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Research Article

Smart Cultivation using IOT

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Abstract

IOT is a revolutionary technology that represents the future of computing and communications. Most of the people around the world depend on agriculture. Because of this reason smart IT technologies are needed to migrate with traditional agricultural methods. Using modern technologies, we can control the cost, maintenance and monitoring the performances of the crops. Satellite and aerial imagery play a vital role in modern cultivation. Precision agricultural sensor monitoring network that is used to measure the information effectively, like temperature, humidity, soil PH, soil nutrition levels, water level etc. So, with the help of IOT, farmers can monitor the crops remotely via phones and computers. In this paper, we have surveyed some typical applications of agricultural IOT sensor monitoring network technologies using Cloud computing as a backbone. This survey is used to understand the different technologies and used to build sustainable smart agriculture. Simple IOT agriculture model is addressed with a wireless network.

Keywords: Fuzzy soft topological space; γ-τ-separate set; γ-τ-disconnected set; γ-τ-connected set Internet of farm Things; Cloud computing; Humidity and temperature sensor; Soil moister sensor.

Introduction

Indian population is either directly or indirectly depends on agriculture. The ever-growing global population would touch around 9.6 billion by 2050. So, to feed this immense population, the agriculture industry needs to be the embrace of IoT. Irrigation accounts 55-75% of water usage in India. Nearly 60% of the water used for irrigation purpose was wasted. That affects food security and economic growth of India [1,2]. As we know, agriculture plays a vital role in manufacturing and livelihood. So, in this smart cultivation, we are going to look at the benefits of IoT in the agricultural area. With the help of precision, the agriculture process can easily monitor and observe the crop's growth based on collected information, like monitoring soil moisture, temperature, weather conditions and efficient usage of inputs.

The demand for more foods has to meet overcoming challenges such as, rising climate change, extreme weather conditions and environmental impact that results from intensive farming practices. Smart cultivation through the use of IOT technology will help farmers to reduce the generated wastages and enhance productivity. That can come from the quantity of fertilizer which has been utilized to the number of journeys the farm vehicles have made. So, smart cultivation is basically a hi-tech system of growing food that is clean and sustainable for the masses [3].

Components used in the proposed system

The proposed system offers a cost effective solution for Real-time monitoring of crops and efficient usage of inputs of the cultivation land. Components used in the proposed work are as follows:

Node mcu

The NodeMcu is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines, show in fig. 1. The Development Kit based on ESP8266, integrates GPIO, PWM, IIC, 1-Wire and ADC all in one board. ESP8266EX

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Wi-Fi SoC is embedded with memory controller, including SRAM and ROM. MCU can visit the memory units through iBus, dBus, and AHB interfaces. All memory units can be visited upon request, while a memory arbiter will decide the running sequence according to the time when these requests are received by the processor [4].

Fig. 1. Node mcu

DHT11

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed)show in fig .2. Its fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is you can only get new data from it once every 2 seconds, so when using our library, sensor readings can be up to 2 seconds old [5].

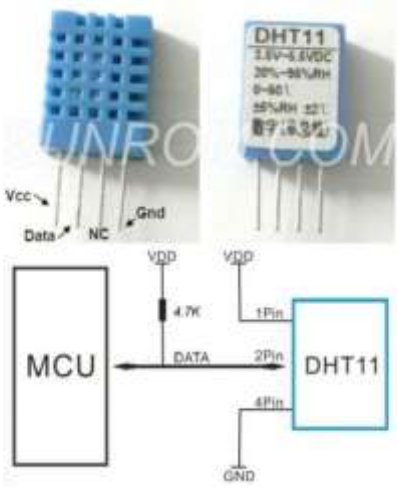

Fig. 2. DHT11 Pin configuration

Soil moisture sensor

This sensor show in fig. 3, can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, else the output is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings [6].

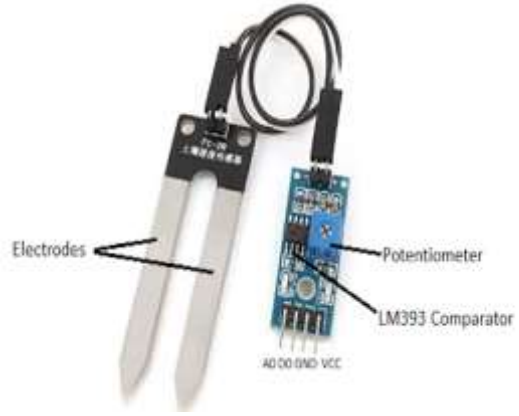

Fig. 3. Soil moisture sensor

Architecture and implementation

The architecture of the proposed system is shown in fig. 4, in this system consists of 3 parts; Microcontroller module, cloud service, Mobile application module. Microcontroller module gathers the information from the soil moisture sensor and DHT11 (digital humidity and temperature sensor). This information contained air temperature humidity and some important parameters of the soil .using node mcu this information is sent to the cloud. Mobile application model used to view the information any place in the world using the internet, and also control the relay by using the same cloud. Users give some information to microcontroller the data will transfer through the cloud to relay.

