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Greenhouse Automation using IoT and Cloud Computing

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ABSTRACT: Irrigation is an important task when comes to farming. India is also known for its farming outputs, so based on several methods used while irrigating a farm field involves manpower, water resource and most importantly availability of water. So to save these efforts also the water, we are proposing a system where the manual work will be exchanged with automated system which is capable enough to irrigate field automatically without human interventions. Automated system here is designed for poly-house which consist of Soil moisture sensor which will sense the soil-moisture content of the soil and based on that the system will operate the pumps and irrigation process is carried out. Another parameter is temperature within poly- house so using temperature sensor we will sense the temperature in poly-house and the temperature cooling mechanism will get operated. Android will act as a user inter-face where the user can manipulate system using the device also gets the information related to its farm field.

KEYWORDS: IoT (Internet of Things), Android, WSU (wire- less sensor unit), WIU (wireless information unit), Temperature sensor, Soil-Moisture sensor, Fan

I. INTRODUCTION

Agriculture field is the backbone of any country. Agriculture supplies the food and raw materials to the people in country. It is the only income source of many peoples. Peoples who belong with agriculture field faces many problems such as decreasing production due to unsuitable climatic changes, flood, dearth and many other natural reasons and rarely factors. They are unable to do agriculture due to this reason. Farmers are facing lots of problems and loss due to lack of knowledge. Most of the farmers are either committing suicide or migrating from the agriculture. Motive behind this project is to provide a system to the farmers that will provide them the suitable information while choosing. Irrigation is an important task when comes to farming. While irrigating a farm field involves manpower, water resource and most importantly is availability of water. Due to climatic conditions sometimes it becomes difficult manage irrigation. We propose a smart irrigation method with smart Greenhouse to make irrigation easier. Water is one of the important factor which is required in agriculture sector, as its requirement in agriculture starts from initial stage like at the time of cultivating crops until the crops are ready for harvesting. So while manually irrigating the fields, sometimes water is irrigated more than required amount or less water can also be irrigated, which is a concern while irrigation which leads to poor quality and quantity of farm output. The system is developed as a automated Greenhouse using IOT and cloud computing to irrigation and maintenance of temperature needed for crops.

A. Objective of system

- The Greenhouse will get irrigated automatically with minimal human interventions.
- Proper Greenhouse related information will be generated so that it can be utilized for required purpose.
- With the help of temperature sensor the temperature within greenhouse can be monitored.
- Moisture sensor will help to sense the moisture level of soil.

Paper is organized as follows. Section II describes about the related work done earlier for the system to be developed. Section III presents method used and algorithms used for the detection. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

II. RELATED WORK

In [1], This paper studies an embedded flower greenhouse supervision system. The system collects the temperature, humidity and light intensity in the greenhouse in real time through the sensor, and generates the curve for display in the

user interface. At the same time, the pictures in the greenhouse are taken by the camera and displayed on the user remote interface. The image recognition is carried out through the deep learning algorithm to obtain the growth state of flower species, give environmental conditions and planting suggestions, and solve the problem of insufficient experience of flower farmers.

In [2], To achieve greenhouse temperature management and energy savings through intelligent control, a greenhouse mechanism model is first built to study the controller design for a greenhouse located in Yiyang city in this paper. Then, the model accuracy is verified by experimental data. Based on the verified model, two intelligent control technologies are proposed, namely, active disturbance rejection control and fuzzy active disturbance rejection control.

In [3], The system can detect the air temperature, relative humidity, illuminance, and carbon dioxide concentration in greenhouses in real-time and transmit the data to the OneNET cloud platform in a wireless way. As stated in [4], The model considers the presence of the plants inside the greenhouse by adding the heat and humidity gain into the heat and water balance of the greenhouse using an evapotranspiration sub- model. The effect of evapotranspiration on the greenhouse thermal behavior was also examined in this study

This article [5] designed a set of an intelligent agricultural greenhouse control system, the system automatically detects the light intensity, soil humidity, air temperature, and humidity, carbon dioxide value, etc., through single-chip data processing, adjust the execution unit so that the parameters in the greenhouse are always kept under conditions suitable for plant growth.. In this paper [6], 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.

