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Web Based Greenhouse Environment Monitoring and Controlling System using Arduino Platform.

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Abstract

As the limitation of existing greenhouse plants is that it is not operated automatically and has to be operated manually with different records. In order to achieve the optimum growth of plants, the continuous monitoring and controlling of environmental parameters such as temperature, humidity etc. are necessary for our agriculture science or greenhouse system. Design of particular model where these environmental parameters from different greenhouses are collected at one station i.e. on PC via LAN connectivity and giving the whole collected data at Web Page via Ethernet. Arduino platform along with the IP connectivity like Ethernet to access and control the devices remotely. This is very low cost and flexible system. Proposed system will demonstrate real time temperature and humidity with controlling parameters as fan and humidifier on developed page.

Keywords**:** *Greenhouse automation, Arduino platform, TFT display, Sensors DHT11, Web Portal.*

I. INTRODUCTION

The atmospheric or environmental conditions plays an important role for growth of the plants .Temperature and humidity are the most important environmental parameters or factors for greenhouse automation. In order to achieve the modifications of optimum growth to achieve high yield of plants at lower cost, good quality and low environmental loads, it is necessary to have the effectiveness in greenhouse crop production. With the help of internet or Smartphone we are going to controlled the greenhouse which is equipped with the cooling, heating, ventilation etc. This internet based smart greenhouse can be controlled from anywhere by focusing the environmental parameters like temperature and humidity. An individual person can controlled this environmental parameters of greenhouse by automatically or remotely. Automation plays an important role for doing the things automatically by reducing the need of tasks of turning ON/OFF switches. Automation cannot completely eliminates or reduces the human errors but it minimizes them at certain levels. It is the need of today's world that everything should be realistic or remotely controlled. Here, assuming the owner of greenhouse can controlled and monitored his greenhouse from anywhere. Owner need not to go over their continuously at every time and check the conditions. Owner has to sit at one place and continuously monitored and controlled the number of greenhouses at a time with comfortably. WiFi is the recent developed technology which connects the different devices to each other. WiFi shield plays an important role to develop Web server for eliminating the needs of cables or wired connections which automatically reduces the cost. So, considering all the facts in the mind we are designing the web based greenhouse automation for remote access.

II. SYSTEM ARCHITECTURE

The basic block diagram of greenhouse system is as shown in fig.1. An Arduino platform micro-controller is used to obtain values of physical data through sensors connected to it. These integrated sensors i.e. DHT11 which is a combine temperature and humidity sensor read the temperature and humidity values. These values are going to be displayed on the TFT (Thin Film Transistor) display. The controlling parameters like fan and cooling equipments keeps the greenhouse at the optimal growing temperature,

and humidifier is used to add the moisture to the air to prevent dryness. A Web portal is acts as input device to control the greenhouse parameters and also acts as output device to monitor the physical conditions. A Web server is designed in such a way that the controlling and monitoring parameters continuously modified.

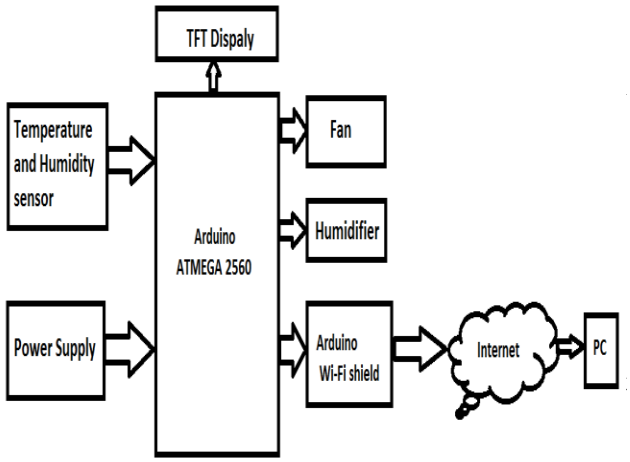

Fig.1 System Block Diagram

III. SYSTEM DESIGN

Proposed system design is divided into two module: hardware module and software module. Arduino platform used for functioning of Web server and all the other hardware devices. Also it is capable of doing all communication and controlling part.

