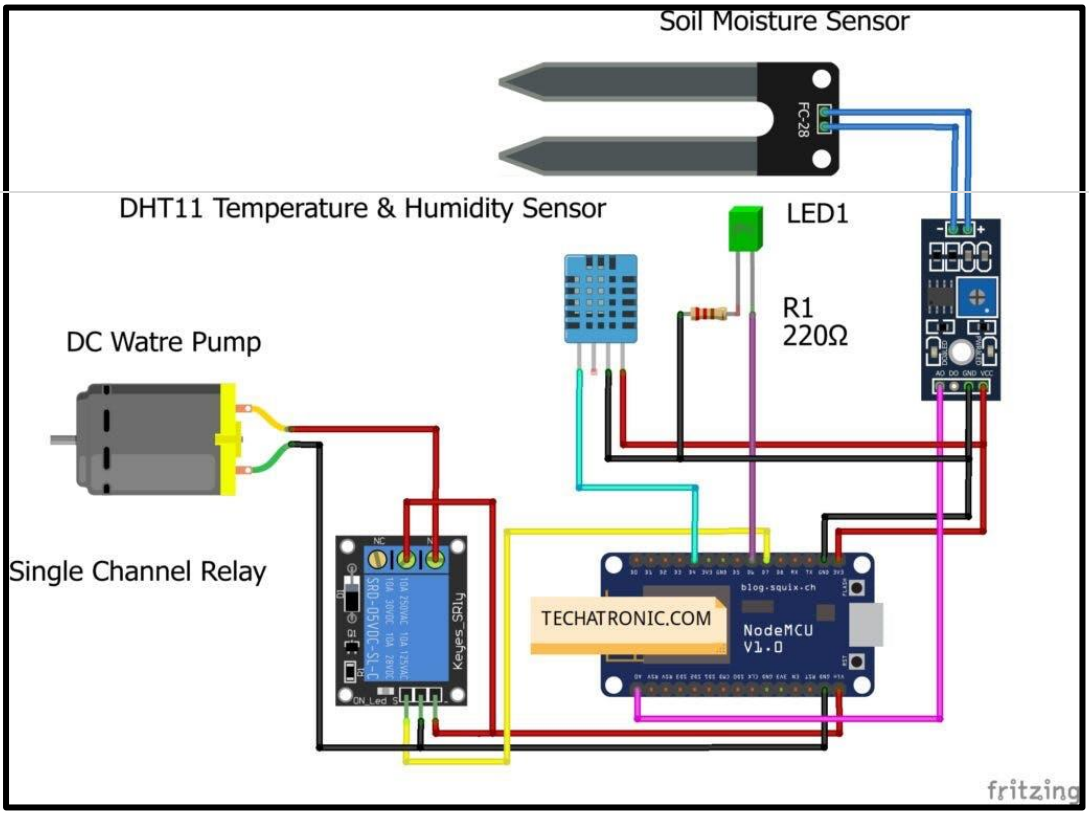

Fig.14 Circuit diagram

4.4 ADVANTAGES

- The main advantage of this project is that it has faster execution when compared to manual execution of the process.
- It is simple, portable and provides high performance.
- It consumes less power
- Dryness can be easily detected in soil.
- Permits a non- expert to do the work of an expert.
- Improves productivity by increasing work output and improving efficiency.
- Saves time in accomplishing specific objective.
- This system ensures that the plants do not endure from the strain or stress of less and over watering.
- This system saves labour cost and water up to 70%. The working of this irrigation system covers over 40 crops spanning across 500 acres

4.5 APPLICATIONS OF PROJECT

I propose an application to detect water deficiency state in soil based exclusively on sensor-provided data.In an Automated Irrigation System, the most significant advantage is that water is supplied only when the moisture in soil goes below a pre-set threshold value.

- This system can be used in roof gardens in highly populated areas where land is expensive and gardening on rooftops seems like the only viable option left.
- The lawns of houses and public buildings can be maintained by these systems, thereby reducing the need for human monitoring.
- The greatest application is in agricultural lands, where farmers are assisted greatly by this. There is no need for the farmer to actually be present during operation.
- Gardens that need to be monitored in the absence of home owners require systems like SPMS. Home gardens that are maintained with large effort by home owners require proper observation and maintenance. It can be provided by SPMS.
- This system can be used in the field of pisciculture. Fish farming or pisciculture involves raising fish commercially in tanks or enclosures, usually for food. It is the principal form of aquaculture, while other methods may fall under mariculture. The fishes need to be in a depth of 1m in the aquarium and this depth is maintained with the help of SPMS. The appropriate threshold value is assigned and the circuit is operated.
- Irrigation in parks needs to be done even when people are not there to maintain the grass or trees.
- Detection in this manner is cheap, non-invasive and can be applied on a population-wide scale.
- The presence of technology in all aspects of life has enabled solutions to real life problem that were either difficult or unfeasib

4.6 FUTURE ENHANCEMENT

The application certainly is much more advantageous than the manual system. There will be no bias in the regions being covered and the delay is kept as minimal as it can be.

