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IOT based Greenhouse Automation System

Mr. Harshal Vijay Shinde¹, Mr. Charudatta Dilip Ghatrao², Mrs. Sunita Nandgave³, Mr. Shubham Bhaurao Ghatage⁴,

Mr. Bhavesh Giridhar Sonawane⁵

^{1, 2, 3, 4, 5}G.H.R.C.E.M Wagholi, Pune

Abstract: *Maintaining the environment for growth of crops in greenhouse is difficult. In world of global warming it's hard to maintain environment factors. A system needs to be developed for monitoring and controlling of greenhouse tasks. Use of modern sensors and on the basis of values obtained by this sensors automation of agricultural tasks can be done.*

Keywords: *Greenhouse, DHT11, Moisture, Automation, Farming, Node MCU, Android, Server*

I. INTRODUCTION

In growing world of technology where people are getting highly dependent on the automated things. As there is lot more pollution is increasing daily in environment. To grow plants healthy and to increase the production [1]. greenhouses should be built. Because of global warming atmospheric factors like temperature, humidity in air and moisture of soil keeps changing time to time. It is not as stable as previous time which was healthy for farming.

There need a system that is able to operate 24*7 from any remote location. So that we can keep an eye on the farm/greenhouse. Also there is problem of manpower occurs when there is need of monitoring the greenhouse , taking care of the farm day and night, to maintain the environmental conditions.

In greenhouse there lot of things can be implemented to maintain atmospheric conditions. As if there is increase in temperature then to maintain the temperature in greenhouse heaters can be fitted which can be used to increase the temperature when temperature gets down in winter times. When there is problem of light intensity the panels which are fitted to the greenhouses can be opened and closed on basis of increase or decrease in light intensity.

Again when there will be hike in temperature in times of summer, to keep the greenhouse temperature maintained exhaust fans can be also used which will help in keeping greenhouses cool. Implementation of water sprinklers plays important role in automation of things.

To make this things automated we will need to implement a server to send data from the controller to server and to access that data from server. An android application is also needed to access all the data from the server. A user friendly application will be very efficient to farmers. As they can easily use that application without any difficulty. So the greenhouse automation system can be one of the system that will change the way of agriculture.

II. LITERATURE SURVEY

A. Applications Of WSN In Agricultural Environment Monitoring System, By Mohamed Rawidean, Mohd Kassim & Ahmad Nizar Harun

In this paper a system designed using IOT for monitoring of climate conditions based on raspberry pie controller using various sensors and CCTV cameras. A three tier architecture is used to process the requests. An android / web application is used to access the information in last tier a web, image , application server is used to store the data provided by raspberry pie

B. Iot based smart crop field monitoring & automation irrigation system by r. Nageswara rao & b. Shridhar

In this paper the controller used is raspberry pie. The main moto behind the this system is to save the costing for large systems. The system is developed for low cost irrigation system which is designed to modernize the traditional irrigation system. The concept which is used in this paper is to use low quantity of water for irrigation. Which solves the water problem. This system will be very useful in the rural areas where water problem is biggest milestone[3].

C. Development Of Low Cost System For Temperature Monitoring System, By Gabriel Gasperac

The system developed is just for observation. A simple GUI based system which which calculates the temperature and when temperature gets exceeds the threshold value it blows the security alarms. It is just a experimental system made to show working of temperature sensor [5].

D. System Of Wireless Temperature And Humidity Monitoring System Based On Aurdino Uno, By Yanping Wang & Zongato Chi
 The paper shows working of a temperature and humidity monitoring system which uses the aurdino uno platform for implementation and controller used in system is ATmega 328 for logic development. A LCD 1284 display is used for displaying values of temperature and humidity. nRF24L01 transreciever is used for transmitting and receiving the data wirelessly.

III. SYSTEM DESIGN

A. Existing System

In india farming is still done in traditional way of farming. Manpower is largely required for that. So cost of maintaining these factors is very high. Some of the advance systems were introduced. like, complete monitoring systems. There are some automated systems available but the disadvantage is they are not network operated. These systems are working on simple seven segment based systems.

B. Proposed System

To design an advance system to overcome problems in existing systems. We got the idea to implement a system based on IOT. There will be sensors like moisture sensor, DHT11 and LDR sensor. These sensors will update their values to the server which is designed in PHP. An android app is developed to monitor all the values from any remote location. Operating from remote location is the main advantage of this system. Also automation is done in system on the basis of values recorded by system. Water pump, heaters, exhaust fans are used to automate the agricultural tasks. The system is designed using NODE MCU microcontroller

