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Smart Monitoring of Agricultural Field Based on IoT

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ABSTRACT :

Agriculture plays very important role in India and it has been developed country in agriculture. But the problems are surrounded through the development in agriculture. The smart agriculture is best method to modernize the country and here we use different new conventional methods and this only one solution for development in agriculture. The best way is to take action by farmer as input in agricultural fields then the IOT sensors will give the knowledge about that. That's why we propose the project i.e, Advance solution for monitoring the soil condition/state and also atmosphere for god quality of crop growth using IOT sensors. Here the server will provide and display the environmental condition including field condition and also the parameters like temperature, humidity, PH level, soil moisture etc…

***Key Words*:** Humidity, IOT, Sensors

1. INTRODUCTION

In India most of the people are make primary source has agriculture for their livelihood. Gadgets like web, IOT and cloud are different ways to smart cultivating. In agriculture the most significant impact is climate change that impact by increasing the demand of water and productivity of crop is limited in areas that is where irrigation is very much needed. Irrigation system, rain fed agriculture, groundwater irrigation is some of the methods introduced to produce healthier crops which may not use water efficiently. Smart design is designed to use the water efficiently.

Before farmers manually make the water flow to their field but now its not needed all will carried by system automatically and even does that efficiently. Thus the technological systems begins to rise the efficiency of production and making the system very reliable. Now a days, we have a smart way to determine the soil moisture and driven water supply to the field. The moisture content may varying several times while raining.

A rain-drop detecting sensor intimates the controller if there is rainfall, making the water supply to reduce or stop depending upon the moisture content at the moment. The crop requirements such as amount of humidity, temperature, moisture and PH content are to be studied and can be installed again in the controller to meet its circumstances.

2. LITERATURE REVIEW

A. Nurzaman Ahmed, Debashis De , Senior Member, IEEE, and **Md. Iftekhar Hussain**, Member, IEEE;

Paper: "Internet of effects (IoT) for Smart Precision Agriculture and Farming in Rural Areas" IEEE INTERNET OF THINGS JOURNAL, 2018.

Summary:

The authors main end of the design is to develop smart perfection husbandry and husbandry with the help of fog computing and the Wi-Fi grounded long distance connecting networks in IoT. The author proposed scalable network armature for monitoring and controlling husbandry in pastoral areas. The advanced design is premium for the developing countries for the use of the system for smart husbandry. To concentrate on the specific conditions, author propose a scalable network armature for monitoring and controlling husbandry and granges in pastoral areas. In this, across-layer-based channel access and routing result for seeing and actuating is proposed.

B. Shewta B. Saraf, Dhanashri H. Gawali;

Paper: "IoT Based Smart Irrigation Monitoring And Controlling System", May 2017.

Summary:

The author developed a remote monitoring and controlling of drips through wireless detector network for smart irrigation system for the ranch field. Smart ranch irrigation system uses android phone for controlling of the system for operation of the ranch irrigation water. Distribution of water force as per demand for better use of the water force for the ranch crops. System is grounded on IoT that uses real time input data to control the water force in the ranch Field. Smart ranch irrigation system uses android phone for remote monitoring and controlling of drips through wireless detector network. ZigBee is used for communication between detector bumps and base station. Real time tasted data handling and demonstration on the garcon is fulfilled using web grounded java graphical user interface. Wireless monitoring of field irrigation system reduces mortal intervention and allows remote monitoring and controlling on android phone. Cloud Computing is an seductive result to the large quantum of data generated by the wireless detector network.

C. S. R. Nandurkar, V. R. Thool, R. C. Thool;

Paper: "Design and Development of Precision Agriculture System Using Wireless Sensor Network", IEEE International Conference on robotization, Control, Energy and Systems (ACES), 2014.

Summary:

The author tried to contemporaneously generating further affair from the same quantum of input, but there's need of enhancement. The author controlled the operations like scattering, cutting, etc. with IOT grounded smart device and do monitoring of ranch field. The author done monitoring of ranch field like temperature, moisture, soil conditions.

D. Abdullah, S. A. Enazi and I. Damaj, "AgriSys;

Paper: A smart and ubiquitous controlled-terrain husbandry system," 2016 3rd MEC International Conference on Big Data and Smart City (ICBDSC), Muscat, 2016, pp. 1-6.

