A project report on

Smart Plant Monitoring System

Under Supervision of

Mrs. Deepika Rawat
Assistant Professor
Raj Kumar Goel Institute of Technology
Ghaziabad, U.P.

Submitted by

Reeshika Gupta
(Roll no.: 2000331550081)
Mohit Singh
(Roll no.: 2000331550063)
Ravina Kumari
(Roll no.: 2000331550080)
Prateek Tyagi
(Roll no.: 20003315500)

(2020-2024)

R.K.G. Institute of Technology
5KM Stone Delhi, Meerut Rd, near Raj Nagar Extension Road, Ghaziabad, Uttar Pradesh-201003

ACKNOWLEDGEMENT

I would like to express my profound gratitude to Dr.Jaideep Kumar), of HOD CSE(IOT) department, and Mr. HG Garg of RKGIT for their contributions to the completion of my project titled smart plant monitoring system.

I would like to express my special thanks to our mentor Mrs.Deepika Rawat for her time and efforts she provided throughout the semester. Your useful advice and suggestions were really helpful to me during the project's completion. In this aspect, we are eternally grateful to you.

Finally, we would like our friends for supporting and encouraging us throughout.

TABLE OF CONTENT

PREVIEW

As we can see in today's world only some devices like PC's and mobiles are connected to internet. Now-a-days world is fully overtaken by the internet and internet of things. Internet is use for basic need of all human beings. The Internet of Things (IOT) is the network of physical objects. It simply means to monitor a physical device or machine or it is inter-networking of physical devices which is embedded with electronics, sensors, software and network connectivity to enable it to achieve greater value and services by exchanging data with the manufacturer Agriculture is the backbone of our country; most of the people depend on agriculture. The main issue in agriculture is water scarcity. The water resource is not used in an effective manner, so the water is wasted. In order to overcome this irrigation process can be automated. The use of Internet of things in this field will be helpful to reduce the wastage of water. So that the temperature as well as humidity and light are measured by means of sensors and depend up on the outcome further processing can be performed. We propose a system that will capture all the details about the soil and the temperature by means of different sensors IOT permits objects to be sensed or controlled remotely across the network infrastructure. The result improves accuracy, economic benefits, efficiency and reduces intervention of human. In this paper we are going to deal with basic and important concepts of IOT and its scope in upcoming future. This paper studies the need of IOT in day to day life for different applications and gives brief information about IOT. IOT contributes significantly toward revolutionary farming methods. So we are trying to demonstrate IOT in Automatic watering system. Automatic watering system monitors and maintain the approximate moisture content in soil. Node MCU is used as microcontroller to implement the control unit. The set up uses the temperature sensor, moisture sensor and humidity sensor which measure the approximate temperature, moisture and humidity in the soil. This value enables the system to use appropriate quantity of water which avoids over/under irrigation.

INTRODUCTION

Plant plays a vital role in maintaining the ecological cycle and forms the fo undation of a food chain pyramid and thus to maintain the plant's proper gr owth and health adequate monitoring is required. Hence the aim at making plant monitoring system smart is using automation and Internet of Things (I OT) technology. This topic highlights various features such as smart decisi on making based on soil moisture real time data.

The computerized water system framework with IOT is practically and fina ncially sufficient for planning water resources for plantation (group of a pl- ant). Adopting the automatic water system framework, we can demonstrate that the utilization of water can be decreased for various plantations (group of plants) usages. The system framework has an appropriated microwaves (wireless) chain of moisture content in the soil through soil moisture sensor, humidity and temperature sensor set in the root zone of the plants and level of water (ultrasonic) sensor is set in tank for checking the water level in tan k. The data will gather from the sensors and send to the web server (cloud).

The background of chapter highlights the study of IOT in the field of agricu -lture. This shows how we can implement the IOT technology to make our planting smart and reliable with the real time updated data. This chapter als o helps the beginners to implement the IOT technology and learn the basics of this technology.

