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EFFECTIVE DATA MONITORING OF CROP ESSENTIALS USING IOT AND WIRELESS SENSOR NETWORK

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Abstract:

Agriculture is an integral part of Indian economy. Over 60% of Indian population based upon agriculture and one third of the income of nation arises from agricultural practices. Hence it plays a vital role in the development of the country. Various issues related to farming is continuously hampering the development of the country. Possible solution for these problems is to opt for modernized agriculture that comprises of modern trends. Hence, agriculture can be made smart using IoT and other technologies. Smart agriculture increases crop yield, decreases water wastage and imbalanced use of fertilizers. WSN based Smart agriculture is proposed which combines WSN and IoT technologies to implement a low-cost data system applicable for vast land. This project describes about increases the quantity and quality of agricultural products with low cost compare to existing IoT based smart farming. The system proposed uses a microcontroller NodeMCU, which has a Wi-Fi module (ESP8266) over it. Soil moisture sensor, humidity and temperature sensor (DHT11) and rain detection sensors along with DC motor are used. This DC motor is connected to a water pump which pumps water to the crops when the DC motor is ON. The soil moisture sensor senses the moisture level in the soil. Depending on the level of moisture, Node MCU decides whether to water the crop or not.

Key words: NodeMCU; WSN; IOT etc.,

1. Introduction:

Agriculture is the major source of income for the largest population in India and is major contributor to Indian economy. However, technological involvement and its usability have to be grown still and cultivated for agro-sector in India. Although few initiatives have also been taken by the Indian Government for providing online and mobile messaging servicesto armer related to agricultural queries and agro-vendor's information to farmers. Based on the survey it is observed that agriculture contributes 27% to GDP, and Provides employment to 70% of Indian population.

IoT is changing the agriculture domain and empowering farmers to fight with the huge difficulties they face. The agriculture must overcome expanding water deficiencies, restricted availability of lands, while meeting the expanding consumption needs of a world population. New innovative IoT applications are addressing these issues and increasing the quality, quantity, sustainability and cost effectiveness of agricultural production.

This research work is confined to the cultivators mainly engaged. It provides details of the farm land, and environmental factors like water, soil, climate, groundwater, seasonal crop sand crop price. Based on the factors the design of DSIS helps getting information relating to the soil fertility level, ground water level, water nutrient content level, suggestions for sowing, seasonal based intercropping suggestions, estimate of crop production value and choice of the best crop for sales based on the crop price reaching farmers via their smart mobile phones. The main objective is to give suitable solutions to the farmers for yield improvement and help farmland maintenance at reasonable cost.

The model's brain of smart farming is that the ESP8266 is primarily based on the NodeMCU Wi-Fi module (12E). 4 sensing devices, in particular pressure sensor (BMP180),temperature and humidity sensor (DHT11), drop module and lightweight dependent resistor (LDR), are connected to the NodeMCU ". If such values cross a selected limit for each text, the owner of the device shall be assured of the appropriate measures.

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2. Literature survey

Primary investigation is carried out under the following stages, such as Understanding the existing approaches, Understanding the requirements, developing an abstract for the system. In this paper, soil moisture sensor, temperature and humidity sensors placed in root zone of plant and transmit data to android application. Threshold value of soil moisture sensor that was programmed into a microcontroller to control water quantity. Temperature, humidity and soil moisture values are displayed on the android application. This project on "Effective data Monitoring on Sensing Soil Moisture Content" is intended to create an automated irrigation mechanism which turns thepumping motor ON and OFF on detecting the dampness content of the earth. In this project only soil moisture value is considered but proposed project provided extension to this existed project by adding temperature and humidity values.

2.1 S.Pandikumar and R.S. Vetrivel Controlling Smart Homes in IoT

This framework is responsible for empowering clients to handle gadgets using the internet and creates an interface amongst clients and the home using GSM.