Microcontroller module

This module consists of 4 components, namely, Nodemcu, soil monster sensor, digital humidity, and temperature sensor & relay. Soil moisture sensors used to measure the water content in the soil. As per Moisture, We will get Analog Output variations from 0.60 volts - 5 volts. DHT11 is used to find the digital data humidity and temperature of the field .this data is ensured high reliability and excellent long-term stability. DHT11 and soil monster sensor output is received by the microcontroller and send this information to the registered cloud database [7].

Every 2 second ones the sensors data will be updated to the cloud database

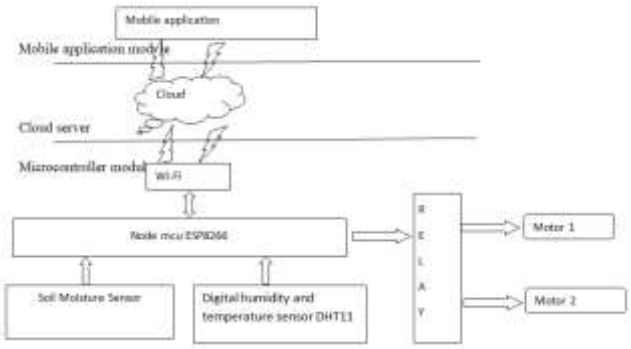

Fig. 4. Block diagram of proposal system

Cloud server

Cloud provides to some space to store your data.teh sensor data is sent through the microcontroller module to receive the data and store the particular. And it is also act as the communication medium of the microcontroller layer and mobile application layer [8].

Mobile application module

This module is implemented as an Android application that is installed on the farmers mobile phone to provide the features of farmers can see the details of crops anywhere and anytime using this mobile application [9]. In case of an emergency, the farmer can receive the push notification and also monitor the water level and control the water pumps (ON/OFF).

Results and discussion

The soil moister sensor value and DHT11 value is lively update think speak application you can see your live update anywhere in the world use of internet. The value is show using this graph any difficulties are there you also control your motors using same application. The DHT11 value is show in fig. 5 and soil moister value is show in fig. 6.

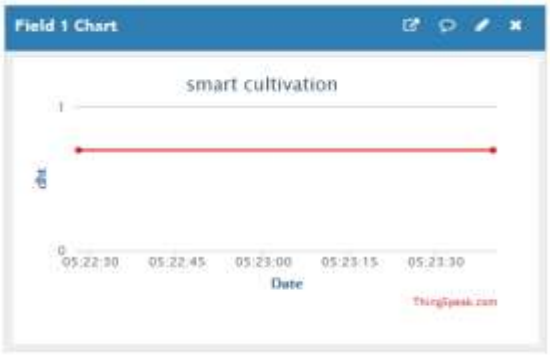

Fig. 5. DHT11 data

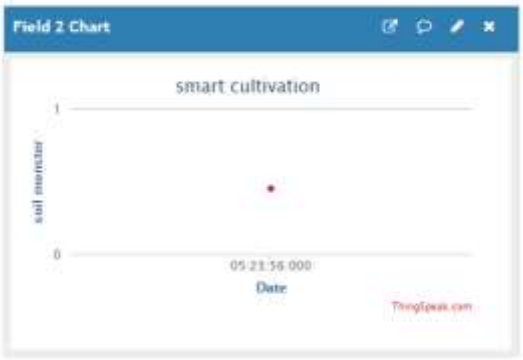

Fig. 6. Soil moister data

Due to the cyclones and monsoons, the crops will ruin, in the summer season, the water availability will become low so the crops are ruin by a natural disaster. The government will appoint some committee to calculate the affected lands and crops. In our project condition of the crops details are stored in the cloud, so the government will calculate the ruined land details easily. So the time and manpower will be less.

Agriculture can be made more accurate and efficient with IOT enabled technologies. IOT can be applied in different domains of crops production [10]. First one is the Water and Energy: for Agriculture, Water and energy are the most important inputs and their costs can improve or break the agricultural business. Due to leaky irrigation systems, inefficient field application methods and the planting of water-intensive crops in the wrong growing location water wastage is done [12]. For its operation Pumps, boosters, lighting etc need electrical energy. Water use can be made smarter for agriculture by monitoring and change water volume, location timing and duration of flow can be done with use of this system. With the help of IofT, use of effective energy for pumps and crop monitoring: the major concerns in this area are an application of fertilizers, pesticides based on crop and soil health, pest control. Efficient use of fertilizers and pesticides can be made with IOT [13].

Conclusion

Finally we conclude that need to develop on smart cultivation using IoT which is enclosed with, low power consumption of devices, low cost, QoS service, better decision making process optimal performance and it is easy to understand the farmer without knowledge.

Conflicts of interest

Authors declare no conflict of interest.

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