International Journal of Combined Research & Development (IJCRD)
eISSN:2321-225X;pISSN:2321-2241 Volume: 5; Issue: 5; May -2016

Green House Monitoring and Controlling Using Android Mobile App

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***Abstract*- Smart Green House android app is developed to Monitoring and controling the microclimatic environment inside a green house.From the green house easly get soil moiseture,humidity and temperature sensor value to android app ,according to sensors values and we set predefined threshould values for each sensor ,depending on sensor readings we are going to contoling using water sprayer,cooling fan,rooftop and focus light and just press the button in android app we can control make on/off motors and it also has datasheet of all Horticulture plantation and season wise precation material for monitorning and controlling.The objective of this project is to design a simple, easy to install, user frendily to monitor and record the values of temperature, humidity, soil moisture and sunlight of the natural environment that are continuously modified and controlled in order optimize them to achieve maximum plant growth and yield. The result shows that the condition specified in sensor's datasheet and system in reality is appropriate. The achieved test result concludes that the system is working properly.**

Keyword: green house, microcontroller-8051, wireless network, sensors,drivers,android phone.

I. INTRODUCTION

Green house farmers cannot precisely detect level of level of humidity inside the green house. They only know the condition inside the green house manually and by feel it by themselves. Ultimately, experiences play a bigger part on their daily operations. If the condition is too dry, they will give water to the plants or soil, but if it is too humid, they will open the rooftop of the green house, especially in the daylight. In designing this device, there is limitation to problems, to see how far this system can

do its tasks. This limitation according to the situation where this system will be used later. There are 3 kinds of activity that are designed in the system. First, monitor the humidity level in the green house. Secondly, if the green house is too dry, the water sprayer can be activated, to increase the humidity level. It also can deactivated water sprayer. Third, if the green house is too humid, the rooftop can be opened to lower the humidity level. The third function can be use to open or close the rooftop based on the needs.

This embedded system for monitoring and controlling the green house is based on measuring the humidity and temperature by sensor that located at different places. The monitoring and controlling is conducted through Android Smartphone.

The proposed system is an embedded system which will closely monitor and control the microclimatic parameters of a greenhouse on a regular basis round the clock for cultivation of crops or specific plant species which could maximize their production over the whole crop growth season and to eliminate the difficulties involved in the system by reducing human intervention to the best possible extent. ,

The sensors sense the change and the microcontroller reads this from the data at its input ports after being converted to a digital form by the ADC . The microcontroller then performs the needed actions by employing relays until the strayed-out parameter has been brought back to its optimum level. Since a microcontroller is used as the heart of the system, it makes the set-up low-

cost and effective nevertheless. As the system also employs an LCD display for continuously alerting the user about the condition inside the greenhouse, the entire set-up becomes user friendly. Thus, this system eliminates the drawbacks of the existing set-ups and is designed as an easy to maintain, flexible and low cost solution.