- The operator does not require any previous training because of its user friendliness.
- The operator is free from any technical issues. Extremely simple design makes the circuit easy to implement and maintain.
- Alterations in the system can be done easily if the process of the working changes in future.
- In future according to the user's requirement it can be updated to meet the user requirements.
- Smart Wifi Irrigation Controllers are next generation controllers that adjust your irrigation system automatically using real-time weather information. Moreover, you can control it from anywhere, anytime.

4.7 LIMITATIONS

- The system requires two different power supplies. While implementing in large fields, industrial supply can be used to run the motor. In small gardens this may seem like a large wastage.
- Needs a large amount of sensing equipment for very large irrigation areas.
- The system is not 100% reliable. Unexpected factors can cause errors, and it may in some cases cause loss. Despite being good, it needs to be manually checked and maintained once every few weeks.

CHAPTER 5

SYSTEM IMPLEMENTATION

5.1 METHODOLOGY

Implementation of the project required the design of the system developed in the design phase of the project to be carefully implemented.
The extensive implementation of automated systems in agriculture has proven to successfully reduce cost. The operation of automated agricultural system could potentially revolutionize the irrigation process and the way it has impacted the commercial & industrial sectors. Thus, this project has been an expert or non-expert-system-based method of field monitoring for detecting dryness & treatment of the field. The prototype system food and beverage industry has the potential to be useful for the industry, seeking ways to make agriculture cost effective. Furthermore, the ultimate beneficiaries of the project are the farmers who are the backbone of an agricultural economy.

5.2 PROJECT PLAN

The Objective of the project planning is to provide a framework that enables an owner to make reasonable estimate of the resources, cost and schedule. The project leader is responsible for designing the system precisely according to the requirement specified by the owner/ customer. He/She is also responsible for maintenance of the system for certain period of time, since in most cases, cost of maintenance is much higher than cost of developing the system. Thus to reduce development and maintenance cost and to provide the system within planned time, proper planning of system is necessary.

5.3 PROPOSED ALGORITHM

```
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

char auth[] = "8zmiDsSIwnxq9sC3kehsUMFUpojOELJ4";
char ssid[] = "Saksham";
char pass[] = "Saksh123";

BlynkTimer timer;
bool Relay = 0;

#define sensor A0
#define waterPump D0
```

```
 void setup() {
   Serial.begin(9600);
  pinMode(waterPump, OUTPUT);
   digitalWrite(waterPump, HIGH);


   Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);

   timer.setInterval(100L, soilMoistureSensor);
 }

 BLYNK_WRITE(V1) {
   Relay = param.asInt();

   if (Relay == 1) {
     digitalWrite(waterPump, LOW);

   } else {
     digitalWrite(waterPump, HIGH);

   }
 }

 void soilMoistureSensor() {
 int value = analogRead(sensor);
 value = map(value, 0, 1024, 0, 100);
 value = (value - 100) * -1;

Blynk.virtualWrite(V0, value);

 }

void loop() {
Blynk.run();//Run the Blynk library
timer.run();//Run the Blynk timer
 }
```

5.4 WORKING

This project consists of two sections: the external sensor unit, and the inbuilt processing unit. In the external sensor unit, the basic requirement of sensing the moistness of the sand or soil through capacitive reactance is performed, the arms of the sensor are able to detect resistance and provide input to the Arduino uno board.

When the soil becomes dry, it produces large voltage drop due to high resistance, and this is sensed by the soil moisture sensor, and this resistance causes the operational amplifier to produce an output that is above the threshold value required. This causes the relay to change from normally open to closed condition – The relay becomes on.

When the relay is turned on, the valve opens and water through the pipes rushes to the crops. When the water content in the soil increases, the soil resistance gets decreases and the transmission of the probes gets starts to make the operational amplifier stop the triggering of the relay. Finally the valve which is connected to the relay is stopped.