Summary:

This proposed wireless robot is equipped with colourful detectors for measuring different environmental parameters. It also includes Raspberry Pi 2 model B tackle for executing the whole process. The main features of this new intelligent wireless robot is that it can execute tasks similar as humidity seeing, spooking catcalls and creatures, scattering fungicides, moving forward or backward and switching ON/OFF electric motor. The robot is fitted with a wireless camera to cover the conditioning in real time. The proposed wireless mobile robot has been tested in the fields, readings have been covered and satisfactory results have been observed, which indicate that this system is veritably important useful for smart agrarian systems

3. Proposed Method

The proposed device uses a microcontroller (NodeMCU) that has a Wi-Fi module over it (ESP8266). Web operation is used as the stoner interface. Soil humidity detector, moisture and temperature detector (DHT11), Ph detector, DS18B20 and relay module are used. This relay is connected to a water pump which pumps water to the crops when the relay is ON. The soil humidity detector senses the humidity position of the soil, depending on the position of humidity, NodeMCU decides whether to water-soak the crop or not. By using applicable functions and tentative statements in the law written for the NodeMCU functioning, the watering of the crop starts by NodeMCU making relay ON when the humidity content is below a threshold value and is made OFF when there's enough humidity content in the soil. The moisture and temperature detector gives the moisture and temperature values of the atmosphere which determine whether the crop is suitable for growth. Some crops grow only in particular rainfall conditions and some give better yield only for a particular temperature range. However, the crops aren't doused. If there is enough downfall to give soil with required water. Indeed after raining, if the crops aren't having sufficient water also water is pumped again by making relay ON. Then we also check the ph for the water as the water contains some acidic content in it or no, so that factory cannot be affected. Data reaches the garcon from NodeMCU through Wi-Fi. From this web app, the planter can control the relay through colorful buttons and switches. When the NodeMCU gets the command from the app also the applicable analysis is done and the pump motor is controlled. The data again travels through Wi-Fi again in the same path.

BLOCK DIAGRAM

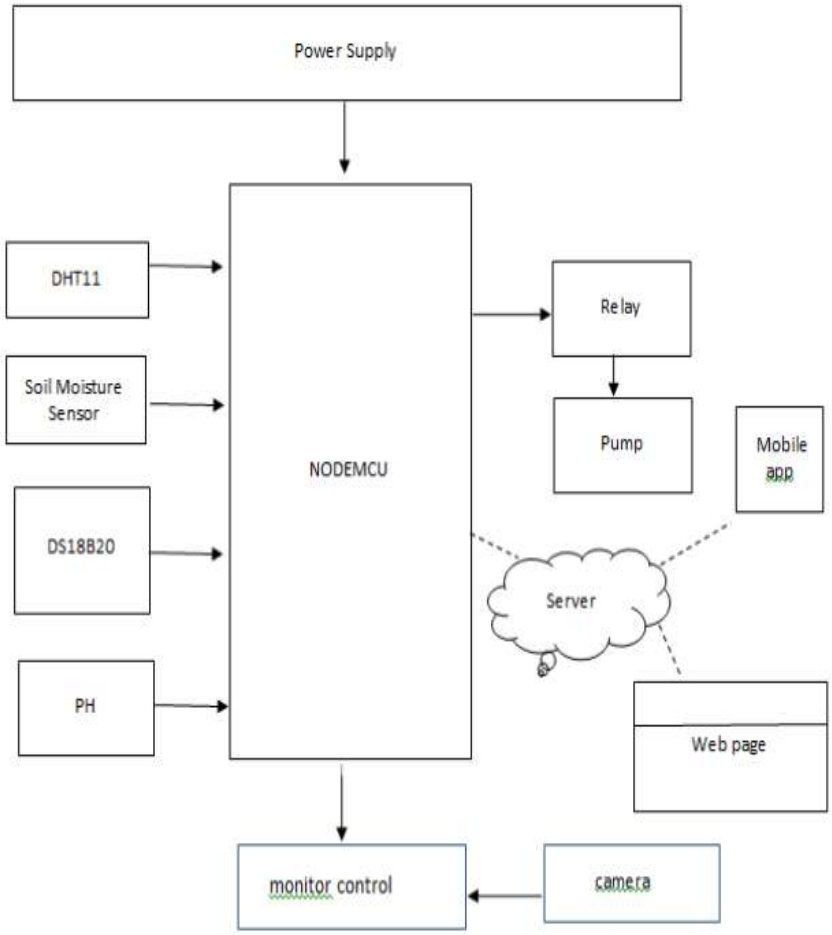


Fig. 1. Block diagram of proposed system.

In order to apply the hothouse monitoring and control system, proper design is needed. In order to do so, Proteus software has been used to produce the schematic of the system. Full schematic of the smart hothouse is presented in Fig. 2. All the detectors and modules are connected to the central microcontroller (Arduino Nano). The microcontroller works as the heart of the system which takes input from the detectors, processes the input signals and exhibits needed instructions to the system.

The system flow chart is shown below

- The system first checks the parameters of the soil.
- The temperature and humidity values are less or more than the threshold value are checked.
- The pH value is less or more than the threshold value are checked.
- If the values are varied from the threshold value, farmer is notified by sending an alert message and display sensors parameters on the web display.
- If the values are normal then the sensors will continue to acquire the required data. The gadget runs a few work processes so as to perform different tasks that are related with the element which prompts the total robotization of the component this lessening human intercession. Such work processes can be utilized to mechanize the necessity of the harvests.