II SYSTEM ARCHITECTURE

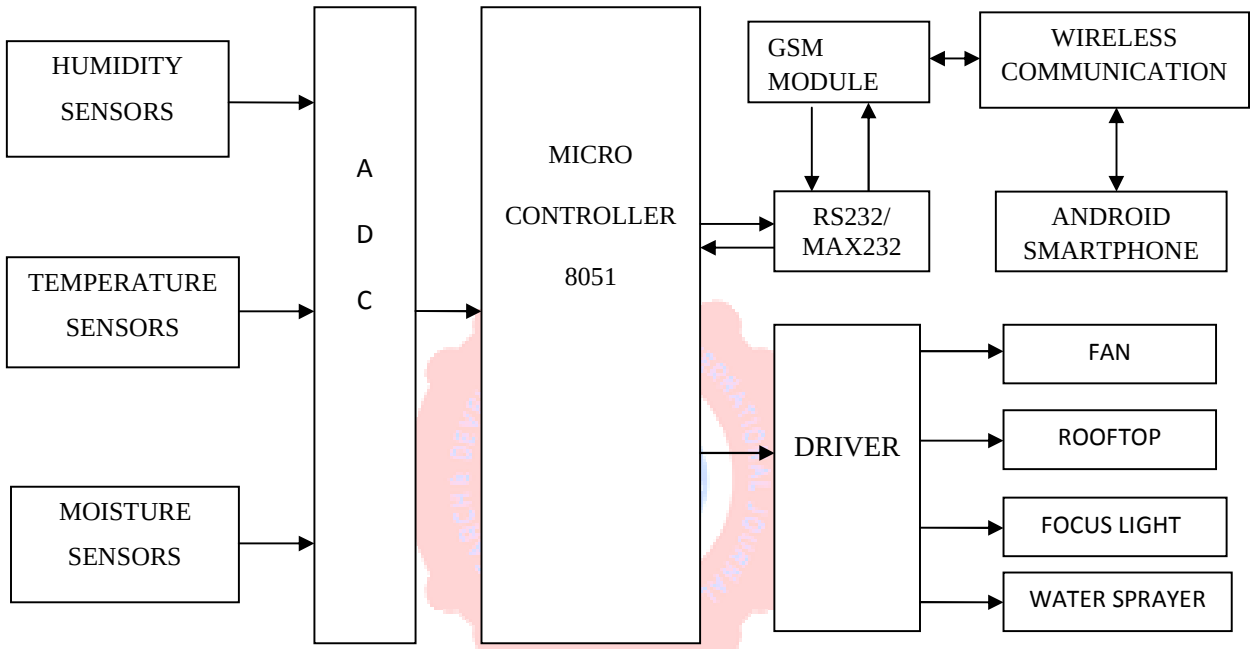


Figure 1 : Basic system model of green house monitor and control

Parts of the System architecture:

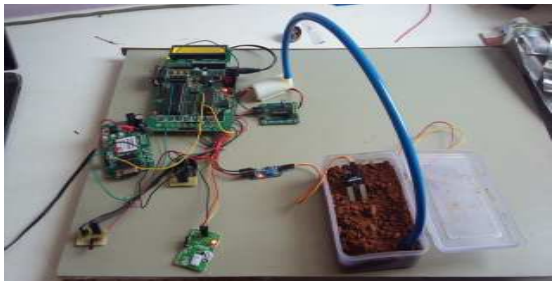
- Sensors (Data acquisition system)
  - Temperature sensor
  - Humidity sensor
  - soil sensor
- Analog to Digital Converter
- Microcontroller
- Liquid Crystal Display
- Actuators – Relays
- Devices controlled
  - Water Pump
  - Rooftop
  - Cooler (simulated as a fan)
  - Artificial Lights

III Implementation of greenhouse monitoring and controlling system

Hardware Implementation

In the hardware implementation, it has wired components sensor to microcontroler by jumper cable and use protoboard as a board for the components like stepper motor and LED module in the hardware. The 5V DC power is provided for microcontroller , stepper motor and also the sensor. Then, the connection between

for microcontroller , sensor circuit, stepper motor, water sprayer replace by LED module are made through serial communication and computer as a server. The computer as a path for receive and transfer value from sensor for monitoring and input for controlling.



Actual Hardware Implementation
Figure 4: Design system
Figure 5:Green house with Design system

5.2 Software Implementation

For software implementation, Figure 6 shows the flow of the software in monitoring and controlling the green house. C program for arduino to measure humidity, send the value to computer then to Android Smartphone through serial communication. Next receive input from Android Smartphone then control the stepper motor and LED module. PHP code use for communication path. Last, Modules for application in android are written in C program.

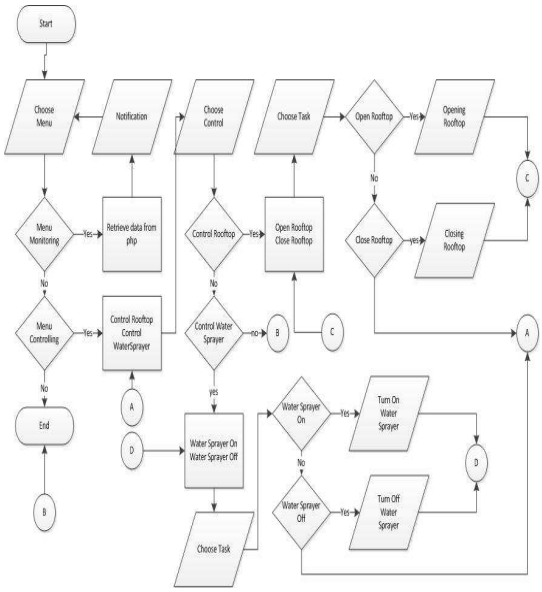


Figure 6. Software Flowchart Design

Figure 7 shown the picture of Main Menu in Android Mobile Phone.

Figure 7. Main Menu

Figure 8 shown the appearance of Monitoring System in the Smart Green House.

