DOI: 10.56452/2021SP-8-016

ISSN: 0974-5823 Vol. 6 (Special Issue 3, November 2021)

International Journal of Mechanical Engineering

Internet of Things (IoT) Based Smart Irrigation System

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Abstract: Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim / objective of this report is to propose IoT based Smart Farming System assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT based Smart Farming System being proposed via this report is integrated with Arduino Technology mixed with different Sensors and a Wifi module producing live data feed that can be obtained online from Thingsspeak.com. The product being proposed is tested on Live Agriculture Fields giving high accuracy over 98% in data feeds.

Introduction

The objectives of this report is to proposed IoT based Smart Farming System which will enable farmers to have live data of soil moisture environment temperature at very low cost so that live monitoring can be done.

IOT TECHNOLOGY AND AGRICULTURE

IOT: CONCEPT AND DEFINITION

Internet of things IOT consists of two words Internet and Things .The term things in IOT refers to various IOT devices having unique identities and have capabilities to perform remote sensing , actuating and live monitoring of certain sort of data. IOT devices are also enable to have live exchange of data with other connected devices and application either directly or indirectly, or collected data from other devices and process the data and send the data to various servers. The other term internet is define as Global communication Network connecting Trillions of computers across the planets enabling sharing of information .Thus the IOT can be define as:"A dynamic Global Network Infrastructure with self configuring capabilities based on standard and inter operable communication to protocol where physical and virtual things have identities, physical attributes ,and virtual personalities and use intelligent interfaces and are seamlessly integrated into the information network ,often communicate data associated with user and their environment." An ideal IoT device consists of various interfaces for making connectivity to other devices which can either be wired or wireless.

IOT APPLICATIONS IN AGRICULTURE

With the adoption of IoT in various areas like Industry, Homes and even Cities, huge potential is seen to make everything Intelligent and Smart. Even the Agricultural sector is also adopting IoT technology these days and this in turn has led to the development of "AGRICULTURAL Internet of Things (IoT)"

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BENEFITS OF IOT IN AGRICULTURE

The following are the benefits of IoT in Agriculture:

1. IoT enables easy collection and management of tons of data collected from sensors and with integration of cloud computing services like Agriculture fields maps, cloud storage etc., data can be accessed live from anywhere and everywhere enabling live monitoring and end to end connectivity among all the parties concerned.

2. IoT is regarded as key component for Smart Farming as with accurate sensors and smart equipment's, farmers can increase the food production by 70% till year 2050 as depicted by experts.

3. With IoT productions costs can be reduced to a remarkable level which will in turn increase profitability and sustainability.

4. With IoT, efficiency level would be increased in terms of usage of Soil, Water, Fertilizers, Pesticides etc.

5. With IoT, various factors would also lead to the protection of environment.

IOT AND AGRICULTURE CURRENT SCENARIO AND FUTURE FORECASTS'

Shows the growth of IoT based adoption in Agriculture sector from Year 2000-2016 and Forecasts of year 2035-2050.

COMPONENTS USED

ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328(datasheet).It has 14 digital input/output pins(of which 6 can be used as PWM outputs),6 analog inputs, a 16 MHz crystal oscillator, a USB connection ,a power jack, an ICSP header , and a reset button.

WIFI MODULE-ESP 8266

ESP8266 Wi-Fi Module is SOC with TCP/IP protocol stack integrated which facilitates any microcontroller to access Wi-Fi network. ESP8266 module is cost effective module and supports APSD for VOIP Applications and Bluetooth co-existence interfaces. Technical Specifications: 802.11b/g/n; Wi-Fi Direct, 1MB Flash Memory, SDIO 1.1/2.0, SPI, UART, Standby Power Consumption of <1.0mW.

ADC Multiplexer

The multiplexer (MUX) is a fast switch that sequentially scans numerous input-signal channels and directs them in a preprogrammed manner to a single ADC for digitizing. This approach saves the cost of using an ADC for each channel.

SENSORS

SOIL MOISTURE SENSOR-FC 28

Soil Moisture Sensor is used for measuring the moisture in soil and similar materials. The sensor has two large exposed pads which functions as probes for the sensor, together acting as a variable resistor. The moisture level of the soil is detected by this sensor. When the water level is low in the soil, the analog voltage will be low and this analog voltage keeps increasing as the conductivity between the electrodes in the soil changes. This sensor can be used for watering a flower plant or any other plants requires automation.

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DHT11 SENSOR

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). Its fairly simple to use, but requires careful timing to grab data. You can get new data from it once every 2 seconds, so when using the library from Adafruit, sensor readings can be up to 2 seconds old. Comes with a 4.7K or 10K resistor, which you will want to use as a pullup from the data pin to VCC.

ALGORITHMS & FLOWCHART

ALGORITHM

THE ALGORITHM OF OVERALL PROCESS:-

STEP 1: START THE PROCESS

STEP 2: CONNECTED TO WIFI

STEP 3: READ TEMERATURE AND HUMIDITY

STEP 4: GET TEMPERATURE AND HUMIDITY VALUE S FROM ANOLOG PINS

STEP 5: SEND DATA TO THINGSPEAK API

STEP 6: DELAY TO 10 SECONDS

STEP 7: REPEAT STEP 4, 5 & 6 UNTIL THE PROCESS END

STEP 8: END

FLOWCHART

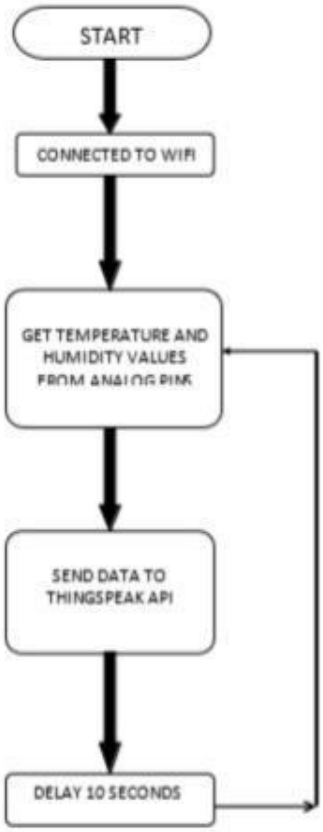

Figure 3.1 FLOWCHART OF OVERALL PROCESS

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Conclusion

IoT based SMART FARMING SYSTEM for Live Monitoring of Temperature and Soil Moisture has been proposed using Arduino and Cloud Computing . The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture. The IoT based smart farming System being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results.

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