2.2 RiyazKazi and GauravTiwari, show Autonomic Shrewd Sensor Interface for Industry in IoT space

The sensing devices are mainly directed by the device because of the present types of signals, rate of samplings and so on. Programmable gate array (FPGA) is used as a core controller in this field

2.3 S. Liet.al, this paper introduces cloud administrations which have an EIS combination plot

Developments in hybrid wireless networks and cloud computing technologies has made it possible for the building up of a coordinated plan which is capable of smoothly incorporating these new changes into already existent EISS.

2.4 Using Zigbee, A IoT WSN unit for present day security

The mandatory characteristics are sent from station to check to control and from that point on sent via WAN to the web if major. Gotten traits are isolated and the limit regards if any conundrum is found, the pros will be advised to take healing measures.A IoT WSN unit for present day security criteria watching's are outlined in this paper**.**

2.5 Arko Djajad et al. structure for encompassing natural quality watching using IoT sensors organize

He have presented their structure for encompassing natural quality watching using IoT sensors organize. In this system sensing devices are related with Net Client through consecutive interfaces, for instance, Mod bus or I2C. Data gathering is then sent to Fog net by TCP/IP.

3. Proposed Methodology:

Block Diagram:

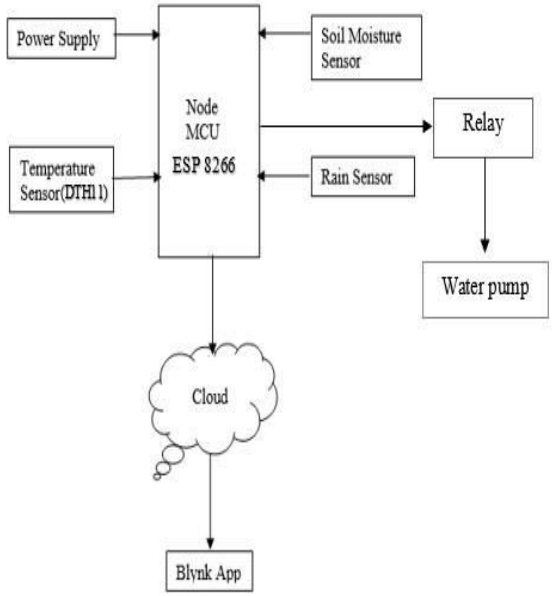

Fig 1: Block Diagram

Methodology

This project focused on development of an IoT platform that to show the data of the sensor. The method divided into two parts which are hardware and software development part. The hardware development involves the circuit construction and develops the prototype. Meanwhile, the software part involves the IoT coding, circuit schematic diagram, circuit simulation and data acquisition. By using three (3) types of sensor to monitoring the Farming parameter that are temperature, humidity, rain, and air quality the system will be able to display the Farming condition by an analysis about the current Farming with the sensor value data.

All the data will be control by a microcontroller ESP8266 and an android application that is Blynk to display the sensor data. The Internet of Things (IoT)will connect the system with the user wireless and online without the need of checking manually.

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The overall project block diagram is illustrated in the block diagram consists of the components that are utilized in this project. There are two modes available in this project working operation. Firstly, controlling mode wil linvolve ESP32 and monitoring mode will involve blynk app. This two-microcontroller board will communicate each other inorderthemonitoringmodegetsensordatafromcontrolli ngmodeviawirelesscommunication and hotspot Wi-Fi. The client will display the sensor data on Blynkapp. The data collected will be analyses to configure the actual condition and the current condition by using simpleformulainEquation1. The result of thisdataanalysisthenwillbemadetheFarming state for this system to tell the user about the rain and air quality condition is it good or bad inactualcondition.

The block diagram of smart irrigation system with IoT. Farmers start to utilize variousmonitoringandcontrolledsysteminordertoincre asetheyieldwithhelpofautomationofan agricultural parameter like temperature, humidity and soil moisture are monitored andcontrol the system which can help the farmers to improve the yield. This proposed workincludesanembeddedsystemforautomaticcontrol ofirrigation.Thisprojecthaswirelesssensornetworkforr eal-timesensingofanirrigationsystem.Thissystemprovides uniformandrequiredlevel ofwater, agricultural farm and it avoids water wastage. When the moisture level in the soil reaches below threshold value then system automatically switch ON the motor. When the waterlevel reaches normal level the motor automatically switches OFF. The sensed parametersandcurrent statusofthe motorwill bedisplayed onuser'sandroidapplication.
Many of these types of modes of communication and sensing devices are exhibited forIoT, the following Farming criteria are measured through the remote Farming monitoringsystemAmonitorsystemisclassifiedasthreet ypes:

