IOT BASED SMART IRRIGATION SYSTEM

A PROJECT REPORT

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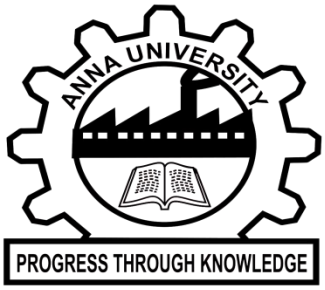

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APPENDIX 2

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BONAFIDE CERTIFICATE

Certified that this project report **"IOT BASED SMART IRRIGATION SYSTEM"** is the bonafide work of "**AVINASH G S , MOHAMMED THOWFIC S , MOHAN RAJ K , DHANUSH P"** who carried out the project work under my supervision.

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ABSTRACT

The Smart irrigation System has wide scope to automate the complete irrigation system. Here we are building a IoT based Irrigation System using ESP8266 NodeMCU Module and DHT11 Sensor. It will not only automatically irrigate the water based on the moisture level in the soil but also send the Data to ThingSpeak Server to keep track of the land condition. The System will consist a water pump which will be used to sprinkle water on the land depending upon the land environmental condition such as Moisture, Temperature and Humidity.

Most of the farmers use large portions of farming land and it becomes very difficult to reach and track each corner of large lands. Sometime there is a possibility of uneven water sprinkles. This result in the bad quality crops which further leads to financial losses. In this scenario the Smart Irrigation System using Latest IoT technology is helpful and leads to ease of farming.

We use drip irrigation where the water was allowed to drip slowly to the roots of plant either from above the soil surface or buried into the surface so that the water can be placed directly into the root zone and minimize evaporation. It uses temperature sensor, soil humidity sensor to collect and monitor field information and also uses float switches to monitor ground water level through web page. When the field gets dry and ground water level falls down, it will be notified through SMS. This provides a solution for the problems in developing a smart farming system. It uses node MCU, relay and water pump.

Also the system will send an e-mail whenever the plants are being watered and all the relevant conditions of the plant like temperature, humidity etc. The principle that we've used is very simple and easy to implement. It'll save the manpower and is time efficient.

OBJECTIVE

The main objective is to provide controlled amounts of water to plants at needed intervals. It helps to grow agricultural crops, maintain landscapes, soil, consolidation and revegetate disturbed soils in dry areas and during periods of less than average rainfall. The objective of our project is to design an automated irrigation system which is cost effective and time saving using Node microcontroller. The NodeMCU (Node MicroController Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266.The proposed system will automatically water the plants when the soil moisture sensor detects insufficient amount of moisture in soil using as the centrecore. We also aim to connect the system with internet so that it can also manually be operated by smartphone app from anywhere-anytime.

The concept of this project is to allow the owners of fields to control and observe the growth of their plants in their farms. This is achieved by using a smart platform of IoT and solenoid valves to control the flow of water based on the moisture of the soil and gives real time surveillance to the owners who stay far away from the farms. This project also allows surveillance on the personnel and their crops so as to not occur losses.

This project has been designed for surveillance of irrigation systems in farms without the need of manual checking of irrigation systems. For example, if you are staying in Bangalore, and have your farm in Andhra Pradesh or elsewhere and it is not possible for you to go to the farms every time to keep a tab on the plants. Instead, this project allows you to check up on your plants using a simple IoT system. The positive part of this project is that, the node used to connect the system to your smart device, also controls the flow of water from the pump and also the timing intervals in between the irrigation cycles. In this paper we will be discussing all about the project as to how it is constructed and how it works.

