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IOT Based Green-house Monitoring

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Abstract

In recent scenario of climate change and its effect on the environment has motivated the farmers to install greenhouses in their fields. But maintaining a greenhouse and its plantation is very labour intensive and majority of them perform vital operations intuitively. With available Greenhouse Monitoring systems, it's not much affordable for farmers to implement such technologies. In this paper, authors propose a system, that is cost effective and easy to design by using technologies Internet of Things (IOT). A wider area of controlling using sensors like temperature sensor, humidity sensor, moisture sensor and light parameters sensing is covered in proposed system. To control environment parameters in real life scenario, actuators are used for particular parameters All the controlling activities are done with the help of PIC microcontroller. For future purpose sensor outputs values can be stored on cloud so that stored data can be used for analysis in evolving technologies like AI. The proposed system works with least human interference and affordable for farmers.

Keywords— *Green House, IoT, Wi-Fi, Cloud, PIC*

I. INTRODUCTION

The concept of greenhouse comes in picture in order to increase the growth and yield more amount of crop. There are factors such as heat, light, moisture, humidity, pH, etc. affecting the growth of crops to great extent. Now a days one can see how drastically weather changes which affects the growth and quality of crops. To maintain these parameters manually people are needed to take care of different parameters and most of the times the conditions maintained there are based on human predictions which again cannot be totally trusted and it's hard to monitor greenhouse continuously. Proposed system makes sure to monitor the parameters, and also controls specific conditions in greenhouse without any human interference. Wi-Fi module and cloud are used to store the data and to control system. Due to Wi-Fi module it is easy to access the data and control the system. The system automates the greenhouse maintenance operations and monitor the growth conditions inside the greenhouse closely.

II. LITERATURE SURVEY

PIC Microcontroller Based Greenhouse Monitoring and Control System [1]- This Paper represents the need of Greenhouse and how much effective they can be in good yield of crops. In this, important parameters like temperature, light, humidity, and pH are monitored. They have used E2PROM to store the values of sensors. The output of system is observed GLCD in the form of graph. For the input power supply they used Solar panels. The main aim of these systems is to reduce

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human efforts, increase the quality and quantity of crops. The humidity and temperature sensor use SHT10. The signal will be adjusted into standard current signal by specified circuit and transmit chip, and then delivered to controller. BH1750FVI light sensor is used. The present study gives a reliable Greenhouse Monitoring and Control System which has a wide application in agriculture. In this system the sensor side acts like a data acquisition unit that is capable of measuring five different parameters like temperature, light, humidity, soil moisture and ph. The main part is the controller which carries out various tasks like collection, data storage, data processing and greenhouse climate adjustment, thus the proposed system providing real time application and is beneficial for farmers of countries like India. Further, Further, in An Intelligent Greenhouse Control System [2], according to the authors, a new control system of much applicability can be developed using RS485 and TMS320F28035.For communication they have used I2C protocol. TMS320F28035 is chosen as the main processing chip. Therefore, the system in this paper uses RS485 bus instead of field-bus, which reduces the requirement in communication for equipment if compared with former control system, this control system in this paper using RS485 is more reliable and desired. This system is less complex as RS485 communication doesn't need complex connections. Hence, the authors concluded from this paper as this is based on RS485 it is more reliable and cost effective also further research of this paper was based on wireless low power consumption sensor system. Ex. ZigBee

In Greenhouse Monitoring System Based on a wireless Sensor Network [3], authors have implemented this system using WSN. Their main task was based on their deployment flexibility and low cost. In this paper they have implemented features of a greenhouse monitoring system which is based on a ZigBee wireless sensor network. From this paper it is concluded that the important issue related to greenhouse operation is climate control. This paper which claim that greenhouse climate is highly heterogeneous and big temperature differences exist in the modern greenhouses that typically occupy large areas. since modern technologies are used like WSN hence it is more reliable and stable. The study gives the idea about non-negligible differences on the levels of temperature , humidity across different sectors of compact greenhouse compartments and ultimate objective is to achieve greenhouse production of high quality and quantity, while using less input resources. Moreover in IOT based Greenhouse Monitoring System[4] author gave brief idea about two different technologies which can be efficiently implemented for greenhouse monitoring. One of them is low-speed short-range wireless network transmission protocol ZigBee where S3C2440 micro-processor is used. Out of three different topologies the star network topology is used for monitoring which consists of co-ordinator node and terminal node where co-ordinator node deals with data gathering such as temperature, moisture, etc. and processing of that data while terminal node deals with performing actions using fans, irrigation, etc.The second method is GSM and RF technology and ATmega16A micro-controller is used. It consists of three units- monitoring nodes, sink nodes and GSM. Monitoring nodes collects information from environment. Sink node sort and process this information for region to server transportation and GSM deals with remote delivering processed information. Both technologies are combination of Hardware and Software and are reliable and implementable.