1. **Humidity**:Withthe humidity sensor,theusageisbasedonthe humiditysensor.
2. **Temperature:** Making use of a digital bit-stream sensor to sense temperature viawireless medium that has no wires and RF modules. The criterion for daylight is utilizedas one to take care of lamp(s) which switches on automatically when there is no light and switches off when light is there. A connection using the ethernet shows the Farming criteria being uploaded on twitter with timings along with the data automatically. The blockdiagram as provided in Fig 1. The modes of communication and types of sensing devicescan be changed according to the requirements of the certain applications. The designspresented is based on the Arduino Uno R3 (Arduino) platform appropriately for theelementaryapplicationthatisunderconsideration,unl ikemoreadvancedplatformssuch as"NodeMCU".TheArduino,unliketheprocessor-based"NodeMCU",isamicrocontroller-basedplatform.
3. **Soil Moisture :** It measures the water content in the soil and can be used to estimate the amount of stored water in the soil horizon. Soil moisture sensors do not measure water in the soil directly. Instead, they measure changes in some other soil property that is related to water content in a predictable way.
4. **Rain Detection :** The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board and also for measuring rainfall intensity. The module features, a rain board and the control board that is separate for more convenience, power indicator LED and an adjustable sensitivity though a potentiometer.

4. Results and Discussions:

Simulation and results Implementation of NodeMCU controller using IoT for Farmingforecasting system using various criteria for implementation this system we will usesimulator of NodeMCU controller using python language and show the various criteria.Findingresults.Thevariouscriteriaaregivenbelo w:

1.Temperaturemeasures.

2.Humidity measures.

3. Moisture measures.

4. Rain detection.

Now we will show theconfigurationofNodeMCUcontrolleronmypcandusi ngpythoncodingforgettingresults intimesofnumericalvalues.AcclimatizesDHT11sensor andsomeneededpartsonalittle PCB. A segment to test the resistance and its type and to test the NTC temperature and anelite8-bitmicrocontrollerinsideandgivesalignedcomputerized flagyieldisincorporated into the DHT11 sensor. It comprises of high stead fastness and extraordinary long-haulsteadiness, thanks to the restricted computerized flag securing technique and temperatureanddampnessdetectinginnovation.EachD HT11isincrediblyexactonstickinessalignmentsinceitis

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entirelyadjustedinthelab.Theadjustmentdataaretaken asprogramed in the OTP memory. This is further used by the sensor's inner flag identifyingprocess. Framework joining is speedy and simple because of the single-wire sequentialinterface. The small size and the less use for power and the flag transmission being easily settledonitisgoodforvarioussolicitations,togetherwitht hosemostintenseones.The4-stick single column stick bundle is the segment in it. It is appropriate to interface, andextraordinarybundles canbe oncondition given bythe clients' demand.

4.1 Blynk app for NodeMCU

Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi and thelikes over the Internet as shown in figure:4.1.It's a digital dashboard where you can build a graphic interface foryourprojectbysimplydraggingganddropping widgets.