The data pins of soil moisture sensor is connected to A0 pin of NodeMCU board and its probe is placed near the roots of the plant. and Vcc pin is connected to 5 V pin of board and GND of sensor and motor driver is connected to GND of board. Probe of soil moisture sensor should be inserted near the roots of the plant. 6V pump is connected to relay module. It is connected in this way because the amount of power that is given to the motor directly by NodeMCU is not sufficient to

run it. The data pin of motor driver is connected to pin 13 of board. Working is as follows: the probe connected to the sensor sends some amount of current into the soil. If the soil is having high moisture content, then it will allow the current to pass through it easily. Output pin will be low and motor will remain OFF. If the soil has less moisture content, then it will not allow the current to flow through. Output pin will be high and motor will remain ON. By comparing the difference in the rate of flow of current, the moisture in the soil is calculated. The moisture sensor measures according to the code transferred into the NodeMCU board. If the readings of the sensor reaches more than value as coded, then the field is irrigated.

5.4.1 WORKING MODEL STRUCTURE

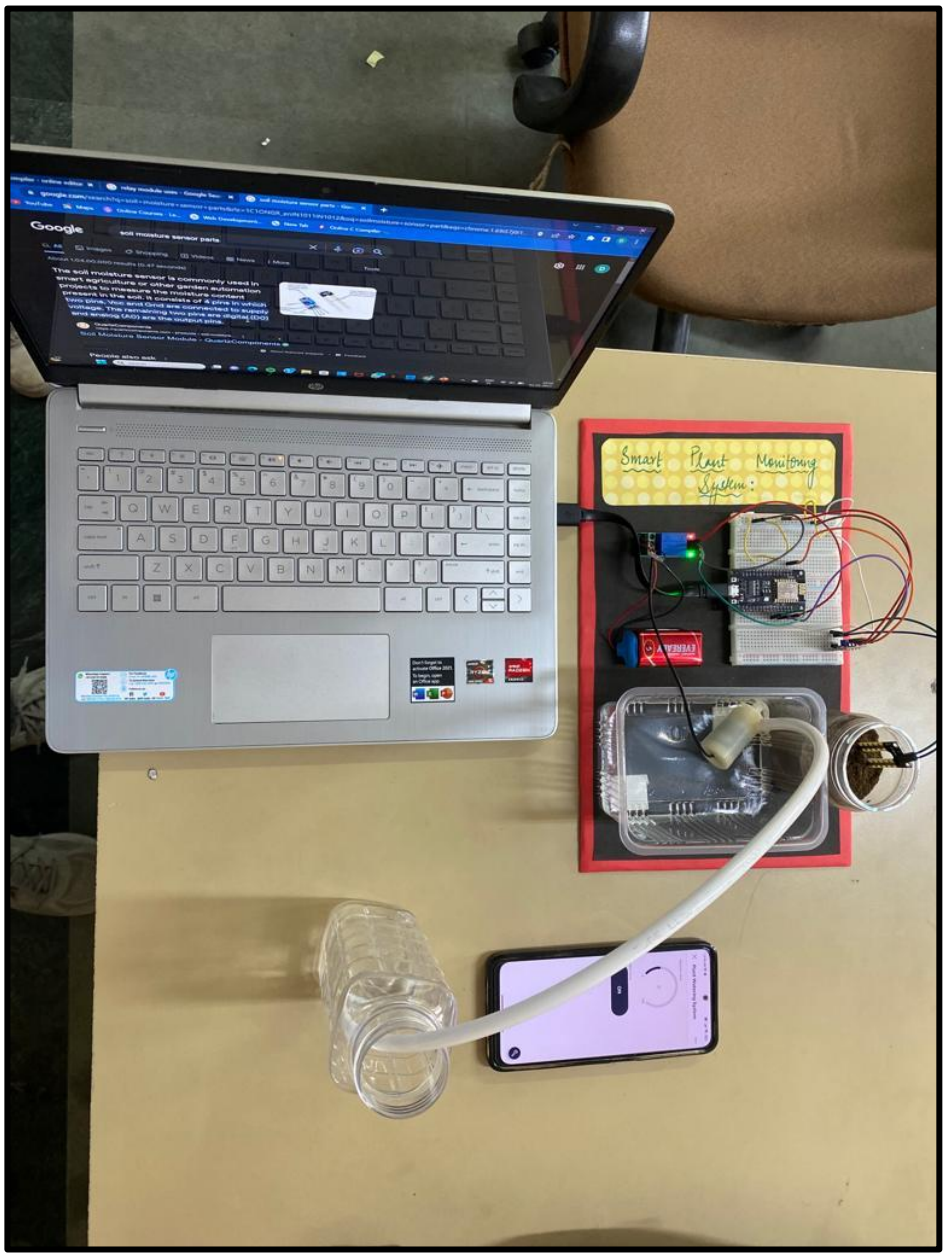

Fig.15 Working model

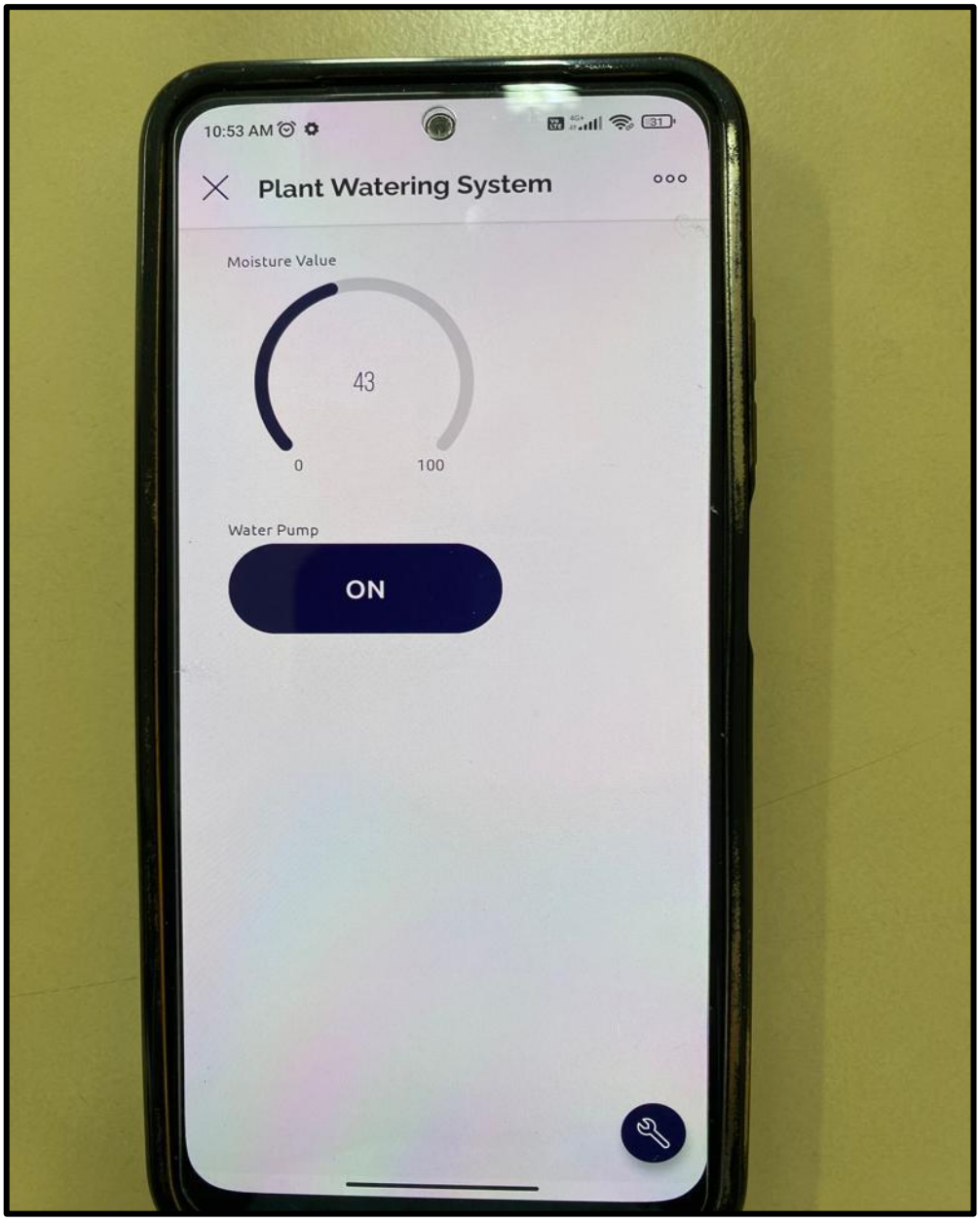

Fig .16. Working Model

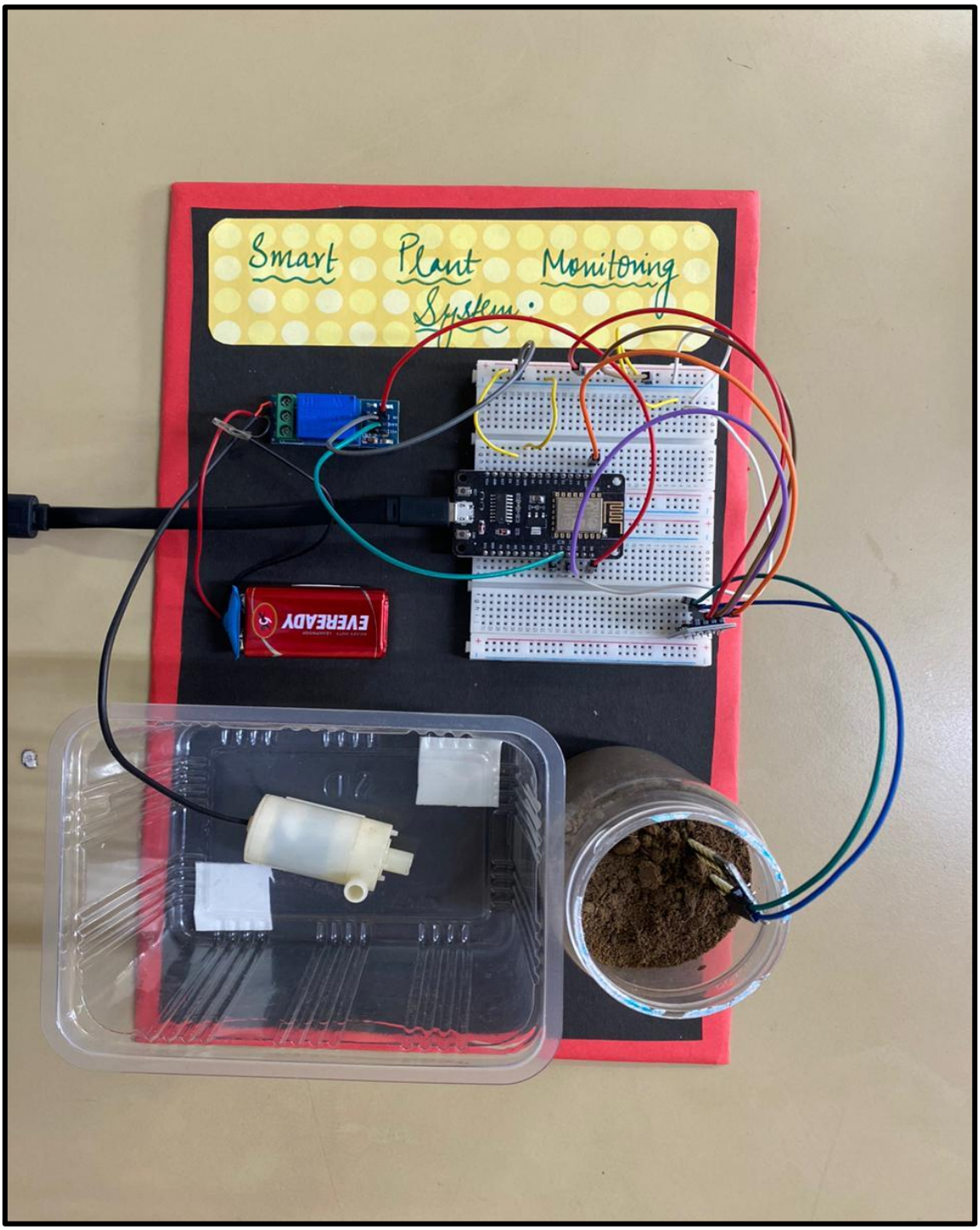

Fig.17Working Model

CHAPTER 6

CONCLUSION

Irrigation becomes easy, accurate and practical with the idea above shared and can be implemented in agricultural fields in future to promote agriculture to next level. The output from moisture sensor and level system plays major role in producing the output.

Thus the "SMART PLANT MONITORING SYSTEM" has been designed and tested successfully. It has been developed by integrating all the features of all the hardware components used. Presence of every module has been reasoned above and placed carefully in order to contribute to the best working of the unit. The system has been tested to function automatically, and to the best of its ability. The moisture sensors measure the moisture level (water content) of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the operational amplifier which triggers the DC Motor pump to turn ON and supply the water to respective field area. When the desired moisture level is reached, the system halts on its own and the DC Motor 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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