In this analysis done without manpower by automatically buzzer will on and it will improve the efficient use of energy saving [7].

This system promises about increase in systems life by reducing the power consumption resulting in lower power consumption. It is considered to be used at Cricket stadiums or Golf stadiums and also in public garden area for proper irrigation [8].

This smart drip irrigation system proves to be a useful system as it automates and regulates the watering without any manual intervention. Sending the emails to the system can be automated but manual sending of the emails has control over the system regarding whether or not to run the system depending upon the weather conditions [9].

In this combination of hardware and software provides a irrigation controller that can be implemented at relatively low cost and which is extremely user friendly [10].

In this paper they are proposing use of IoT in a poly house and poly house is a fully covered structure so there is almost no effect of outside factors like insects do not enter and cannot harm the crop so there will be less need of insecticides. By using sensors, the crop field that is connected to internet, an appropriate decision can be taken [11].

In this irrigation system the drip is ON/OFF using a Bluetooth module. In this system the data storage device is reduced to control a drip and reduced a manpower.

III. METHODOLOGY

A. Block Diagram Description

- 1) Arduino: Arduino is the center hardware where the other component are connected.
- 2) Router: It is used to collect the data through Arduino kit and sends to the remote devices e.g: Smart phone, Tablet, PC etc.
- 3) Smart phone: It is used to access the details and get the feedback through system and also can give permission to the system to work.
- 4) Relay switch: Through Relay switch the Water pump is connected to Arduino kit and it switches the pump on and off while irrigating farm land.
- 5) Temperature sensor: Senses Farm temperature and regulate the temperature adjusting mechanism
- 6) Soil-Moisture sensor: Senses the Moisture content of soil bases on threshold values and regulates the water pumps for irrigation.
- 7) Fan : The fan is used to control the temperature in greenhouse. If temperature goes high the fan starts to bring down the temperature.