Internet of Things (IoT) plays an important role in most of the fields. The use of IoT increased because of the various advantages we can get from that. The agriculture is the area where a lot of improvement is needed because that is one of the essential needs and a large sector of people is involved in that. Most of the area the major problem is the water scarcity because of low rainfall and even though there is rainfall the water is wasted because of no proper arrangement for the storage of water. Many techniques are proposed in IoT in terms of providing a better irrigation to the crop. The IoT devices can also be used in home for monitoring the garden real time.

LITRATURE SURVEY

In India about 35% of land was under reliably irrigated. And the 2/3rd part o f land is depending on \monsoon for the water. Irrigation reduces dependenc y on monsoon, improves food security and improves productivity of agricul ture and it offers more opportunities for jobs in rural areas. Farmers are faci ng problems related to watering system that how much water has to supply a nd at what time? Sometimes overwatering causes the damage to crops and a s well as waste of water. Hence for avoid such damage we need to maintain approximate water level in soil.

In this paper, humidity sensor, moisture sensor, temperature sensors placed i n root zone of plant and gateway unit (ESP8266) handles the sensor informa tion and transmit data to a android application. This application is develope d for measure approximate values of temperature sensor, humidity sensor an d moisture sensor that was programmed into a microcontroller to control wa ter quantity.

MATERIAL REQUIRED

1. NODE MCU
2. SOIL-MOISTURE SENSOR
3. DHT11(TEMPRATURE-HUMIDITY SENSOR)
4. RELAY MODULE
5. 12V WATER SUPPLY SOLENOID
6. POWER SUPPLY ADOPTER
7. LED
8. JUMPER
9. BREADBOARD

MATERIAL DISCRIPTION

NodeMCU

NodeMCU is an Internet of Things (IoT)-focused open-source Lua-based firmware and development board[9]. It includes software for Espressif Systems' ESP8266 Wi-Fi SoC as well as hardware for the ESP-12 module.The major argument for choosing this is that it is cheap and includes a built-in Wi-Fi module[10]. Because it is similar to Arduino, it can be programmed using the Arduino IDE software. It has ten General Purpose Input/Output pins for connecting to external devices. A standard NodeMCU, complete with pin numbers.

Soil Moisture Sensor

The Soil Moisture Sensor is a straightforward breakout for determining the moisture content of soil and other similar materials. The soil moisture sensor is simple to set up and operate. The sensor's two big exposed pads serve as probes, and combined they operate as a variable resistor. The greater the amount of water in the soil, the better the conductivity between the pads will be, resulting in a lower resistance and a larger SIGout[13]. It's commonly used in greenhouses to regulate water supply and other bottle enhancements. Experiments in biology to track the amount of water in the soil.

Specifications:

- Working voltage: 5V
- Working current: <20 mA
- Interface: Analog
- Working Temperature: 10°C~30°C

DHT 11

The dht11 sensor, which combines a temperature and humidity sensor, typically outputs either digital or analog data. It contains information about the temperature around the plant if it needs extra sunshine and the degree of humidity in the surrounding environment. Water vapor is detected by measuring the electrical resistance between the two electrodes. The humidity sensing component consists of the electrode and the substrate, which is responsible for retaining moisture while in contact with the surface. Ions are released by the substrate. The conductivity between the electrodes rises as soon as water vapour is absorbed by it. The calibration result of the dht11 sensor is quite accurate. Because of its small size and low power consumption, the DHT11 sensor has a wide range of uses. It can also transmit signals over a distance of up to 20 meters. The product we used was a four-pin single row pin box.

Specification:

- Temperature range: 0 to 50° C error of + 2° C.
- Humidity: 20-90% RH + 5% RH
- Interface: digital

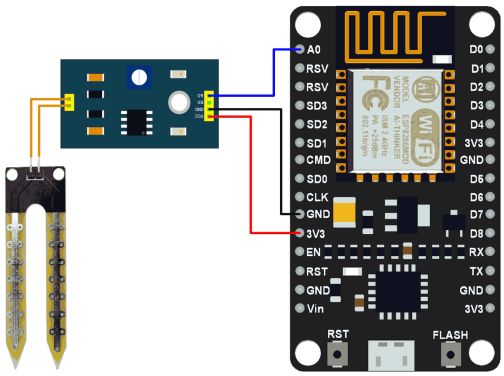
Relay

Within a relay, there is a core with copperwire wrapped around it (the coil). Under normal conditions, the switch (armature) remains in contact with the normally closed (NC) terminal. An electromagnetic field is generated when power is applied to the coil, and the coil begins to function as a magnet, attracting the armature to the normally open terminal (NO). At their most fundamental level, relays are nothing more than that. Aside from that, there are a variety of other types of relays, such as solid state and thermal relays, all of which have distinct functioning processes but serve the same purpose.