Fig 4.1 Blynk app

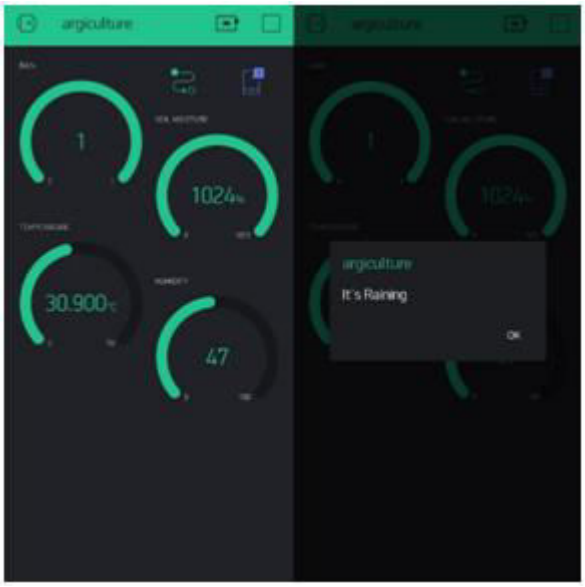

Fig 4.2 Project Software Output

4.2 Project Hardware

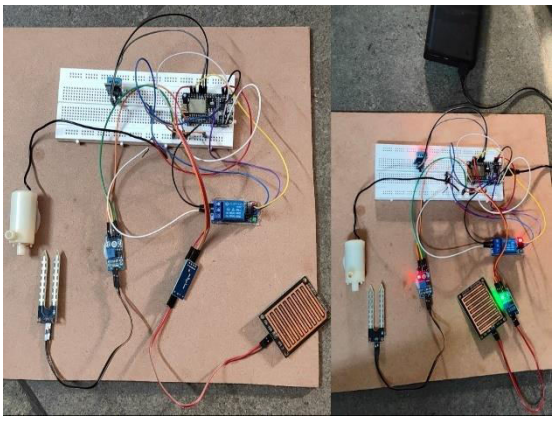

Fig 4.3 Project Hardware

5. Conclusion:

This project presents an innovative and dependable concept of a low-cost simple Farmingmonitoringandcontrollingsystem.Thesystemo peratesunderIoTtechnologysupervisionwhich effectively optimizes remote areas. The creativity of this revolutionary Farming station allows monitoring and controlling of the webserver-based climate conditions using the ESP8266 node MCU microcontroller. In terms of network connectivity, the devices can be turned ON or OFF at any moment and any where. The applicability

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ofthelocalIPgivenbytheESP8266meansthatthedesign's costisinexpensive.

The system contributes to being applicable in two fields. The first contribution is extremely useful to businesses and other organizations that are tasked with preparing and handling their operations based on Farming situations; such as high-priority transport systems, airways, and forestry, etc. The second contribution is specifically designed to control locations regarding the changes in user interface status based on information generated by improvements in output due to Farming disturbances; such as monitoring esidences, stores, hospitals, universities, and smart vehicles. With the planned approach,weshouldalwaysinterfaceandsynchronizethe "NodeMCU".Thus,wehaveatendency tomightwatchtheresults.Hence,anovelstrategyforSensingTemperatureand humidness become investigated by keeping the established devices in nature for checking empowers poise(i.e.,shrewdsituation) to the planet. To executet his needtoshipthesensingelementgadgetswith intheplanetforaccumulatingtherecordsandinvestigation. By conveyance of title sensing element gadgets within the planet, we areable to convey the planet into true. At that time the accumulated records and examinationconsequencesaregoingtobewithintheaccess stotheadvocatewiththehelpofthe Wi-Fi.Thesavvymethodstoscreencircumstance andaprecocious,minimumtry inserted frameworkisgiventotallydifferentfashionsonthisproject.ThisIoTbasedmostly convenience provides actual trailing of environmental criteria. This convenience monitors temperature,humidity,strain,altitude,intensityandrain waterstage.Bymistreatmentthisconveniencetheclientwillperpetuallyscreenone-of-a-kindenvironmentalcriteria."NodeMCU" itself acts as a server. this is often properly performed by mistreatmentRaspbianoperatingdevice.Thisclimatetrailingsystemisintendedtheusageof NodeMCUhaslowvalue,littlelength,lowelectricityconsumption,quickfactsswitch,rightperformanceandfarawaytrailing.Thissystemhassomelimitations,itdoesnothavebuilt-inWi-Fiandbuilt-inRealTimeClock.Fornetworkingdirectinternetconnectionhastobegiven. As well as all sensing devices has to be connected directly to the GPIO header. Forfuture development improved version of "NodeMCU" board system can be used. Moresensing devices can be added to expand the system also for remote location monitoringsolarpanelandwindmillcanbeusedforsupplyingpowertothesystem.

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