LITERATURE REVIEW

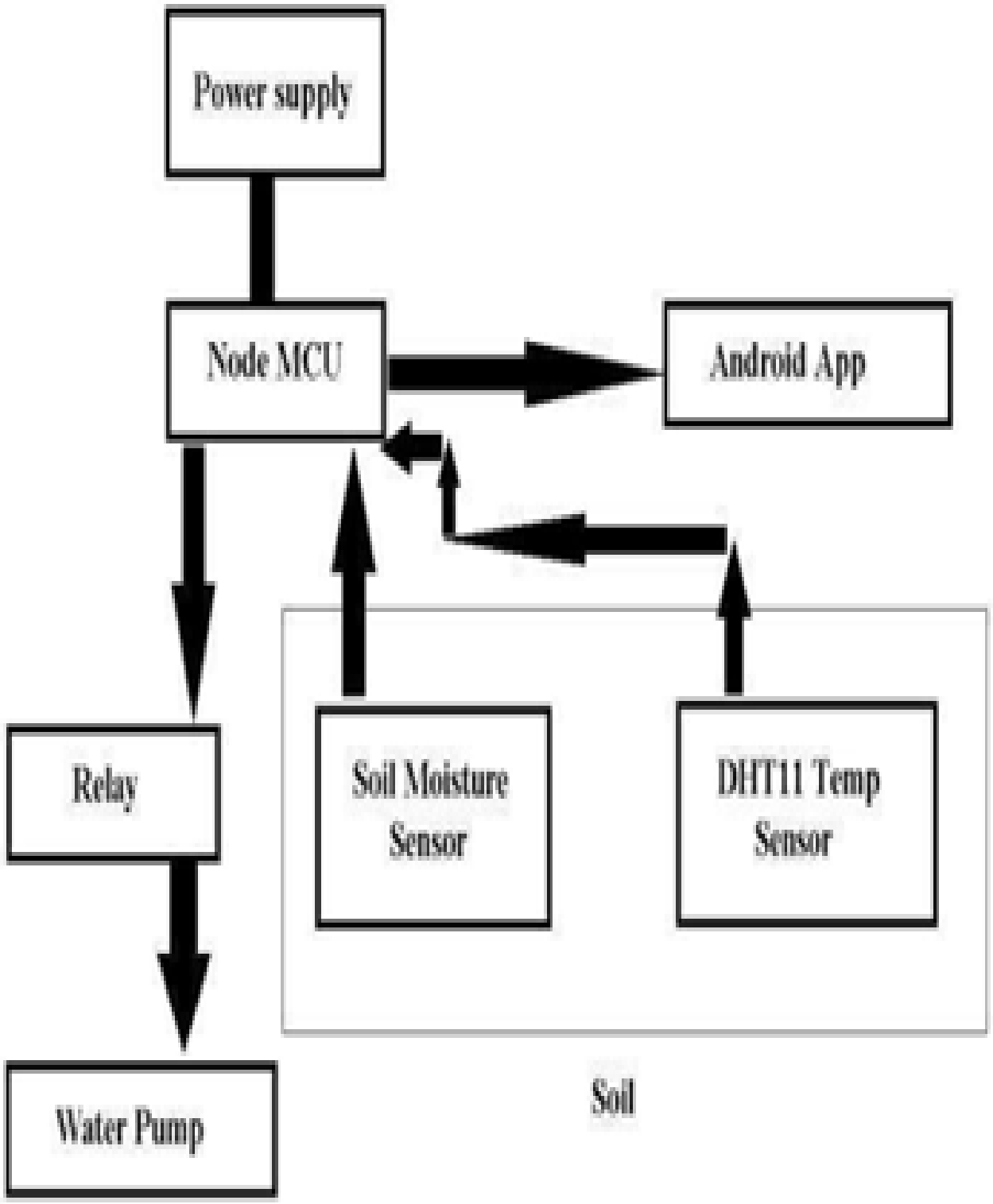
Archana and Priya published a paper in which determined value of soil and a temperature sensor placed in roots of plantscontrol the switch on and switch OFF of the water motor. The drawback of their project is that they didn't include any technique to send the status of the agriculture field to the user.

Karan Kansara build an automatic irrigation system project in which include the drawback of the Archana and Priya published paper. The drawback of this project is that this system is not capable to determine the nutrient value of the plants.