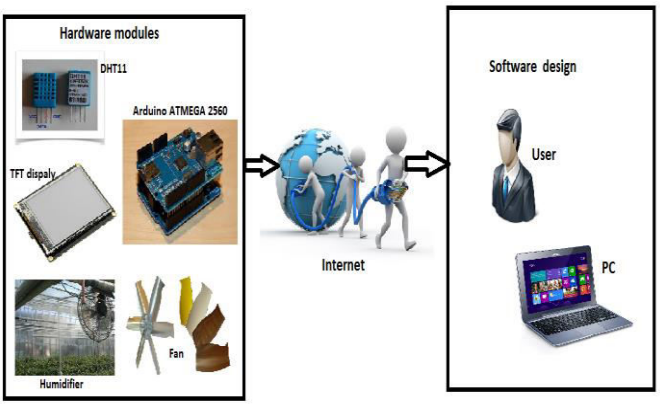

Fig.2 System architecture

A. HARDWARE MODULE

1] DHT 11 sensor:

In order to measure the surrounding environmental conditions like temperature and humidity, we are going to use DHT11 sensor. DHT11 is a complex temperature and humidity sensor with calibrated digital output. The sensor uses resistive- type material for humidity measurement and NTC for temperature measurement. By using only single wire serial interface we can connect it to our system very quickly and easily. It is a 4-pin IC with small in size and has low power consumption. It operates on 3-5.5V DC and supply current is 0.5-2.5mA. It has humidity range along with accuracy is 20-90 % RH ±5 % RH and temperature range with accuracy is 0-50 °C ±2% °C.

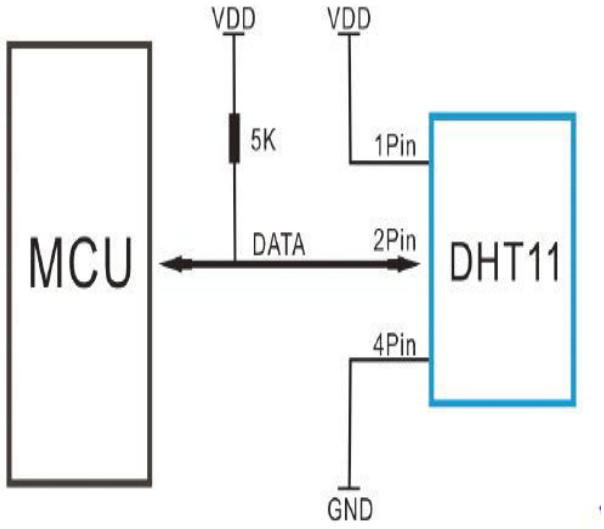

Fig.2.1 Pin connection of DHT11 with ATMEGA

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2] TFT Display:

A Si- TFT LCD (Silicon Thin Film Transistor Liquid Crystal Display) which is color LCD panel structure. Shown in Fig.2.2.

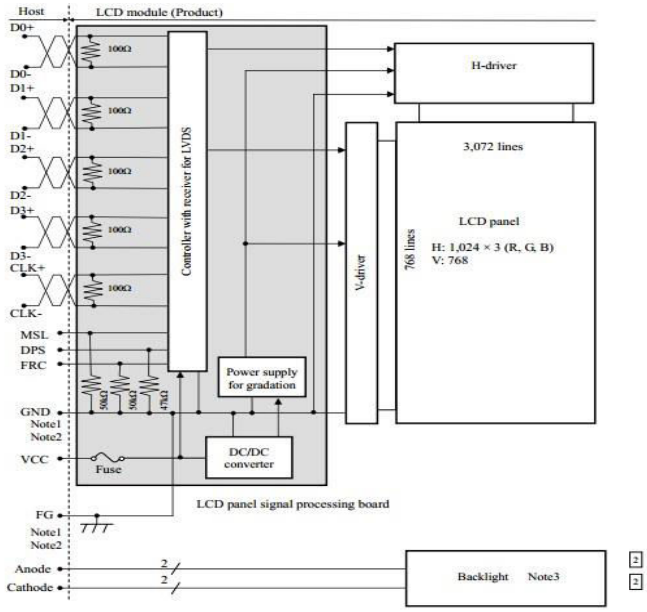

Fig.2.2 TFT display

It has high luminance, high contrast, 6-bit digital RGB signals and it includes LCD controller and power supply.

