AUTOMATED IRRIGATION SYSTEM IN POLYHOUSE USING IOT

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***Abstract*—**Over the years, the traditional way of farming resulted in a reduction in the yield of crops due to the changing climatic conditions and insufficient downpouring. To tackle this problem, water usage in irrigation must be restricted and no wastages of this precious resource are tolerable. This paper represents the use of IoT in irrigation and the challenges expected to be faced when integrating technology with conventional farming methods. The objective of this paper is to implement the technology of smart irrigation using Node MCU and raspberry pi controller that processes the filed data from soil moisture sensor. The proposed system also uses Python programming language and a Wi-Fi module.

Keywords—***Raspberry Pi, Node MCU, Python, Wi-Fi Module, IoT***

1. Introduction

Agriculture is the broadest economic sector that has a major contribution to the development of India. India is also concentrating on the technological aspects. When technology and agriculture are integrated that may yield good results. The conventional method of cultivation requires a tremendous amount of time, human effort and requires continuous monitoring. There are several problems such as unpredictable weather conditions and the plants may be easily affected by pests and diseases in a conventional method of cultivation. A polyhouse is a closed environment where the plants are grown on a controlled platform irrespective of climate and location. Generally, a polyhouse is a structure built using bamboos or iron pipes which are covered with ultraviolet sheets of a certain thickness. The thickness of ultraviolet sheets depends on the crop variety. Polyhouse provides a reliable and crucial way to generate higher revenues. It is an automation system that alters the physical parameters in favor of the plantation and growth. The polyhouse can be in any shape it may be in a tunnel and it is termed as a polytunnel. It may be also in the square, semi-circular, elongated in shape. The polyhouse is covered with polyethylene sheets. These sheets are used to stabilize the ultraviolet rays and help in proper photosynthesis in crops. The manual process for polyhouse is that the sun rays that fall on it will preheat the air inside it. The major parameters to be considered for the polyhouse are temperature, humidity, and the intensity of the light. The many polyhouse will be failed to show the result due to the manual error such as not maintaining it properly. Three parameters are set only by the specification of the plant. Scientist proves that the polyhouse techniques can hold 4 to 10 times more yielding than the normal method of farming techniques. Mostly the polyhouse is constructed in the east to the west direction to allow proper entry of sunlight in polyhouse farming, we can protect our crops from any adverse environment such as high humidity or high temperature. There is a facility in the polyhouse to control temperature or humidity.

2. Objectives

1. To collect the data from the different sensors like humidity sensors, soil moisture sensors, etc., which are placed in different locations. With NodeMCU and raspberry pi.
2. The sensor data should be available in the cloud(Thing Speak Server) so that it will be processed by a raspberry pi.
3. Raspberry pi will accordingly make the decisions based on humidity and moisture percentage and will turn the sprinklers ON/OFF.

   -Based upon the analysis of temperature, humidity, moisture from all four nodes of NodeMCU, it will be very useful to analyze the data and to make the decisions.

3. LITERATURE SURVEY

- Automation in polyhouse is the latest method in farming. With the help of poly house, we can create a fake as well as a comfortable environment for the crop. This method helps to get more crops than the regular methods and it's more organic. Automation in polyhouse avoids unnecessary errors by the farmer. We are monitoring the humidity, soil moisture, using different sensors. The whole polyhouse is controlled

using Arduino. The whole polyhouse is monitored automatically with the help of node MCU and raspberry pi.

- In this paper, a method for monitoring the soil moisture and relative humidity inside a poly house using a microcontroller has been discussed. In the proposed method, the polyhouse controller senses the change in moisture content and relative humidity with the help of input sensors and processes the output to take an appropriate control action. The proposed system is a low-cost and user-friendly system with high stability and reliability.

- Polyhouse is the latest technology related to farming technology. Polyhouse is an emerging organic business in developed countries. It is creating a comfortable environment for crops. With the help of this method more crop yields than normal methods where it is more organic. The whole polyhouse is controlled with help of node MCU. NodeMcu is connected to an IoT WIFI module which sends the output from sensors to the cloud.

- The system given in the paper is based on the internet of things (IoT), it is the cloud of interconnected physical devices which are used to communicate with each other with help of the internet. Physical devices such as microcontrollers, microprocessors, actuators, and sensors are unable to directly communicate with the internet, hence IOT is used as a gateway. This entire infrastructure is known as IoT infrastructure

4. Block Diagram:-

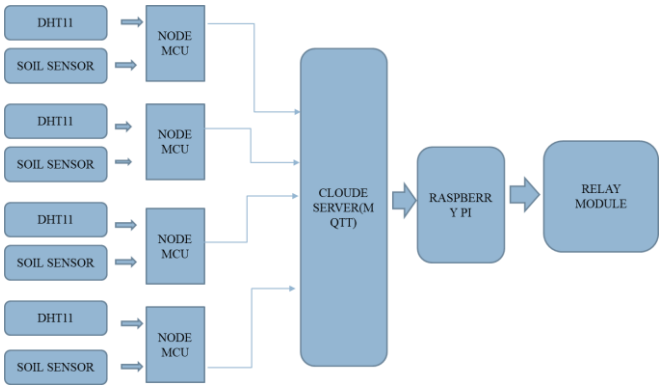

Fig 1.1

[1] Component Description

A. Node MCU (ESP8266) :-

Node MCU is an open-source IoT platform. It includes firmware that runs on the ESP8266 Wi-Fi SOC from Express if Systems, and hardware that is based on the ESP-12 module. The term "Node MCU" by default refers to the firmware rather than the dev kits. It's having 128KBytes of memory and its storage space is 4Mbytes power is supplied through a USB it is a single-board microcontroller and also it is having 16 GPIO pins.