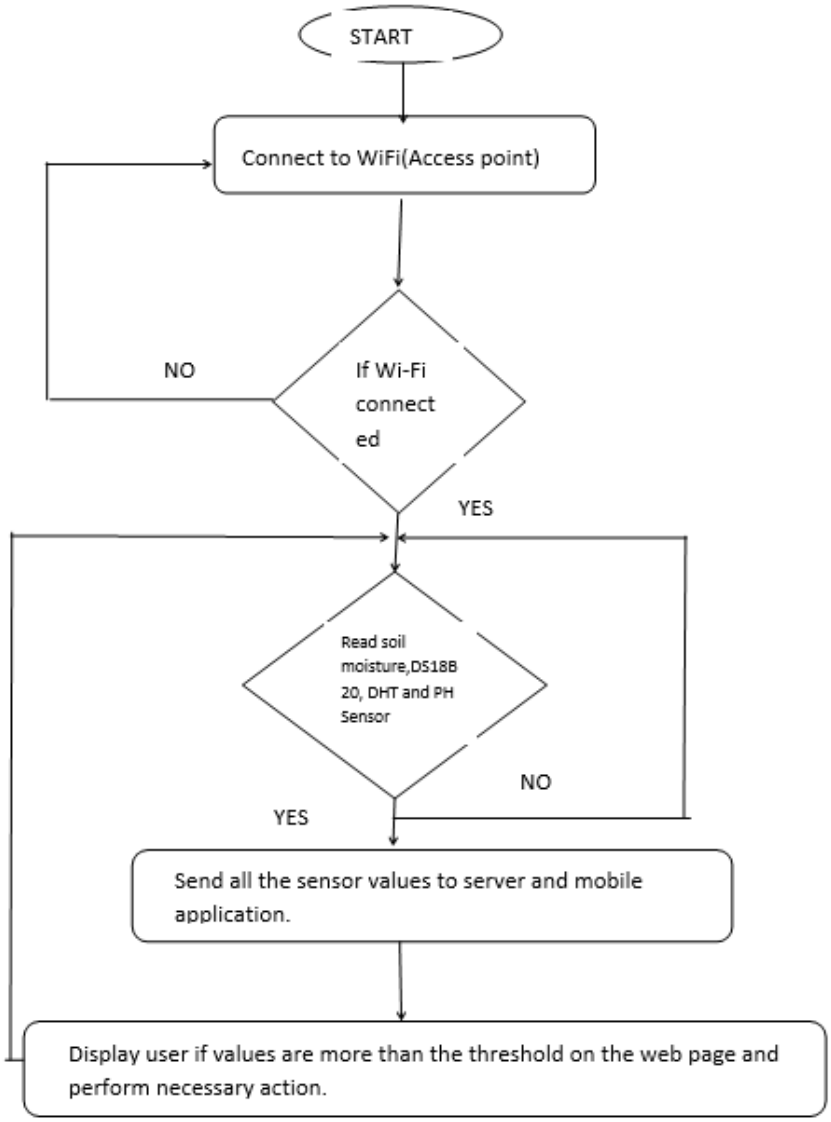


Fig 2: Flow chart

The activity diagram is shown below

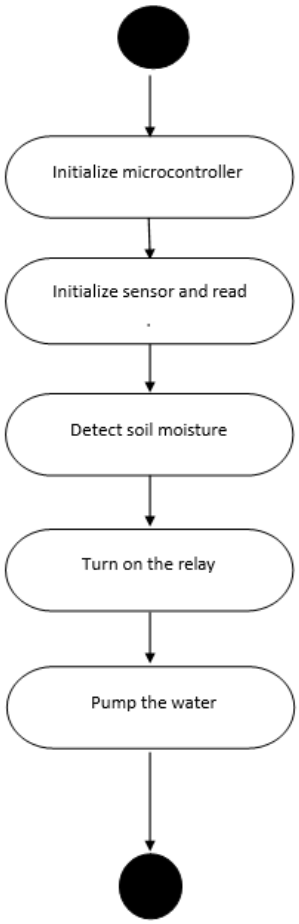
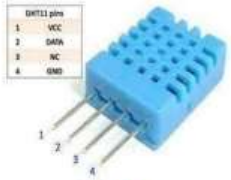


Fig 3: Activity diagram

Hardware Components and Equipment

The needed factors and accoutrements used to apply the smart hothouse is presented in Table 1. The factors are shown in Fig



