Greenhouse Environmental Parameters Monitoring and Controlling

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Abstract- *In India the earning source of many people is farming but many of them uses the manual system for farming. The caring of the crops with manual one is troublesome for farmers and this also affects the health of crops. Farming can be done using various new technologies to yield higher growth of the crops and their more production. The objective of our project is to work for the same mentioned above in affordable cost for farmers. In this project we are going to check the parameters like temperature, light, humidity, and soil moisture which are important for any type of crop so that the health of the crop can be improve. The project works automatically and hence reduces the man power. The main moto of our project is to yield the healthy crops and reduce the manpower.*

Keywords- greenhouse, Arduino Uno, sensors, LCD and interface.

I. INTRODUCTION

Greenhouse is an artificial climate-controlled structure which is made-up of a glass or translucent plastic roof and it is used for various applications such as off-season growing of vegetables, floriculture, planting material acclimatization, fruit crop growing and plant breeding etc. These structures of the greenhouse range in size from small size sheds to industrial large sized buildings. A miniature greenhouse is also known as a cold frame.The interior of a greenhouse when exposed to sunlight it becomes significantly warmer than the external ambient temperature and protects its contents in cold weather.

Most of the farmers in rural area use the conventional method for farming .By using this conventional method it takes lots of efforts to take the care of the plant . For any farmer it is very hard to take proper care of their crops manually . And due to the manual work the nutrients and the growth of that particular crop are as per the requirement.

It is necessary for farmers to change the method of farming as per the technology changes. The effectiveness of the plant creation inside greenhouse depends fundamentally on the conformity of ideal atmosphere development conditions that attains the high return at very low cost, great quality as well as low natural burden. For attaining these objectives a few parameters, like light, temperature and humidity, soil moisture must be controlled ideally in certain criteria by warming, lighting, ventilation and water creation. Growth of the plants is directly dependent on the water and nutrients of the soil in which it is grown. Growth of the plants directly depends on the water and nutrients of the soil in which it is grown. The water content, soil and salts form a soil solution which providesnutrients to plants. Ventilation is the important component in a successful greenhouse, especially in hot and humid tropical climate condition. Greenhouses and their growing plants can become prone to problems if there is no proper ventilation.

The proposed system consists of a framework that gathers the data which is identified with greenhouse environment and yield status and control the system automatically in view of the gathered data. By throatily observing periodic conditions, this study has the reason for securing connection between sensors flags and reference estimations. Control programming will give information finding of ongoing show. Through long time running and functional utilizing, the framework has been demonstrated that it has numerous points of interest. To monitor the environment inside greenhouse different parameters have been considered such as light, temperature, humidity, soil moisture etc. using different sensors like DHT11 temperature and humidity sensor, LDR, soil-moisture sensor etc. which will be interfaced with Arduino controller. It is a closed loop system that will execute control action to adjust temperature, humidity, light intensity and soil moisture if any unwanted errors (high/low) occur.

II. METHODOLOGY

Green house environment monitoring system consist of Four sensors are interfaced with Arduino controller. The temperature sensor LM35 is used for sensing maximum temperature. When temperature exceeds from a defined level, the system automatically turns on the fan. Humidity is measured by using the humidity sensor DHT11. If the humidity of the environment is below the defined levels, sprays are automatically turned on and if the humidity level

exceeds from the defined level sprays are automatically turned off. For detecting light intensity LDR is used. To resolve the problem of low light, artificial lights are used. Here in this project 100-Watt bulb is used for demonstration. When light intensity is lower than a defined level, the artificial lights turns on, and when the light intensity comes in normal range artificial lights automatically turns off. Two probe soil moisture sensor FC28 is used and placed in soil. It detects the moisture percentage in the soil and as per requirement it turns ON the dc motoring pump. The current status of the system is displayed on LCD.