The published paper on "Automatic Irrigation System on Sensing Soil Moisture Content" only includes measuring the moisture of the soil. Nut in our proposed system we have also included a temperature sensor along with soil moisture sensor.

Prof C.H.Chavan and P.V.Karnade proposed a system smart wireless sensor network for monitoring environmental parameters using Zigbee. In this model, nodes can send data to a central server, which stores and further process the data and then displayed it. The drawback is weather forecasting and nutrient content is not determined in their proposed system.

BLOCK DIAGRAM



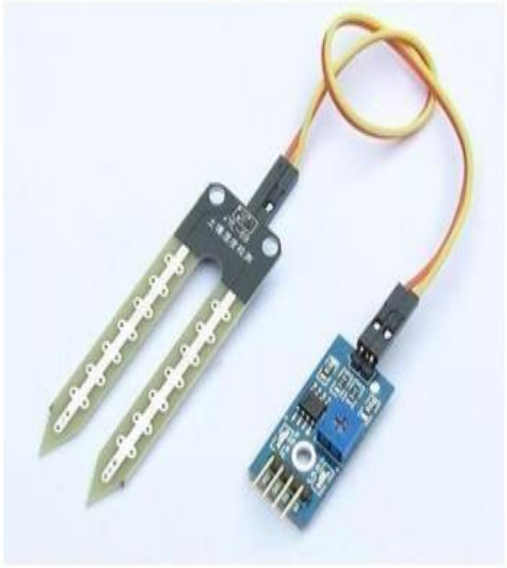
HARDWARE COMPONENTS

1. Node MCU (ESP8266) Wifi Module

2.Relay Module

3.DHT11

4.Soil Moisture Sensor



SOFTWARE DETAILS

SOFTWARE:

Arduino IDE : Arduino Integrated Development Environment (IDE) [7] is used to write the program. The Arduino IDE is a cross platform application (for Windows, macOS , Linux) which is used to write and upload programs to Arduino compatible boards and also with development boards such as NodeMCU. It is derived using C and C++.

CODE:

```
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>


char auth[] = "sdfgsdgjkhdfgkndfsgjkldf"; // the auth code that you got on your gmail

char ssid[] = "Shanthi Ganesh"; // username or ssid of your WI-FI

char pass[] = "ngfbasketball"; // password of your Wi-Fi

int water ;

int prevState = 0;



void setup()
```

```
{
  Serial.begin(9600);
  pinMode (D3,OUTPUT);
  pinMode (D5,INPUT);
  Blynk.begin(auth, ssid, pass);

}

void loop()
{
  Blynk.run();

 water=digitalRead(D5);
 Serial.println(water);

  if (water == HIGH && prevState == 0)
  {
  Serial.println("Pump Started, Water Flowing");
  digitalWrite(D3,LOW);
  Blynk.notify("Pump Started, Water Flowing");
  prevState = 1;
```