This portion is used to regulate the small dc pump, which is used to water the plants automatically, and the flow is regulated by a relay. Relays are used to switch control circuits that handle lower currents. Furthermore, it can manage even greater voltages and amperes with the assistance of amplification.

CIRCUIT DIAGRAM

Step 1:- Circuit of NodeMcu and soil moisture sensor of Plant Monetoring and control system



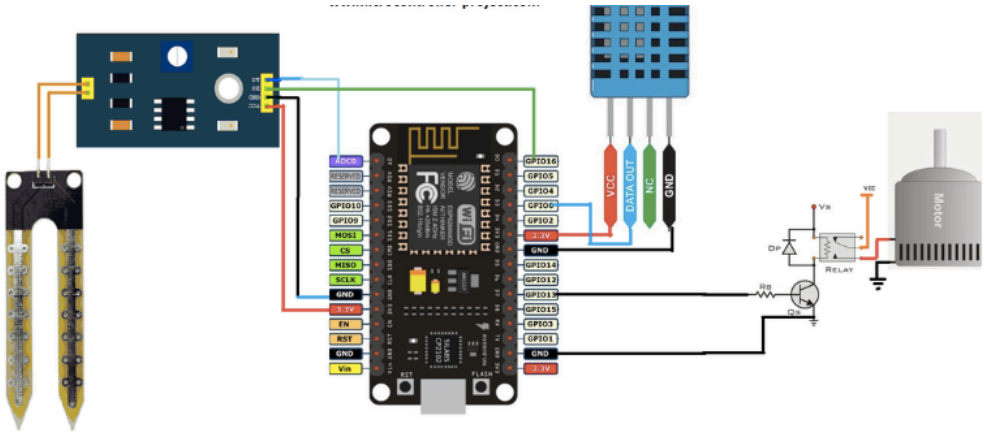
Step 2:- Circuit of NodeMcu, Humidity Temperature and soil moisture sensor for Plant Monitoring and control system

Step 3:- Circuit of NodeMcu, Humidity Temperature, LED and soil moisture sensor for Plant Monitoring and control system

Step 4:- Circuit of water pump and battery for Plant Monitoring and control system

Step 5:- Circuit of water pump, Relay and battery for Plant Monitoring and control system

Step 6:- Plant Monitoring system circuit diagram with relay Module



CODE SNIPPET

```
#define BLYNK_PRINT Serial
#include <OneWire.h>
#include <SPI.h>
#include <BlynkSimpleEsp8266.h>
#include <DHT.h>
#include <DallasTemperature.h>
#define ONE_WIRE_BUS D2
OneWire oneWire(ONE_WIRE_BUS);
DallasTemperature sensors(&oneWire);
char auth[] =”BOsoqmyvsdJSenk51n6EplHN0jqela_aajwi”;
char ssid[] = “Freewifi”;
char pass[] = “Reeshika1605”;
#define DHTPIN 2
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);
SimpleTimer timer;
void sendSensor()
{
float h = dht.readHumidity();
float t = dht.readTemperature();

if (isnan(h) ll isnan(t)) {
Serial.println(“Failed to read from DHT sensor!”);
return;
}

Blynk.virtualWrite(V5, h); //V5 is for Humidity
Blynk.virtualWrite(V6, t); //V6 is for Temperature
}
void setup()
{
```

