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IOT Based Smart Agriculture Monitoring System

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Abstract :

In every country agriculture is done from lifetime which are examine to be science and also skill of growing plants. In day today life, technology is updating and it is also necessary to trend up agriculture too. IoT plays a lead part in smart agriculture. Internets of Things (IoT) sensors are used to provide necessary information about agriculture fields. The main head of IoT is to monitor the agriculture 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 utilizing IoT system the smart agriculture is charged by Node MCU. It comprises the humidity sensor, temperature sensor, moisture sensor and DC motor. This structure begins to inspect the humidity and moisture level. The sensors are used to sense the level of water and if the level is below the range then the system automatically stars watering. According to the exchange in temperature degree the sensor does its job. IoT too shows the details of humidity, moisture level by including date and time. The temperature measure based on type of crops cultured can also be modify.

Introduction

One of the biggest livelihood companies in India is Agriculture.Agriculture performs an indispensable position in aiding human life. The upward shove in populace is proportional to the extend in agriculture production. Basically, Agriculture manufacturing relies upon the seasonal conditions which do now not have adequate water sources. To get advisable consequences in agriculture and to overcome the problems, IoT primarily based clever agriculture device is employed.

Global and regional scale agricultural monitoring structures aim,to grant up-to-date records regarding meals production. In IoT-based smart farming, a device is built for monitoring the crop discipline with the help of sensors like light, humidity, temperature, soil moisture, etc. The farmers can display the field prerequisites from anywhere. IoT-based smart farming is rather efficient when in contrast with the conventional approach. The proposed IoT based totally Irrigation System uses ESP8266 NodeMCU Module and DHT11 Sensor. It will now not only routinely irrigate the water based on the moisture stage in the soil but additionally send the Data to ThingSpeak Server to maintain track of the land condition.

Due to the current advances in sensors for the irrigation structures for agriculture and the evolution of WSN and IoT technologies, these can be utilized in the improvement of computerized irrigation systems. The device will decide the parameters that are monitored in irrigation structures concerning water volume and quality, soil characteristics, climate conditions, and fertilizer utilization and supply an overview of the most utilized nodes and wi-fi applied sciences employed to put in force WSN and IoT based totally clever irrigation systems.

Literature Survey

An IOT Based Crop-field monitoring an irrigation automation machine describes how to display a crop field. A device is developed by means of the use of sensors and in accordance to the choice from a server primarily based on sensed data, the irrigation device is automated. Through wi-fi transmission the sensed records is forwarded to net server database. If the irrigation is computerized then the moisture and temperature fields are lowered under the achievable range. The consumer can reveal and manipulate the device remotely with the assist of software which gives a net interface to person [1].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 [2].

The device focuses on creating gadgets and device to manage, show and alert the customers the usage of the benefits of a wi-fi sensor community system. It objectives at making agriculture clever the use of automation and IoT applied sciences [3].

The cloud computing units are used at the give up of the machine that can create a entire computing machine from sensors to equipment that look at statistics from agriculture field. It proposes a novel methodology for clever farming by way of which include a clever sensing gadget and clever irrigator machine thru wi-fi conversation science [4]. This machine is less costly at price for installation. Here one can get admission to and additionally manipulate the agriculture machine in laptop, mobile smartphone or a pc [5].

Block diagram

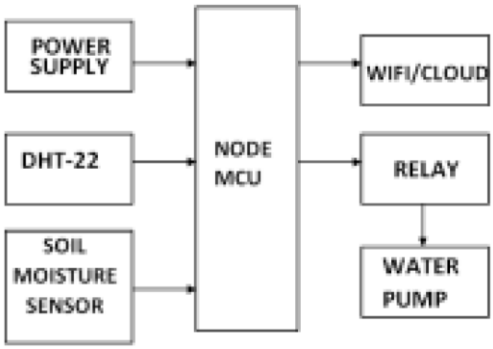

Figure 1: Block Diagram

The Block diagram of the proposed system which gives information of the required modules is shown in Figure 1.

Required Modules

Hardware requirements

- Soil moisture sensor
- Temperature sensor (DHT-11)
- Relay
- Pump
- IoT (WI-FI module ESP8266)
- Power supply: 5V, 700mA Regulated power supply **Software tools required**
- Arduino IDE
- Thingspeak website

Soil Moisture sensor

A system which is used to experience the moisture stage in the sand is referred to as soil moisture sensor and is proven in Figure two When the sensor senses the water scarcity in the field, the module output is at excessive degree else the output is at low level. This sensor reminds the consumer to water their flora and additionally video display units the moisture content material of soil. It has been extensively used in agriculture, land irrigation and botanical gardening.

