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IOT Based Smart Agriculture Monitoring SystemProject Using Arduino

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ABSTRACT

In every country agriculture is done from ages which are considered to be science and also art of cultivating plants. In day today life, technology is updating and it is also necessary to trend up agriculture too. IoT plays a key role in smart agriculture. Internetsof Things (IoT) sensors are used to provide necessary information about agriculture fields. The main advantage of IoT is to monitor theagriculture by using the wireless sensor networks and collect the data from different sensors which are deployed at various no des and send by wireless protocol. By using IoT system the smart agriculture is powered by NodeMCU. It includes the humidity sensor, temperature sensor, moisture sensor and DC motor. This system starts to check the humidity and moisture level. The sensors are used tosense the level of water and if the level is below the range then the system automatically stars watering. According to the change in temperature level the sensor does its job. IoT also shows the information of humidity, moisture level by including date and time. The temperature level based on type of crops cultivated can also be adjusted.

Keyword : - IoT, Soil, Moisture and Temperature sensors, Relay, Wi-Fi module ESP8266, ThingSpeak

1. INTRODUCTION

One of the largest livelihood providers in India is Agriculture. Agriculture plays an essential role in supporting human life. The rise in population is proportional to the increase in agriculture production. Basically, Agriculture production depends upon the seasonal situations which do not have enough water sources. To get beneficial results in agriculture and to overcome the problems, IoT based smart agriculture system is employed.

Global and regional scale agricultural monitoring systems aim to provide up-to-date information regarding foodproduction. In IoT-based smart farming, a system is built formonitoring the crop field with the help of sensors like light, humidity, temperature, soil moisture, etc. The farmers can monitor the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach. The proposed IoT based Irrigation System uses 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.

Due to the recent advances in sensors for the irrigation systems for agriculture and the evolution of WSN and IoT technologies, these can be applied in the development of automatic irrigation systems. The system will determine the parameters that are monitored in irrigation systems regarding water quantity and quality, soil characteristics, weather conditions, and fertilizer usage and provide an overview of the most utilized nodes and wireless technologies employed to implement WSN and IoT based smart irrigation systems.

2. LITERATURE REVIEW

An IOT Based Crop-field monitoring an irrigation automation system describes how to monitor a crop field. A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system is automated. Through wireless transmission the sensed data is forwarded to web server database. If the irrigation is automated then the moisture and temperature fields are decreased below the potential range. The user can monitor and control the system remotely with the help of application which provides a web interface to user. By smart Agriculture monitoring system and one of the oldest ways in agriculture is the manual method of checking the parameters. In this method farmers by themselves verify all the parameter and calculate the reading.The system focuses on developing devices and tool to manage, display and alert the users using the advantages of a wireless sensor network system. It aims at making agriculture smart using automation and IoT technologies.The cloud computing devices are used at the end of the system that can create a whole computing system from sensors to tools that observe data from agriculture field. It proposes a novel methodology for smart farming by including a smart sensing system and smart irrigator system through wireless communication technology. This system is cheap at cost for installation. Here one can access and also control

the agriculture system in laptop, cell phone or a computer .

3. BLOCK DIAGRAM

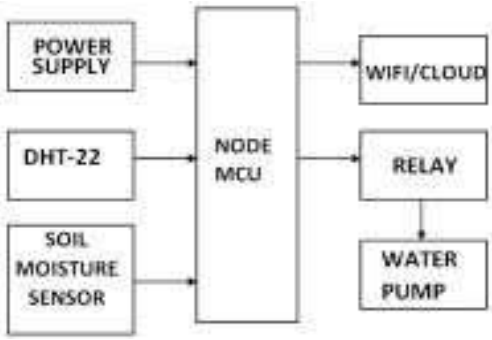

Figure 1: Block Diagram

3.1 SOIL MOISTURE SENSOR

A device which is used to sense the moisture level in the sand is called soil moisture sensor and is shown in Figure

2. When the sensor senses the water shortage in the field, the module output is at high level else the output is at low level. This sensor reminds the user to water their plants and also monitors the moisture content of soil. It has been widely used in agriculture, land irrigation and botanical gardening.

Figure 2: Soil Moisture Sensor

3.2 Temperature Sensor (DHT-11)

Temperature Sensor (DHT-11) is used to monitortemperature and humidity of the atmosphere. The DHT-11 shown in Figure 3 is a basic ultra low cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surroundingair and split out a digital signal on the data pin. The DHT-11calculate relative humidity by measuring the electrical resistance between two electrodes.

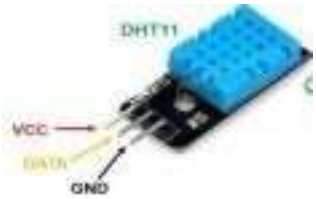

Figure 3: Temperature sensor

3.3 Relay

A relay is used as electrically operated switch which is shown in Figure 4. It has a set of input terminals for a single or multiple control signals and a set of operating contact terminals. The switch may contain number of contacts in multiple contact forms which make contacts or break contacts. Relay is used to turn on the water pump in order to maintain the moisture level of the crop.