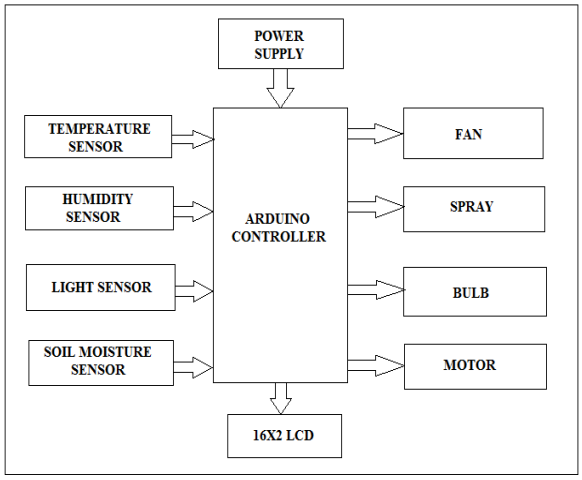

Fig1.Block diagram of proposed design

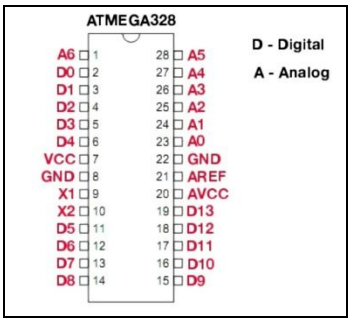

Fig2.Pin diagram of arduino controller

(i)Sensors

LM35 is precision IC temperature sensor in which output is proportional totemperature (in °C). Due to sealed circuitry, it is not subjected to other processes or oxidation. With LM35 temperature can be measured with more accuracy comparative to the thermistor. It possesses low self-heating and does not cause more than 0.1°C temperature rise in still air. The operating range of LM35 is from - 55°C to 150°C.The output voltage changes by 10mV/°C rise or fall in the embosoming temperature, and its scale factor is 0.01V/ °C.

Fig3.Temperature sensor-LM35

DHT11 is a humidity and temperature Sensor which have a temperature & humidity sensor complex with a calibrated digital signal output. High reliability and excellent long-term stability is ensured by the exclusive digital-signal-acquisition technique and temperature and humidity sensing technology. This sensor includes a resistivetype humidity measurement component and NTC temperature measurement component, and it is connected to a high-performance 8-bit microcontroller and it offers excellent quality, fast response, anti-interference ability as well as cost-effectiveness.

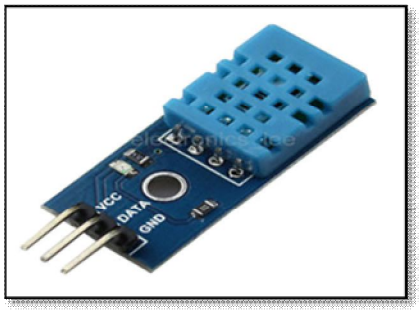

Fig4.Humidity sensor-DHT11 sensor

Light intensity sensor module adopts LM393 voltage comparator as the main chip. And it is perfect suitable for light control applications. When module is powered by 3.3-5V voltage the onboard power indicator will be turned on. Visible light which is seen by the human eye is measured by LDR which is a variable resistor. LDR is a resistor which has internal resistance increase or decrease depends on light intensity levelimpinging on the sensor surface. The characteristic of this type of sensor is it issmall in size and have fast response. The brightness of the surrounding environment and the light intensity can be detected(compare with the photoresistor, directivity is relatively good, can perceive the fixed direction of the light source).

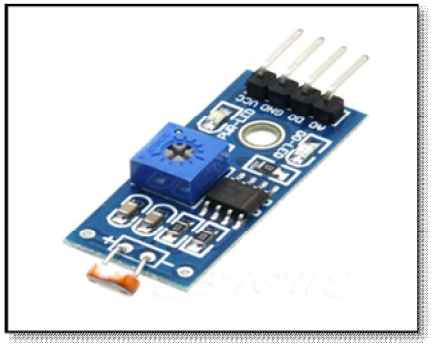

Fig5.Light intensity sensor-LDR

The FC28 Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. The soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acting as a variable resistor. This is a simple water sensor, can be used to detect soil moisture. Module Output is high level when the soil moisture deficit, or output is low.

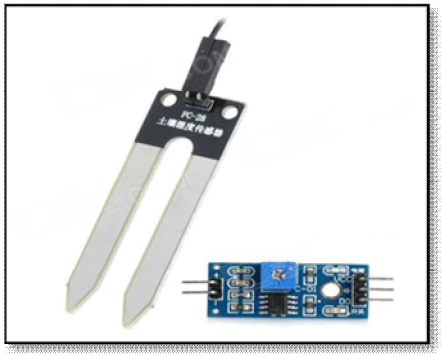

Fig6.Soil moisture sensor-FC28

(ii)voltage regulator

7809 is a 9V fixed three terminal positive voltage regulator IC. The IC has features such as safe operating area protection, thermal shut down, internal current limiting which makes the IC very rugged.