Figure 2: Soil Moisture Sensor

Temperature Sensor (DHT-11)

Temperature Sensor (DHT-11) is used to reveal temperature and humidity of the atmosphere. The DHT-11 proven in Figure three is a primary extremely low value digital temperature and humidity sensor. It makes use of a capacitive humidity sensor and a thermistor to measure the surrounding air and cut up out a digital sign on the information pin. The DHT-11calculate relative humidity by measuring the electrical resistance between two electrodes.

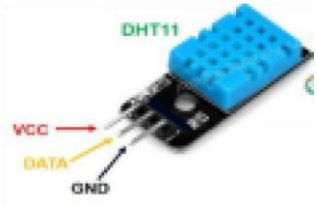

Figure 3: Temperature sensor

Relay

A relay is used as electrically operated alternate which is validated in Figure 4 It has a set of enter terminals for a single or a couple of manipulate indications and a set of going for walks contact terminals. The swap may additionally comprise vary of contacts in extra than one contact sorts which make contacts or injury contacts. Relay is used to flip on the water pump in order to maintain the moisture stage of the crop.

Figure 4: Relay

Water pump

The DC 3-6V Mini Micro Submersible Water Pump proven in Figure 5 is a low cost, small measurement Submersible Pump Motor. It operates with a 2.5 to 6V strength supply. It can pump up to a hundred and twenty litres per hour with a very low contemporary consumption of 220mA. Just join the tube pipe to the motor outlet, submerge it in water, and strength it.

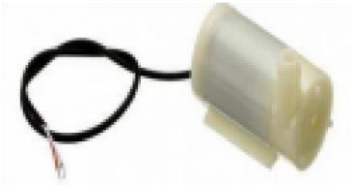

Figure 5: Water Pump

IoT (WI-FI module ESP8266)

The NodeMCU (ESP8266) proven in Figure 6 is a microcontroller with an built in Wi-Fi module. The complete pins on this system are 30 out of which 17 are GPIO (General Purpose Input/Output) pins which are linked to a range of sensors to get hold of information from the sensors and ship output information to the linked devices. The NodeMCU has 128KB of RAM and 4MB flash reminiscence storage to save applications and data. The code is dumped into the NodeMCU thru USB and is saved in it. Whenever the NodeMCU receives enter information from the sensors, it crosschecks the information acquired and shops the acquired data. Depending on the records acquired it sends a pulse to the Relay Module which in-turn acts as a change to on or off the pump. The running frequency of the NodeMCU stages from eighty to one hundred sixty MHZ and the working voltage of this system vary from three to 3.6V. The Wi-Fi module presents in the NodeMCU range from 46 (indoors) to 92 (Outdoors) Meters.

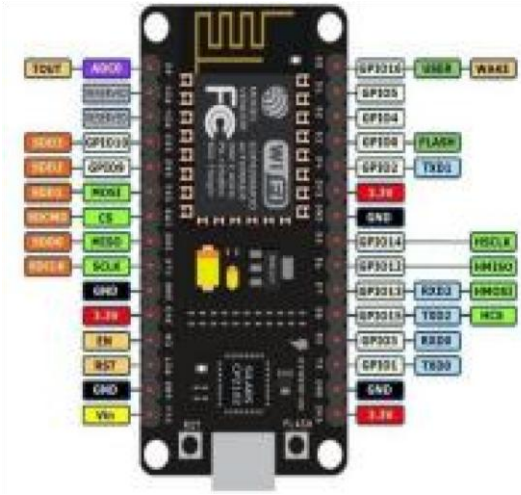

Figure 6: ESP8266 module

Power Supply

Power grant tested in Figure 7 is an electrical device which assets electric powered powered strength to an electrical load. The first characteristic of a electrical energy provide is to convert electric powered powered current day from a provide to the proper voltage, present day and frequency to strength up the load. As a result, energy assets are moreover referred to as electric powered powered power converters. Some electrical energy substances are separate standalone parts of tools while others are built into the load domestic tools that they power

Figure 7: Block diagram of a fixed regulated power supply

Arduino IDE

The Arduino Integrated Development Environment (IDE) is a cross-platform utility in which the features are written in C and C++ languages. It is used to write and dump the written applications to Arduino like minded boards with the assist of 1/3 birthday party cores and different supplier improvement boards.