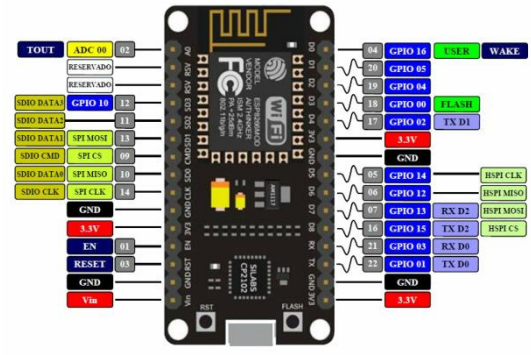

Fig.1.2

B. Raspberry Pi (Raspberry pi model 4):-

The Raspberry pi Development Board is a small-sized Broadcom BCM 2835 SOC-based ARM11 power minicomputer. The raspberry pi can be easily plugged into a monitor because of its inbuilt GPU and audio-visual capabilities. Also, it uses a standard mouse and keyboard. This is easily programmable by powerful languages like C, python, etc, giving it the capability to store and analyze the data. The inbuilt Wi-Fi, BLE, the storage capability of this board, and the available RAM being very huge in comparison to other boards enables it to act as an IoT server in most of the IoT network configurations.

Fig 1.3

C. Wi-Fi Module:-

Wi-Fi is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. There are lots of Wi-Fi Features that make it more easy and simple wireless network. Wi-Fi Technology is, in spirit, a version of Ethernet without wires in the form of a wireless local area network. Nowadays millions of people use this built-in feature of amazing wireless technology.

D. Humidity sensor (DHT11):-

Because of their low cost and small size, DHT11 humidity and temperature sensors are perfect for lots of different DIY electronics projects. Some projects where the DHT11 would be useful include remote weather stations, home environment control systems, and agricultural/garden monitoring systems. DHT11 digital temperature and humidity sensor is a composite Sensor that contains a calibrated digital signal output of the temperature and humidity.

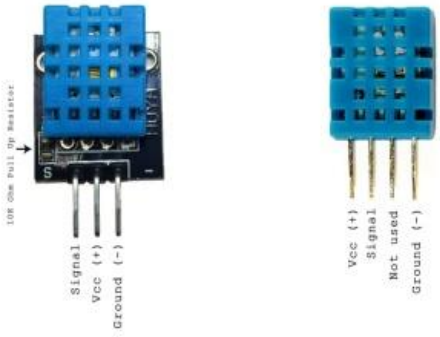

Fig 1.4

E. Soil Moisture Sensor:-

A soil moisture sensor is a device that measures the content of water in the soil. Soil moisture measurement is important to help farmers manage their irrigation systems. It consists of two probes that are used to measure the volumetric content of water. When there is more water, the soil will conduct more electricity which means that there will be less resistance. Therefore, the moisture level will be higher so when there will be less water, then the soil will conduct less electricity which means that there will be more resistance. Therefore, the moisture level will be lower.

F. Relay:-

The Single Pole Double Throw SPDT relay is quite useful in certain applications because of its internal configuration. It has one common terminal and 2 contacts in 2 different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed. So basically you can see the SPDT relay as a way of switching between 2 circuits: when there is no voltage applied to the coil one circuit "receives" current, the other one doesn't, and when the coil gets energized the opposite is happening.

Fig 1.5

5. Software Description

i. Raspbian OS:-

Of all the operating systems Arch, Risc OS, Plan 9, or Raspbian available for Raspberry Pi, Raspbian comes out on top as being the most user-friendly, best-looking, has the best range of default software's and optimized for the Raspberry Pi hardware. Raspbian is a free operating system based on Debian (LINUX), which is available for free from the Raspberry Pi website.

ii. Python:-

Python is a widely-used general-purpose, high-level programming language. Its syntax allows the programmers to express concepts in fewer lines of code

when compared with other languages like C, C++or java.

6. Conclusion

The traditional methods have certain boundaries which are not appropriate key for the polyhouse monitoring and controlling. So that there is a need to work on a system that can be used to increase quality and productivity. Monitoring and controlling of field parameters provide a better environment for crop growth which ultimately causes product improvement. This system simplifies the task of wiring, reducing the cost for the polyhouse provides effective and intelligent wireless network solutions.

7. REFERENCES

[1] Sushil Kumar Choudhary, R. S. Jadoun and H. L. Mandoriya, "Role of cloud computing technology in agriculture fields", COMPUTING, vol. 7, no. 3, 2016.

[2]

[3] V. Sharma and N. Jain, "Wireless Polyhouse Cultivation System using RF Module", International Journal of Innovative Research in Science Engineering and Technology, vol. 5, no. 7, 2016.

[4] Harald Sundmaeker et al., "Internet of food and farm 2020" in Digitising the Industry-Internet of Things connecting physical-digital and virtual worlds, pp. 129-151, 2016.

[5] D. S. Pavithra and M. S. Srinath, "GSM based automatic irrigation control system for efficient use of resources and crop planning by using an Android mobile", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), vol. 11, no. 4, pp. 49-55, 2014.

[6] Jayavardhana Gubbi et al., "Internet of Things (IoT): A vision architectural elements and future directions", Future generation computer systems, vol. 29, no. 7, pp. 1645-1660, 20