Output currents up to 1A can be drawn from the IC provided that there is a proper heat sink. A 9V transformer steps down the main voltage, 1A bridge rectifier which uses 1N4007 diodes rectifies it and capacitor C1 filters it and 7809 regulates it to produce a steady 9Volt DC.

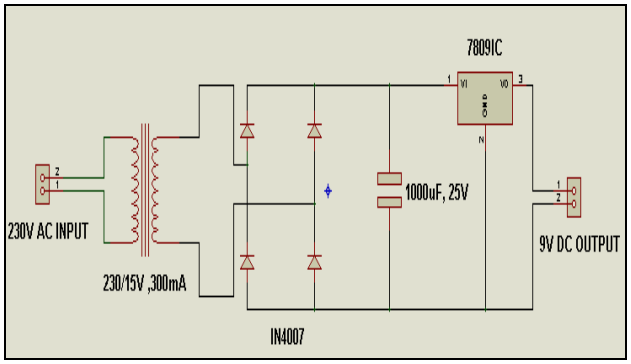

Fig7. Voltage regulator

(iii)LCD display

For indication of the present status of parameters Liquid Crystal Display is used. 4-bit interfacing of LCD with Arduino controller is done. The LCD display supposed to used is 16*2 green backlight display. As the display is 16*2 it will show all four-parameter status simultaneously.

IV. SIMULATION DIAGRAM

For the simulation purpose Proteus software is used. Working with the Proteus is simple and, in this software, there are different types of microcontrollers, components are inbuilt. The 3D view of software improvers the visualization effect. Changes can be done very easily in Proteus.

In simulation temperature sensor, light sensor, humidity sensor, moisture sensor is interfaced with Arduino microcontroller. For indication of current status of parameters, the LCD display is used. The Fig8 shows the simulation for standstill condition and after running simulation we get the readings for the all four parameters.

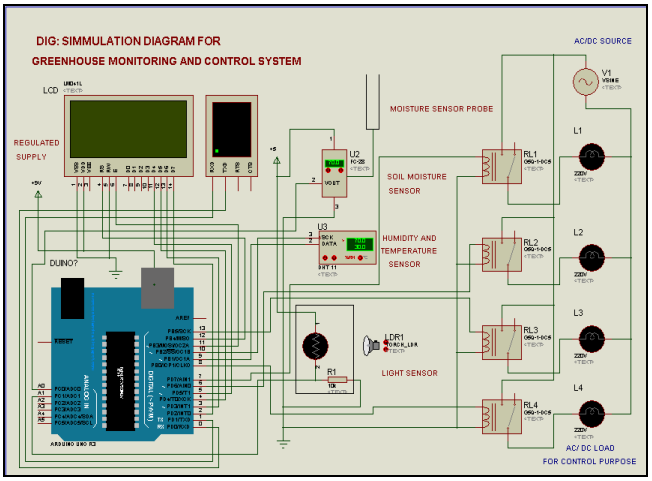

Fig8.simulation diagram at standstill condition

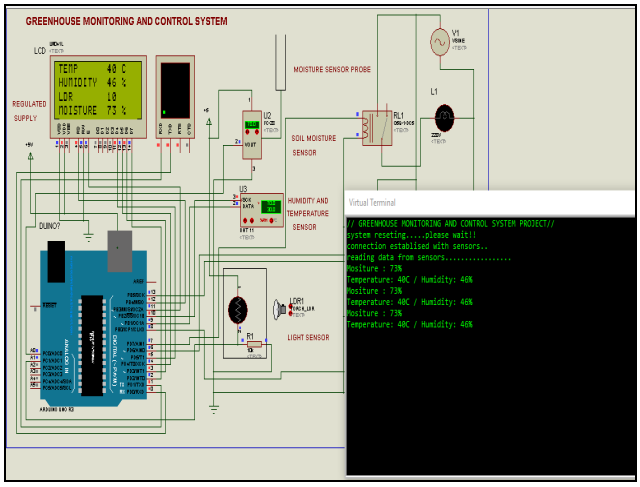

Fig9.simulation diagram under running condition

The LCD display shows the status of parameters as:
1.Temperature -40℃
2.Humidity -46%
3.Light intensity -10
4.Soil moisture -73%

V. CONCLUSION

The purpose of this project is to design and build a working prototype monitoring and control system for green house environment this system allows user to monitor temperature, humidity, moisture and light intensity. The system is able to reduce the complexity and maintenance of the existing system by referring the set parameter values and simultaneously providing a flexible and precise form of maintaining the greenhouse environment.

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