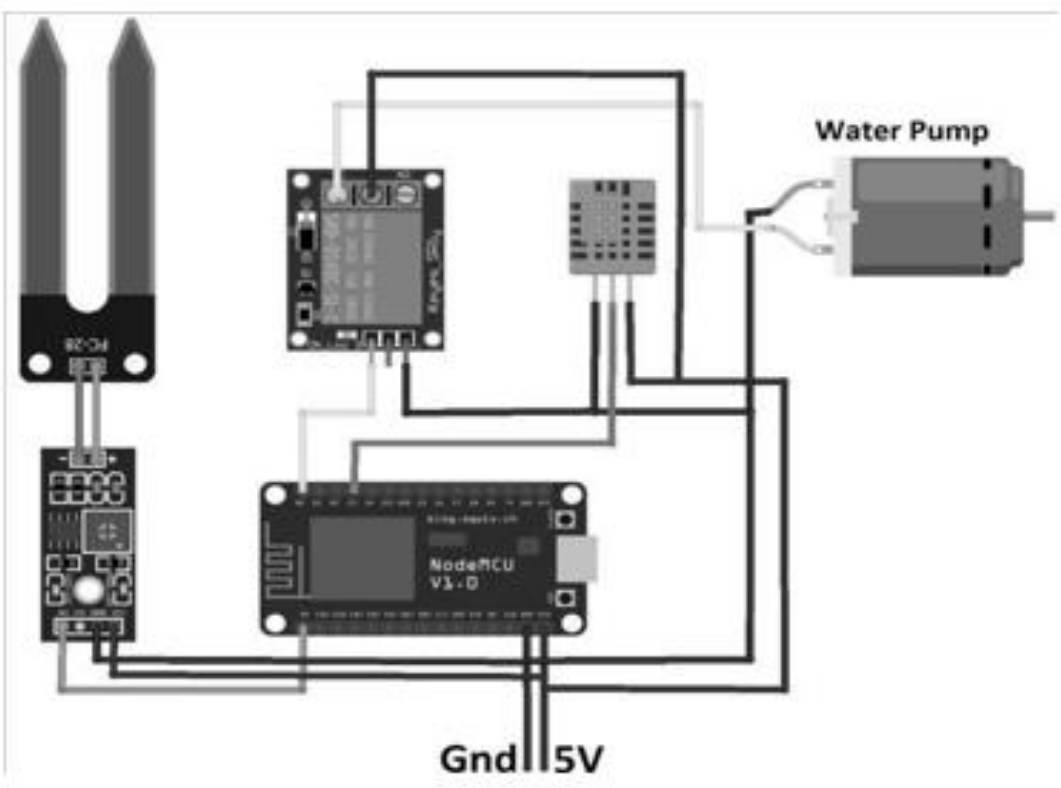
```
  delay(400);
  }


  else if (water == HIGH && prevState == 1)
  {
   Serial.println("Pump Stopped, Water Not Flowing");
  delay(400);
  }
  else
  {
  digitalWrite(D3,HIGH);
  prevState =0;
  }
  delay(100);
}
```

DESCRIPTION

1. The Sensors (Soil Moisture Sensor, Temperature and Humidity Sensor) and the Motor/Water pump. 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.
2. The sensors and the water pump is connected to the microcontroller NodeMCU ESP8266.
3. On receiving the signal the Microcontroller triggers the Water Pump to turn ON and supply the water to respective plant. When the desired moisture level is reached, the system halts on its own and the Water Pump is turned OFF. The Temperature and Humidity Sensors measure temperature and humidity to provide data for data logging and deciding intervals for watering.

CIRCUIT DIAGRAM :



Download and install the Blynk app into your smartphone. After, sign up in this app using your Gmail. Then, run this app and click the New project button.

- Next, enter the project name and select the device and connection type. Then click the Confirm button.
- Now, you can see the project interface. Then click on the “+” icon in the top corner. After, add the Button Widgets and Gauge Widgets to the interface.
- OK, now set up this widget. First, click the Button Widget. Then, name it as you like and select the pin as D4. Next, change the values from 1 to 0 and change the mode as the switch.
- Now, click the Gauge widget and named it. Then, select the pin as V0 and change the input values from 0 to 100. Finally, customize these widgets as you like.

APPLICATIONS

1. This idea is applicable in real life application.
2. Cost effective in production level.
3. User friendly.
4. It provides more accuracy compare to humans.
5. Improvement in the use efficiency of inputs (Soil, Water, Fertilizers, Pesticides, etc.)
6. Reduced cost of production .
7. Increased profitability
8. Sustainability .
9. Food safety .
10. Protection of the environment.