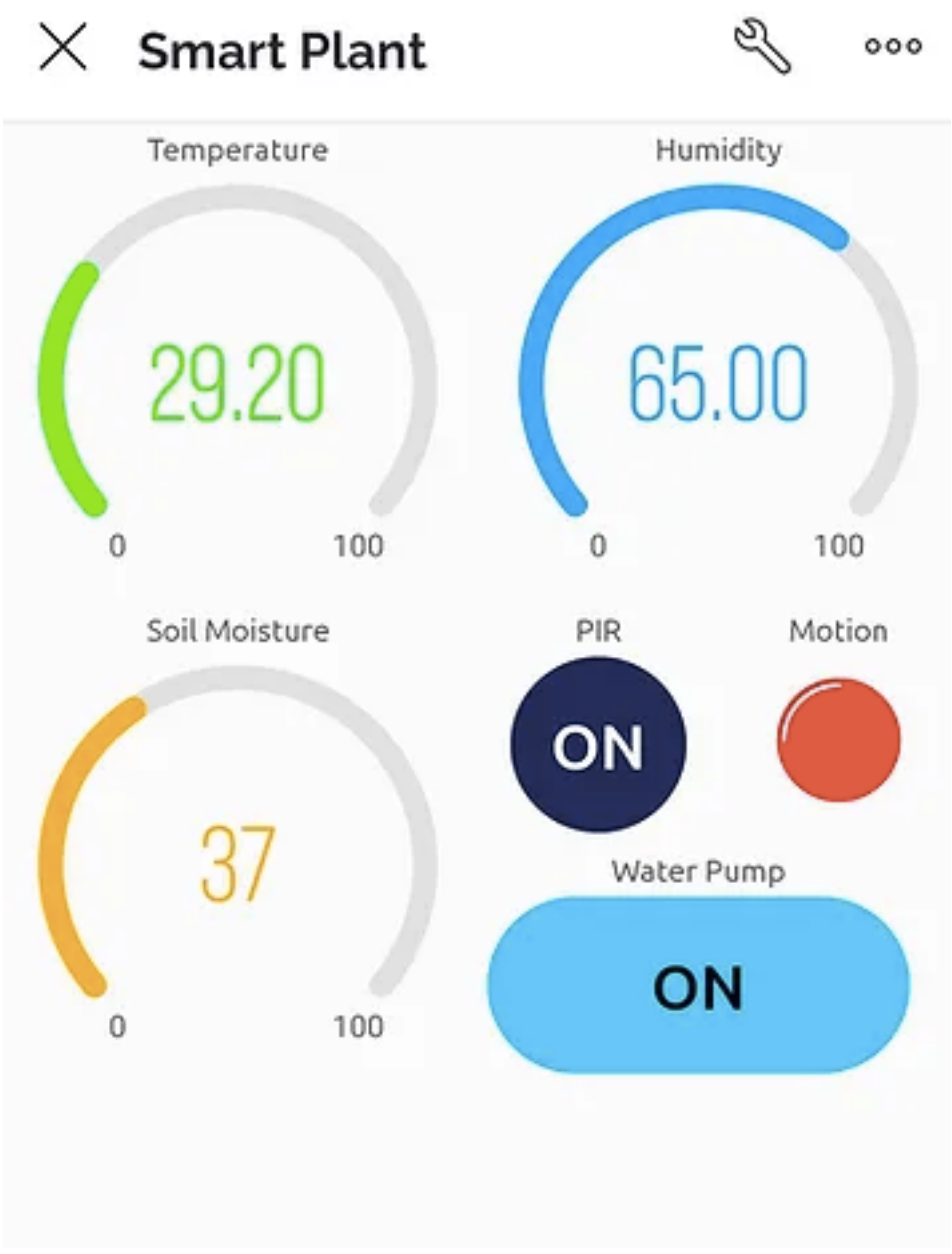
```
Serial.begin(9600);
dht.begin();

timer.setInterval(1000L, sendSensor);
Blynk.begin(auth, ssid, pass);
sensors.begin();
}
int sensor=0;
int output=0;
void sendTemps()
{
sensor=analogRead(A0);
output=(145-map(sensor,0,1023,0,100)); //in place 145 there is
100(it change with the change in sensor)
delay(1000);
sensors.requestTemperatures();
float temp = sensors.getTempCByIndex(0);
Serial.println(temp);
Serial.print("moisture = ");
Serial.print(output);
Serial.println("%");
Blynk.virtualWrite(V1, temp);
Blynk.virtualWrite(V2,output);
delay(1000);
}
void loop()
{
Blynk.run();
timer.run();
sendTemps();
}
```