Automation using IOT in greenhouse environment[5], is the system structure of the green house is embedded with IOT, sensors and the Netduino3 Wi-Fi to enable an automated monitoring and controlling in the green house. The main advantage of the system is: Due to machine to machine interaction human efforts are reduced. Netduino & Wi-Fi connectivity in the Cloud enables to transmit the information gathered from the sensors to the cloud and gets stored in the cloud data base. So the idea of use Wi-Fi module and cloud came from this particular paper. In [6], IOT based

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Automated Greenhouse Monitoring and control system, The authors discussed about greenhouse monitoring system which can move throughout the greenhouse. Node MCU is used for controlling vehicle part. It follows the flood fill following mechanism. Vehicle can be manually controlled by user through Phone. Different kind of sensors are put on vehicle for sensing parameters like temperature, moisture, humidity, CO2 gas, etc. This sensed data is uploaded by cloud interface and IOT using wi-fi module and required commands are sent to controlling part to maintain optimal environment. User can check past events and values as date and time is also collected by cloud. Controlling part consists of Arduino nano which controls different levels of parameters by performing actions by pump, sprayer, cooling fan, etc. if Presence of any toxic gas is detected then it is displayed on mobile Further in Greenhouse Controlling and Monitoring System using ARM 7 LPC2148[7], they have implemented "*Greenhouse Controlling and Monitoring System*" using ARM 7 LPC2148. So the sensors they have used will sense the changes in the threshold values i.e. if it increases or decreases with respect to threshold values then the microcontroller reads this from the data at its input ports after being converted to a digital form by the ADC of microcontroller ARM 7. The microcontroller then performs the needed actions by employing. Relays until the strayed-out parameter has been brought back to its optimum level, thus completely automated system can be developed. Moreover in Digitally Greenhouse Monitoring and Controlling of System based on Embedded System[8],the system controlling is done byAT89s51. This controller will activate the actuators when changes occurs in order to control it. LCD is used to display all the parameters. They have used KEIL environment is used to create software to run on controller in assembly or C language. This system has many advantages as it is cost effective.

III. METHODOLOGY

A. Methodology:

The system consists of three different parts i.e. receiving part, actuation part, storing part and receiving part consists of sensors such as temperature sensor, soil moisture sensor, pH sensor, light sensor, humidity sensor. These sensors will measure the values of respective environmental parameters and fed them to micro-controller. Actuation part consist of actuators like exhaust fan, sprinkle irrigation motor, light bulb, heater. As soon as the micro-controller detects any fall or rise in particular parameter value the respective actuator will be turned on in order to maintain the proper environment in the green-house. Storing part consists of wi-fi module which will be basically used for establishing connection between micro-controller and cloud and the values from different sensors will be stored on cloud. The micro-controller used here is PIC16F877A and wi-fi module is ESP8266. These two are compatible with each other. Most of the sensors used here give analog output and PIC16F877A has inbuilt 10-bit, 8 channel ADC also as it is 32 bit micro-controller it is much faster than 8051.

To make this system more useful and keeping in mind the importance of storing data for upcoming modules , the author has chosen to use "thinkspeak" cloud platform for data storage. For communication between hardware system and virtual cloud, the ESP2866 wi-fi module is used as Wi-Fi is more reliable and easily available over smartphones. This makes monitoring and storing of data easy and also access to data is possible for future use.