REFERENCES

[1] IOT based Smart Irrigation System “Srishti Rawal” presented at International Journal of Computer Applications, volume 159-No 8, February 2017. [2] Design and Implementation of Automatic Plant Watering System “Archana and Priya” presented at International Journal of Advanced Engineering and Global technology, vol- 04, Issue-01, Jan-2016. [3] Sensor Based Automated Irrigation System with IOT “Karan Kansara and Vishal Zaweri,” presented at International Journal of Computer Science and Information Technologies, vol-06, 2015.

OUTCOME OF THE PROJECT

Different cases could be taken into consideration that has been able to successfully inculcate and implement elements of SMART irrigation systems. Organisations all around the world related to agricultural sector and others that have been involved in irrigation activities have become keen regarding implementation of Smart irrigation methods in order to lower the costs and augment work efficiency. One of the cases that could be identified is of WaterBit, which is a company in the industrial sector. The organisation is an innovative technology firm that has collaborated with AT&T (one the largest telecommunications company in the world) in order to provide secured wireless connectivity to its autonomous irrigation solution, allowing management and control of local irrigation. This has allowed the farmers to not only augment their overall yield but also save resources in a considerable way . WaterBit gateway sends in-field data gathering of soil moisture through wireless technology to the cloud in a secure and reliable manner. This particular data is updated after every few minutes regularly through which users are given the opportunity to access and control via a mobile-friendly application .

FUTURE SCOPE:

The challenges and prospects of applying machine learning are covered in this section. There are several obstacles to overcome in the development of machine learning and digital software programs for smart irrigation systems for managing various crops specially to help attain

sustainable agriculture. The overall food production must be increased to address the fold shortages. In addition, more cash crops like cotton and rubber need to be grown to meet industrial demands, particularly if mixed with a sustainable materials to refrain from polluting the soil. Moreover, these problems present a number of difficulties, including the decline in agricultural manpower, the shrinking area of arable land, the scarcity of water supplies, the effects of climate change, etc. The population of rural areas is ageing quickly and declining as the world moves toward urbanization.

IoT techniques integrated in irrigation systems have a wide range of possible uses in farming and food production. There are numerous factors associated with IoT in smart irrigation that needs further attention which includes, cost, autonomous operation, portability, low maintenance, effectiveness, robust architecture, and reliability. When integrated systems recognize the capabilities of artificial intelligence and big data, it is anticipated that agriculture will evolve into a dynamic industry. These integrated systems will combine a variety of agricultural tools, equipment, and management techniques that can be used for various activities ranging from planting to yield forecasting. A new era of IoT in the farming industry may be introduced by advanced machines like agricultural robots, cloud computing, artificial intelligence, and big data. These tools are deemed with high importance to ensure sustainable agriculture.

There are several prospects for farmers and stakeholders who combine machine learning forecasting with portable software solutions. Water use efficiency can be enhanced by improving the predictions on irrigation needs, matching timing and volume to plant water needs, and adaptively compensating for water loss.

Water use efficiency can be enhanced by improving the predictions on irrigation needs, matching timing and volume to plant water needs, and adaptively compensating for water loss. This will result in increased yield while using less irrigation water. As the system becomes more advanced and intelligent, a better trained model will be deployed for better irrigation decision making. Thus, much of the stress and burden associated with irrigation can be reduced for farmers and users.

CONCLUSION:

We have successfully designed and implemented a smart irrigation system using the concept of Internet of Things. This automated irrigation system is easily controlled using a computer. It behave as an intelligent switching system that detects the soil moisture level and irrigates the plant if necessary. This will also save time and energy, as well as minimize energy loss. With the use of sensors whose cost is low and with simple circuitry this experiment aims in low cost solution, which can be bought even by a poor farmer and it is also easy to implement.

With the Internet of Things, single farmers may be able to deliver the crops directly to the consumers not only in a small region like in direct marketing or

shops but in the broader area. This will change the whole supply chain, which is mainly in the hand of large companies, now, but can change to a more direct, shorter chain between producers and consumers. Cloud Computing would enable the corporate sector to provide all the necessary services at an affordable cost to farmers in rural area.