B. Block Diagram:

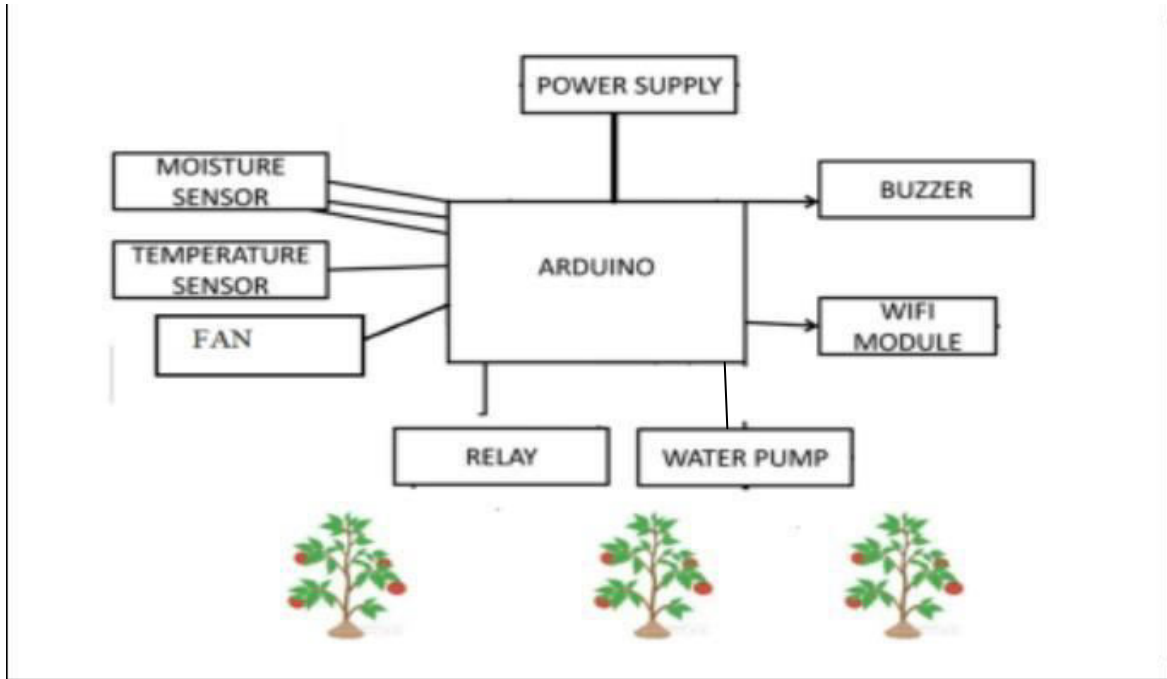


Fig 1: Block Diagram

C. Hardware Used

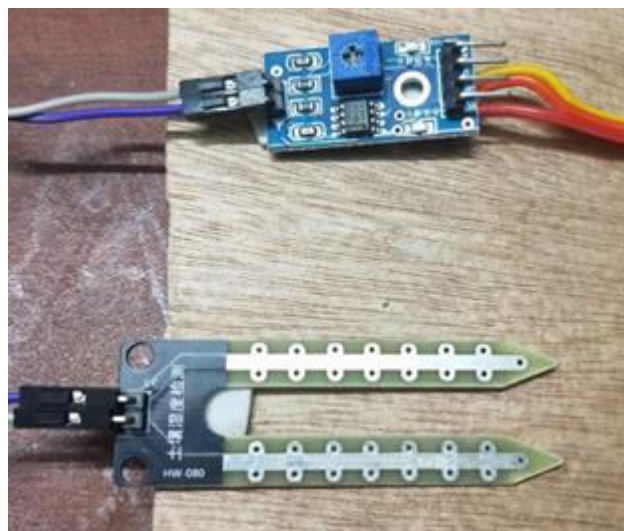


Fig 2: Soil Moisture Sensor



Fig 3: Water pump

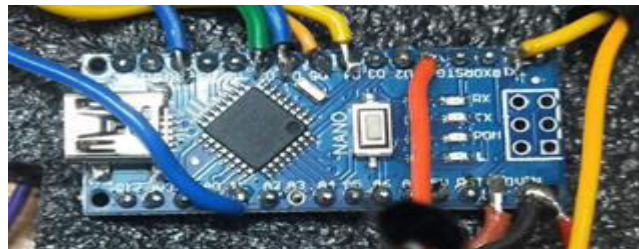


Fig 4: Arduino Nano

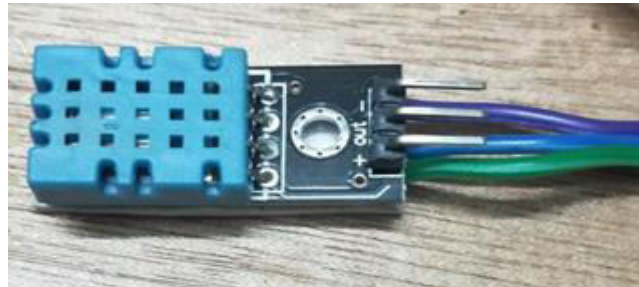


Fig 5: DHT11



Fig 6: Fan

IV. CONCLUSION

The system can provide the better and convenient way of farming so that farmers can work with proper knowledge and can cultivate crops also keeping the quality and quantity of crops, with that they can save adequate amount of water and can reduce the human efforts. The observations and results will tell us that this solution can be implemented for reduction of water loss and reduce the man power required for a field. In future we can make use of cameras which can capture images of crops, also we can move the cameras remotely through the app in front and backward direction just to see each and every crops condition to detect any disease. Use of solar panels for energy conservation can be done

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