Thingspeak website

ThingSpeak is an IoT analytics platform which is used to aggregate, visualize, and analyse stay facts streams in the cloud. When the information is despatched to Thingspeak from the devices, it creates on the spot visualization of stay statistics and sends an alert.

Internal Work of ThingSpeak is proven in Figure eight

Working

The clever agriculture monitoring device is examined beneath a number conditions. The soil moisture sensor is used to check the soil for all climatic stipulations and outcomes are interpreted successfully. The moisture output readings at exceptional climate prerequisites is taken and updated. Wi-Fi is used to gain the wi-fi transmission.

The values of soil moisture sensor purely depend on the resistivity of the soil. The value of the sensor at beginning of wet condition is 0. The sensed value is sent to microcontroller through NodeMCU and motor pump gets

OFF in this condition. The most threshold fee upon dry soil is1023. When the sensed price with the aid of sensor reaches the threshold value, the microcontroller set off the relay and motor receives ON. When enough quantity of water is furnished to plants, the motor pump is became ON and is became OFF automatically.

Advantages

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. The information is up to date even in absence of farmer.
- The collected data is updated and the farmer is conscious about the status of the crop.
- To achieve more effective and accurate details of crop several additional sensors can also be included.

Results and Analysis

The foremost intention of this challenge is to put in force the current science in required fields like agriculture. Using IoT technological know-how in agriculture, this machine makes agriculture monitoring easy. The benefits as cited like water saving and labour saving are required the most in modern agricultural kingdom of affairs. Consequently, the use of the sensor community in fields of agriculture makes wise irrigation. The data from IoT is despatched to the customer the use of cloud. Consequently, any adjustments interior the crop may additionally be recognized without difficulty and early evaluation is carried out as such.

The measured and monitored parameters like temperature, humidity and moisture in soil are shown in figures Figure 10, Figure 11 and Figure 12 respectively.

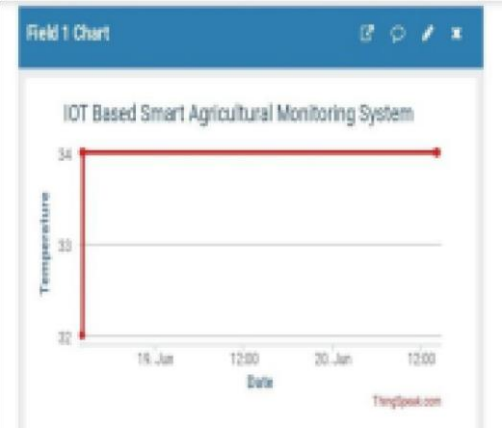

Figure 10: Temperature Measurement

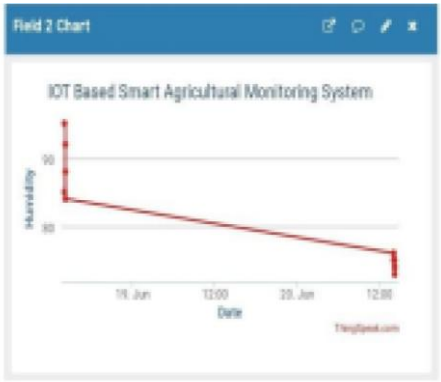

Figure 11: Humidity Measurement

Figure 12: Soil Moisture Measurement

Conclusion and Future Scope

7.1 Conclusion

IoT will assist to decorate clever farming. Using IoT the gadget can predict the soil moisture stage and humidity so that the irrigation machine can be monitored and controlled. IoT works in distinct domains of farming to enhance time efficiency, water management, crop monitoring, soil administration and manipulate of insecticides and pesticides. This machine additionally minimizes human efforts, simplifies methods of farming and helps to attain clever farming. Besides the benefits furnished by using this system, clever farming can additionally assist to develop the market for farmer with single contact and minimal effort.

7.2 Future Scope

- The venture has widespread scope in creating the device and making it greater consumer pleasant and the extra aspects of the machine like:
- By putting in a webcam in the system, images of the vegetation can be captured and the facts can be despatched to database.
- Speech based totally choice can be applied in the machine for the human beings who are much less literate.
- GPS (Global Positioning System) can be built-in to grant unique region of the farmer and greater correct climate reviews of agriculture subject and garden.Regional language feature can be implemented to make it easy for the farmers who are aware of only their regional language.

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