Blynk app setup for Plant Monitoring and control system

The proposed Plant Monitoring System uses NodeMCU as microcontroller. NodeMCU comes with the inbuilt ESP8266 WiFi module which connects o ur system to blynk app using WiFi. The program which controls the functio ning of the whole system is fed into the microcontroller using Arduino IDE which is an environment which integrates code with the hardware. Soil moi sture sensor continuously detects the level of moisture in the soil and displa ys it on the Virtual LCD widget on the Blynk app. If the water content in th e soil is less than what is required by the plant, a notification is sent to the u ser?s smartphone and he/she can switch ON the button widget in Blynkapp which will turn ON the water supply. Real time values from the DHT11 tem perature sensor are also displayed on the virtual LCD.

Excessive heat from the sun can be harmful for plants to prevent them from dying we introduced a green shade which will automatically be drawn over t he plant with the help of two DC motors which rotate clockwise and anti-cl ockwise to help movement of the shade. Temperature more than 30C can ca use shriveling of plant.

When temperature increases this limit the motor rotates and cause the shade to move automatically. The user is notified about each and every step throu gh the notification feature of the Blynkapp. Hence, this system monitors and controls the plants requirements remotely.


Smart Plant
Temperature
29.20
0
100
Humidity
65.00
0
100
Soil Moisture
37
0
100
PIR
ON
Motion
Water Pump
ON

Result

Using Internet of Things we can establish communication between various household devices to bring out automation. Automation in routine household chores can save a lot of time and also organize the lifestyle of an individual. Point of this project was to layout a circuit that comprise of sensors and utilizing idea of Internet of things that monitors and analyses the information provided by the sensors and notifies the user regarding the changes in the plant's conditions. This plant monitoring systems a low cost system whose basic use is for the household purposes. Alongside it is kind of an interesting concept as the plant itself can call for water and protection whenever it needs it. The IOT system was thus developed using two major problems in context – to monitor and control the shade which inversely alters the amount of sunlight received by the plant. The catch of finding the correct shade time interval was crucial as too little sunlight would result in starvation due to lack of food preparation and too much would cause irreparable damage to the biological structure of it leading to eventual mortality.

Future Scope

The performance of the system can be further improved in terms of the oper ating speed, memory capacity, and instruction cycle period of the microcont roller by using other high end controllers. The number of channels can be in creased to interface more number of sensors which is possible by using adv anced versions of controllers.

The system can be modified with the use of a data logger and a graphical L CD panel showing the measured sensor data over a period of time. A speaki ng voice alarm could be used. The device can be made to perform better by providing the power supply with the help of renewable source. Time bound administration of fertilizers, insecticides and pesticides can be introduced.

Conclusion

The implementation of Smart Garden system using the Internet of Things has been verified to satisfactorily work by connecting different parameters of the soil to the cloud and was successfully controlled remotely through a mobile application. The system designed not only monitors the sensor data, like moisture, humidity, temperature and ultrasonic but also actuates other parameters according to the requirement, for example, if the water level in tank is reduced to a minimum value then the motor switch is turned on automatically to the water level of the tank reaches the maximum value. The initial cost and the installation of this system are cheap and hence it can be implemented anywhere. With the development of sensor technology, the system can be elevated to the next level which helps the users to utilize their investment in an economic manner. If soil nutrient sensors can be installed, then the system can be modified to supply fertilizers to the garden precisely. This system saves manpower and efficiently utilizes the water resources available ultimately leading to more profit. The feedback provided by the system will improve the implementation of the gardening process A system to monitor temperature, humidity, moisture level in the soil was designed and the project provides an opportunity to study the existing systems, along with their features and drawbacks. Agriculture is one of the most water-consuming activities. The proposed system can be used to switch the motor (on/off) depending on favourable condition of plants i.e sensor values, thereby automating the process of irrigation. Which is one of the most time efficient activities in farming, which helps to prevent over irrigation or under irrigation of soil thereby avoiding crop damage. The farm owner can monitor the process online through a android App. Though this project can be concluded that there can be considerable development in farming with the use of IOT and automation.