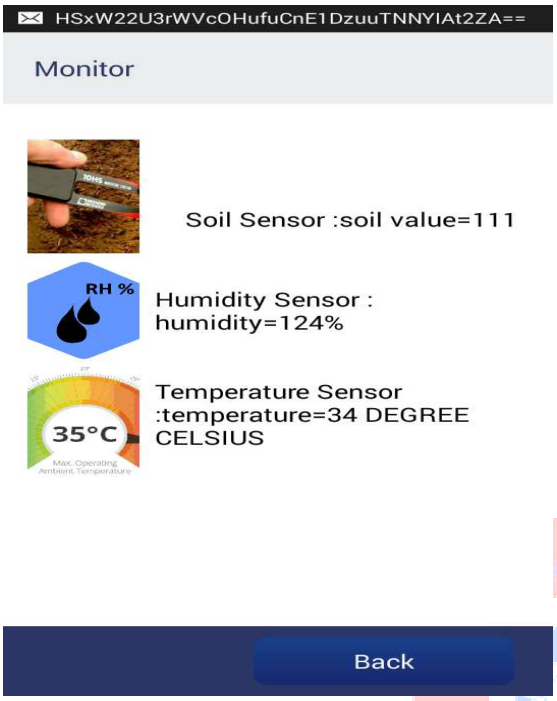


Figure 8. Monitoring System

Figure 9 shown the picture of Controlling System in Android Mobile Phone.

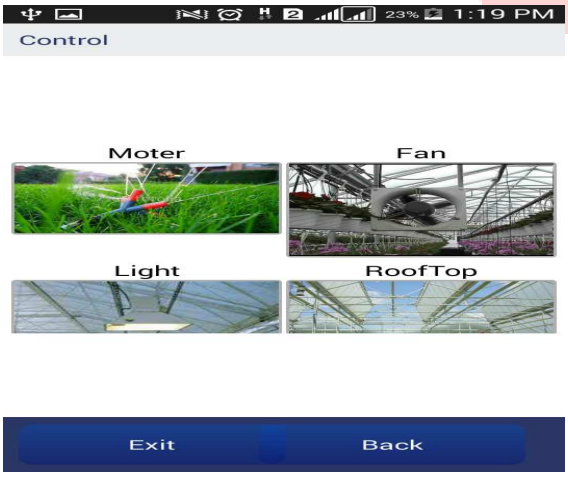


Figure 9. Controlling System

VI. ANALYSIS

Based on datasheet, sensor works stable within recommended normal range (see Figure 10). Long term exposures to conditions outside normal range, especially at humidity >80%RH. After return to normal range it will slowly return towards calibration state by itself. Prolonged exposure to extreme conditions may accelerate ageing. [5]

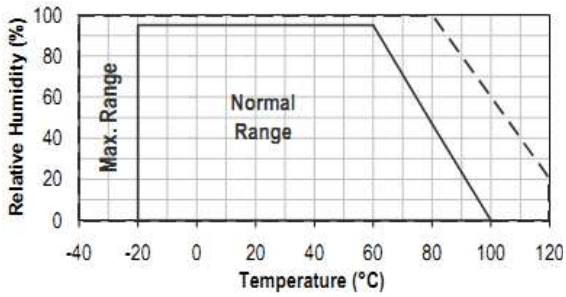


Figure 10. Operating Condition of SHT 11 Sensor [5]

In testing of work characteristic sensor, it used heat from GPU core of a computer through GPU ventilation to increase the temperature inenvironment . This test used a closed box to put the computer and sensor.

Figure 11 shows the graphic of sensor working characteristic in this system (shown in red) compared to ideal sensor characteristic (shown in blue), where the comparison between temperature and humidity is in normal range SHT 11 sensor. In the red line, the tests are from 30oC until 70oC. In conclusion, sensor works fine and fit with the value in datasheet. The system shows that the sensor works properly.

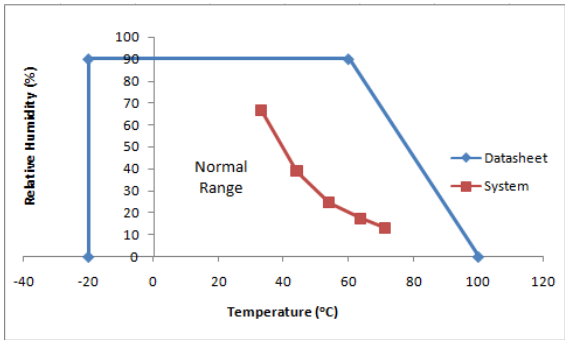


Figure 11. Comparison of Sensor WorkCharacteristic with Datasheet

VII. CONCLUSION

The system is successfully built and run in reality based on Technology Acceptance Modeling. The output for the given analog input values are visualized in android application system. The analog value given by the sensor changes it into a digital value. The android software is already working properly and appropriate with the purpose in the beginning, that is to get humidity value from green house and give input to control components in green house. After development is finished, test for sensor's work is done and device is working properly. The testing that has done shows that condition in datasheet of sensor and in system is appropriate. The test result shows in temperature 30°C to 70°C, humidity is still in normal range area. If temperature gets higher and more, relative humidity will be decrease and goes near to zero.

The system has successfully overcome quite a few shortcomings of the existing systems by reducing the power consumption, maintenance and complexity, at the same time providing a flexible and precise form of maintaining the environment.

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