DHT 11

Water pump

Moisture sensor

Relay

Nodemcu

ESP 32 Cam

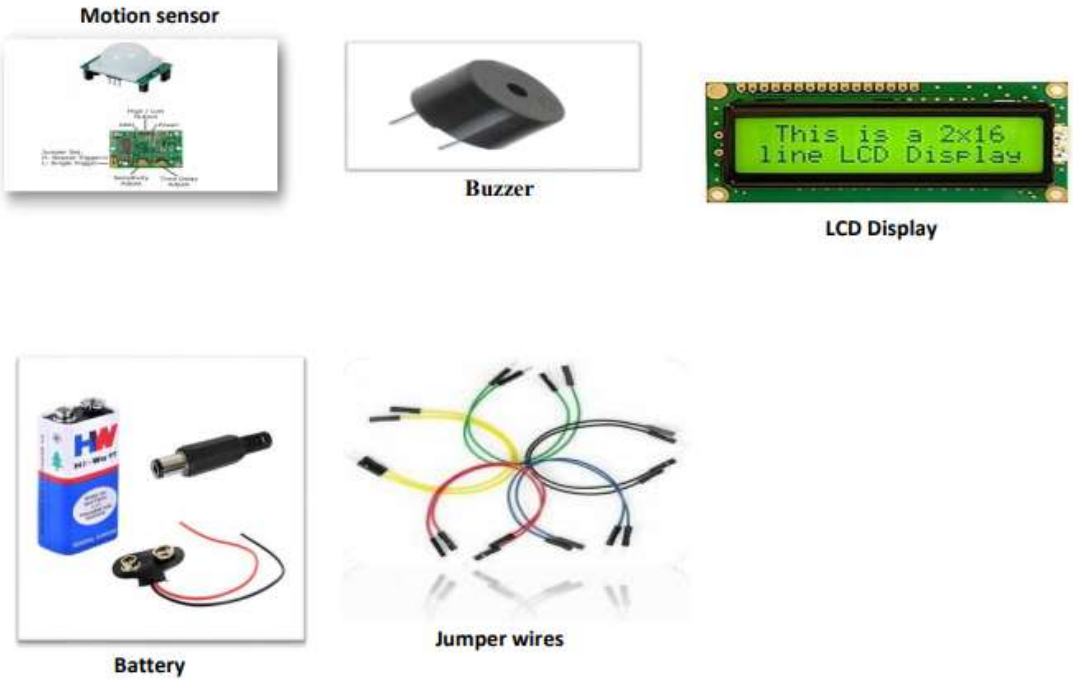


Fig. 4. Components and Equipments Utilized.

Device	Specification	Quantity
DHT11	20m signal transmission	1
Water Pump	12V DC	1
Moisture Sensor	20 - 90%RH, YL69	1
Relay	5V DC power relay	1
Esp8266 Nodemcu	ESP8266 module	1
Esp32-Cam	40 x 27 mm	1
Motion Sensor	PIR sensor	1
Buzzer	Piezo with Arduino	1
Jumper Wire	-	10
Battery	9v	1
LCD Display	2x16	1

Table: Equipment and Component List

4. Results And Discussion

This system supports aggressive water operation for the agrarian land. This armature is grounded on the capabilities of current and coming-generation microcontrollers and their operation conditions. Microcontroller used for the system is promising that it can increase system life by reducing the power consumption performing from lower power consumption.

The system provides with several benefits and can operate with lower force. When the water in the soil goes below the reference level then the system will supplies the water. Due to the direct transfer of water to the roots water conservation takes place and also helps to maintain the humidity to soil ratio at the root zone constant to some extend. therefore the system is efficient and compatible to the changing terrain. Also the system saves the water and improves the growth of shops.

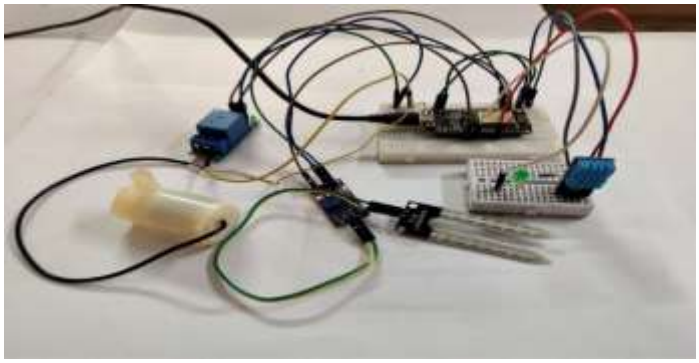


Fig 5. working module

Fig 6. Prototype module

5. CONCLUSION

Using NodeMCU, IoT technology is used to smell and analyses temperature, moisture position, soil humidity position, ph,DS18b20 and pump motor. All these values are transmitted using Wi-Fi to the garcon and displayed on webpage. Applicable water is pumped when needed because of the use of this system. This system is veritably useful for growers because they need to pump water regularly and check the status of each crop and also about the condition of the terrain. Growers can know the values of moisture, temperature and soil humidity from anywhere in the world

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