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B. Block Diagram:

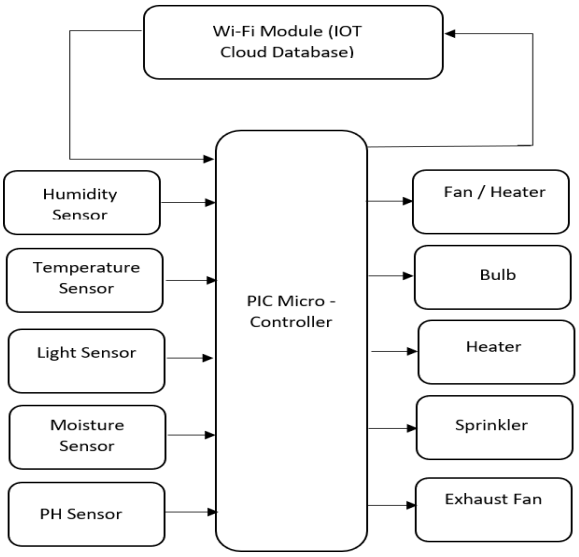

Fig.1 -System Architecture

IV. EXPERIMENTATION AND RESULTS

For coding *Micro c Pro* software is used and for simulation *Proteus 8.10 professional software is used.* Here's some simulation results for different conditions.

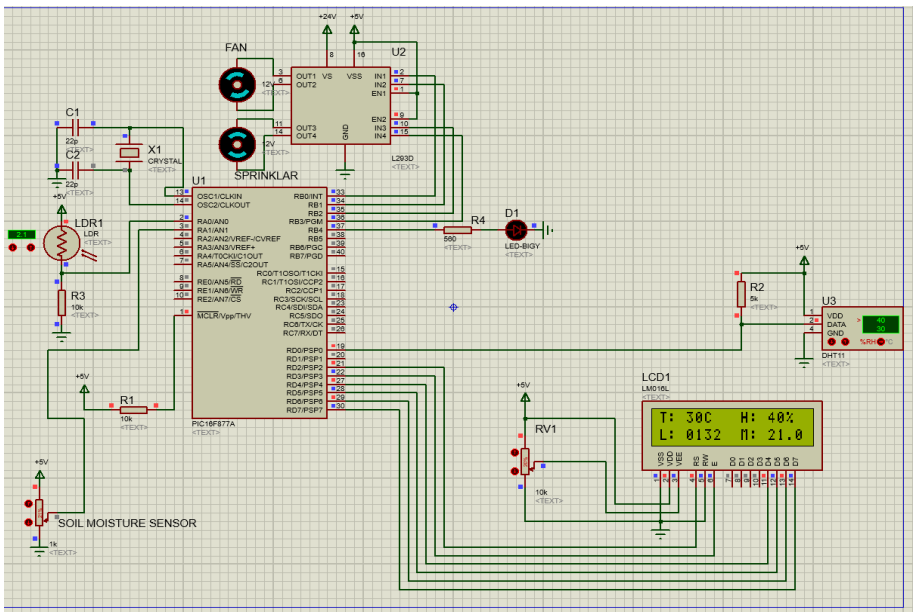

Fig.-1.1 All parameters are within the specified range hence no actuator is turned on.

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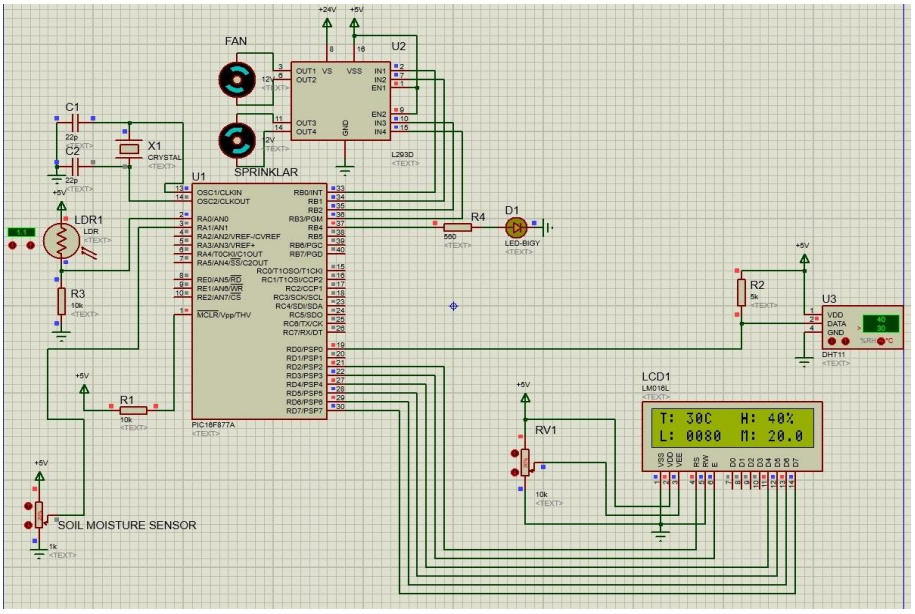

Fig.-1.2 When Light is less than 100 units, Bulb D1 turns on.