Figure 4: Relay

3.4 WATER PUMP

The DC 3-6V Mini Micro Submersible Water Pump shown in Figure 5 is a low cost, small size Submersible PumpMotor. It operates with a 2.5 to 6V power supply. It can pump up to 120 litres per hour with a very low current consumption of 220mA. Just connect the tube pipe to the motor outlet, submerge it in water, and power it.

Figure 5: Water Pump

3.5 IOT (WI-FI MODULE ESP8266)

The NodeMCU (ESP8266) shown in Figure 6 is a microcontroller with an inbuilt Wi-Fi module. The total pinson this device are 30 out of which 17 are GPIO (General Purpose Input/Output) pins which are connected to various sensors to receive data from the sensors and send output data to the connected devices. The NodeMCU has 128KB of RAM and 4MB flash memory storage to store programs and data. The code is dumped into the NodeMCU through USB and is stored in it. Whenever the NodeMCU receives input data from the sensors, it crosschecks the data received and stores the received data. Depending on the data received it sends a pulse to the Relay Module which in-turn acts as a switch to on or off the pump. The operating frequency of theNodeMCU ranges from 80 to 160 MHZ

and the operating voltage of this device range from 3 to 3.6V. The wifi module presents in the NODE MCU rangefrom 46(indoors) to 92 (outdoors) Meters.

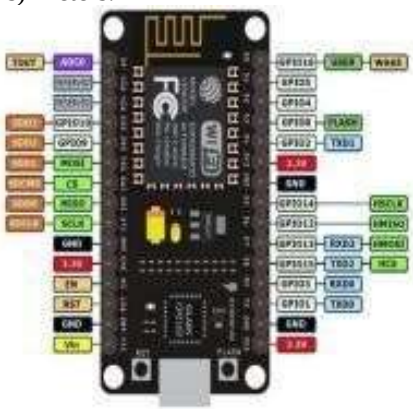

Figure 6: ESP8266 module

3.6 POWER SUPPLY

Power supply shown in figure 7 is an electrical device which supplies electric power to an electrical load. The first function of a power supply is to convert electric current from a source to the correct voltage, current and frequencyto power up the load. As a result, power supplies are also referred to as electric power converters. Some power supplies are separate standalone pieces of equipment while others are built into the load appliances that they power.

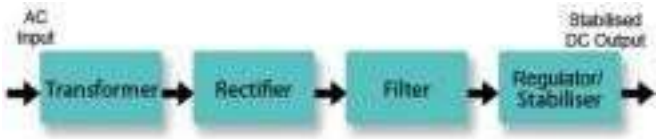

Figure 7: Block diagram of a fixed regulated power supply

4. WORKING

The smart agriculture monitoring system is tested under various conditions. The soil moisture sensor is used to test the soil for all climatic conditions and results are interpreted successfully. The moisture output readings at different weather conditions is taken and updated. Wi-Fi is used to achieve the wireless transmission. The values of soil moisture sensor purely depend on the resistivity of the soil. The value of the sensor at beginning ofwet condition is 0. The sensed value is sent to microcontroller through NodeMCU and motor pump gets OFF in this condition. The maximum threshold value upon dry soil is1023. When the sensed value by sensor reachesthe threshold value, the microcontroller trigger the relay and motor gets ON. When sufficient amount of water is suppliedto plants, the motorpump is turned ON and is turned OFF automatically.

5. ADVANTAGES

1. It is easy to maintain and cost is reasonable to purchase. The components which are used are easily available.It has advantage to observe the status on smartphone or laptop using internet.
2. The information is up to date even in absence of farmer.
3. The collected data is updated and the farmer is consciousabout the status of the crop.
4. To achieve more effective and accurate details of crop several additional sensors can also be included

6. CONCLUSION

IoT will help to enhance smart farming. Using IoT the system can predict the soil moisture level and humidity so that the irrigation system can be monitored and controlled. IoT works in different domains of farming to improvetime efficiency, water management, crop monitoring, soil management and control of insecticides and pesticides.This system also minimizes human efforts, simplifies techniques of farming and helps to gain smart farming.Besides the advantages provided by this system, smart farming can also help to grow the market for farmer withsingle touch and minimum effort.

7.FUTURE SCOPE

- By installing a webcam in the system, photos of the crops can be captured and the data can be sent to database.
- Speech based option can be implemented in the system for the people who are less literate.GPS (Global Positioning System) can be integrated to provide specific location of the farmer and more accurate weather reports of agriculture field and garden.
- Regional language feature can be implemented to make it easy for the farmers who are aware of only their regional language.

8. REFERENCE

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