3] Arduino platform:

It is a high performance, low power 8-bit platform microcontroller.

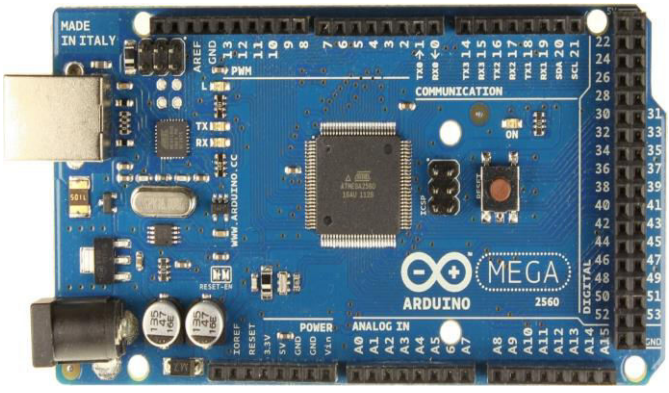

Fig.2.3 Arduino Mega 2560

Some of features are: it uses supply voltage of 5V, digital I/O pins are 54, analog input pins are 16, clock speed 16 MHz, input voltage 6-20V, DC current 50mA, flash memory is of 256 KB out of which 8KB is for bootloader, SRAM is of 8KB and EEPROM is of 4KB.

4] Circuit diagram:

Here, the Arduino platform is for controlling and monitoring of greenhouse environment.

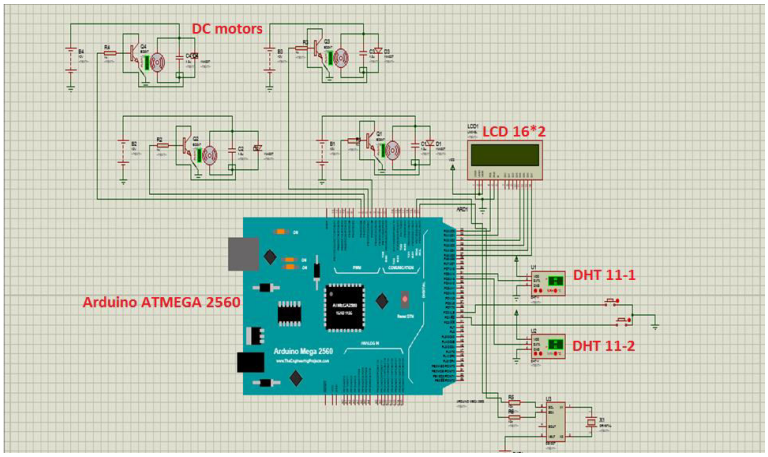

Fig.2.4 Circuit diagram of greenhouse system with Proteus simulation

The DHT11 sensor used to sense the values of temperature and humidity. The TFT LCD displays the continuous readings of temperature and humidity. In controlling part, as per the changes in temperature values the speed of fan is controlled by the controller and cooling action will be taken. Similarly, the changes in humidity readings, adds the moisture to the air to prevent the dryness.

B.SOFTWARE DESIGN

The Internet of Things (IoT) is a growing topic in the tech world, and more and more hardware projects that are funded using crowd-funding campaigns include some connected objects. Such objects can be

smart watches that connect to the Web, the environmental parameters. Here by using Wi-Fi shield of Arduino board we are going to interface the web server. On the software side, you will need the latest beta version of the Arduino IDE, which is the only IDE that supports the Arduino board (we used Version 1.5.5 when doing this project).

Fig.2.5.Arduino IDE

You will also need the DHT library for the DHT11 sensor. To install the library, simply unzip the files and extract the DHT folder to your libraries folder in your main Arduino folder.

IV. CONCLUSION

Here, proposed design is interface with Arduino platform and implemented the Arduino platform based greenhouse monitor and control system with the help of Web server. Our system architecture gives micro web server application for communication between remote user and greenhouse system. As the Arduino has inbuilt Wi-Fi shield so there is no need of wiring i.e. it reduces the wiring cost. Also due to the continuous monitoring and controlling of environmental parameters like temperature and humidity, it is beneficial for crop production. So, proposed system is the very flexible and low cost smart greenhouse system.

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