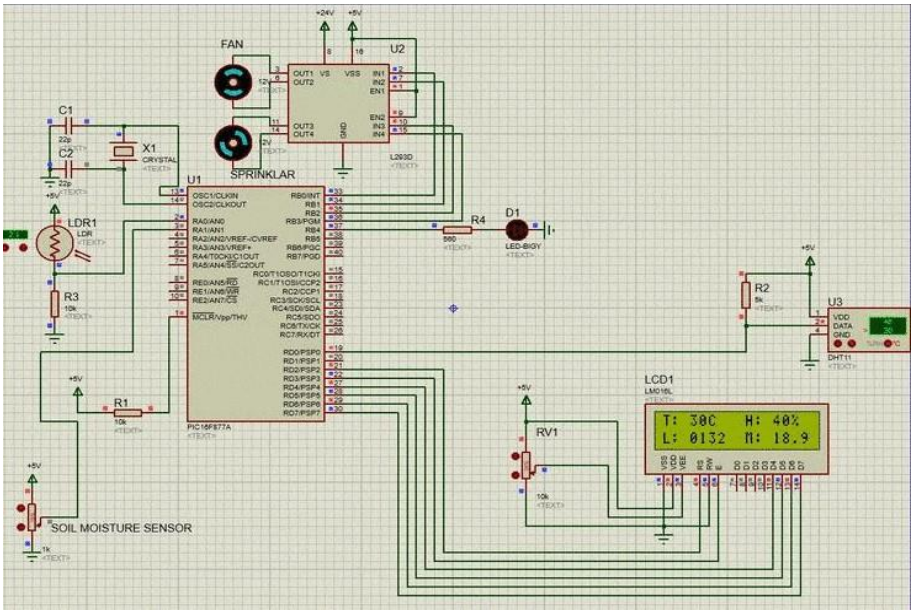

Fig.-1.3 When Moisture is less than 20 units, sprinkler turns on.

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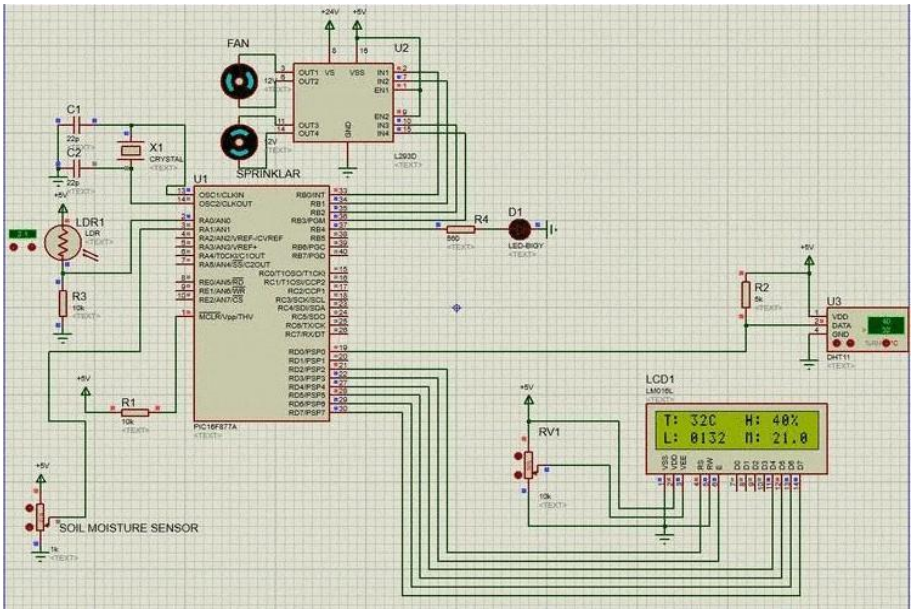

Fig.-1.4 When temperature is greater than 30 units, fan turns on.

V. CONCLUSION

System is automatic as sensors and related actuators are used in order to maintain certain parameters. It provides more precise environment as compared to conventional systems because the parameters are set based on output of sensors rather than human predictions. System is cost effective as it eliminates the need of human interference and intern labor cost.

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