C. System Architecture

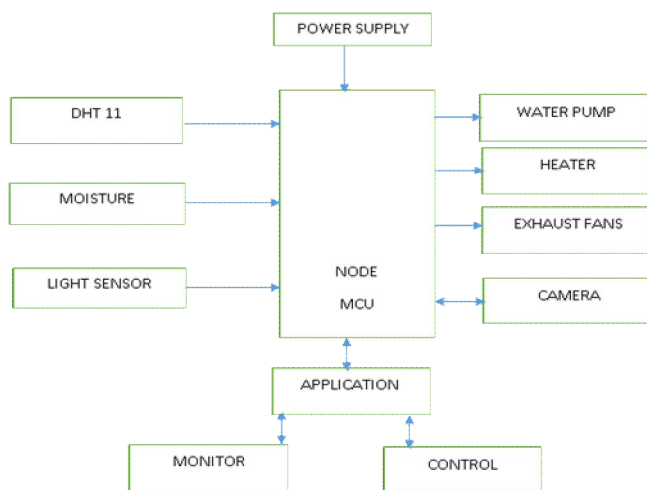


Fig. 3.1

Fig illustrate the block diagram of proposed system. Node MCU controller is used as heart of the system. Which is powered by 12v power supply. On the left hand side all sensors are given which are DHT11, Moisture sensor, LDR sensor. On the right hand side devices like water pump, heater, exhaust fan and camera. And on down side an android application is connected to the hardware. The system is designed in a way that when temperature gets down heaters starts automatically. When temperature starts increasing over the threshold exhaust fans starts to make the temperature under control. Also the water pump can be started from anywhere. On a single click.

IV. SENSORS DESCRIPTION

A. DHT11 & Moisture sensor

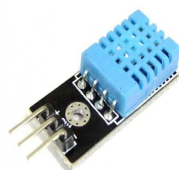


Fig 4.1

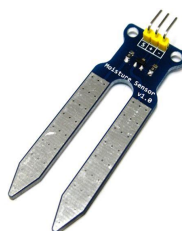


Fig 4.2

In fig above sensors displayed are DHT 11 and Moisture sensors. DHT11 is a sensor which is used to measure temperature and humidity in air. There is no need of using separate sensors for measuring temperature and humidity. Another sensor used is a moisture sensor. moisture sensor is a sensor which is used for measuring values of moisture in soil.

B. Light Intensity Sensor & Motor Driver

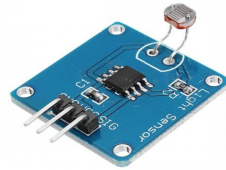


Fig. 4.3

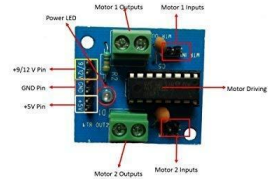


Fig. 4.4

In above figures sensors given are LDR and motor driver. LDR sensor is a light intensity sensor which is used to measure light intensity. It is mostly used in greenhouses to maintain the light inside the greenhouse. Another one is a motor driver. Motor driver is used as a power supply for devices connected to the controller. Because of lack of GND and VCC pins on controllers motor driver is used to interface devices having large power requirement.

C. Node MCU & Water Pump



Fig. 4.5



Fig. 4.6

Node MCU is an arduino family controller which we can buy in low cost as compared to other controllers. Like raspberry pie and arduino boards. IT is a 32 pin controller which have 8 data pins. I.e. we can add up to 8 devices that can transmit or receive data. Another one is water pump. It is a motor which requires 12v power supply. Mainly this motor is used for irrigation of water. Using this motor irrigation task can be automated.

V. GUI OF THE APPLICATION

A user friendly GUI which provides information of all values provided by sensors. Firstly user have to login by his hardware ip address and server ip address. Username and password. When user will enter into application it will show the panel status on basis of status of light intensity sensor. after that of Exhaust fan is on it will show status of fan in red color. If it is off it will be normal. Next is bulb showing functionality of heater weather it is on or off. And a manual option for starting water pump.

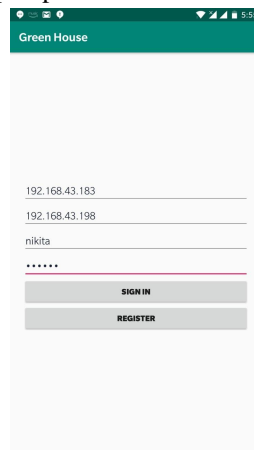


Fig. 5.1.

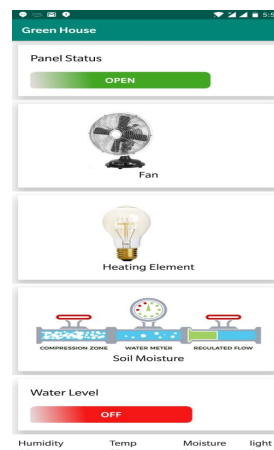


fig. 5.2.

VI. OBSERVATIONS.

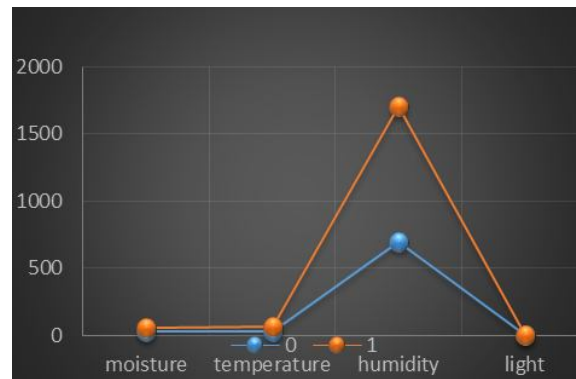


Fig. 6.1

In fig above graph shows the change in status of the sensor values. Orange curve shows values when temperature, humidity, moisture values goes up. And blue curve shows the lesser initial values obtained by the sensors.

At the start moisture value is at 29. When moisture in soil goes up to 30 water pump starts automatically. In 2nd observation temperature was at 30 degrees and when temperature goes over 30 degree curve goes up. Exhaust fans starts. Same case is with humidity and light intensity.

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