IMPLEMENTATION OF GREEN HOUSE ENVIRONMENT MONITORING AND CONTROLLING SYSTEM BASED ON ANDROID MOBILE PLATFORM

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ABSTRACT

The embedded system we have proposed is real time application of greenhouse environment parameter monitoring and controlling using Android mobile through wireless network. The android mobile connected to the hardware using internet and GPRS shield. The green house environment parameters such as temperature, humidity, moisture, light are monitored and controlled as per requirement. It has three sensors at input side and it has four devices at the output side to control the environment parameters. The values of proposed green house environment parameters are represented graphically with latest value highlighted.

Keywords: Android Mobile Phone, Arduino Uno, GPRS Network, Soil Moisture Sensor, Temperature And Humidity Sensor.

I.INTRODUCTION

Facilities agriculture is one of the emerging interdisciplinary research field, which result from the modern engineering technology, automation technology and information technology mixing together. Often it is necessary to develop a control system to implement these studies. Modern technology application in greenhouse environment, can improve the production efficiency and security, reduce production cost, promote the improvement of agricultural automation degree, still can reduce the production strength, improve employee management level, thus bring huge economic benefits and social benefits. A greenhouse is a structure with different types of covering materials, like glass or plastic roof and frequently glass or plastic walls; it heats up because incoming visible solar radiation from the sun is absorbed by plants, soil. Glass is transparent to this radiation. The warmed structures and plants inside greenhouse re-radiate this energy in the infra-red, to which glass is partly opaque, and there is some heat loss due to conduction and increase in temperature inside the greenhouse. The greenhouses are filled with environment parameters like temperature, humidity, moisture and light.

II.RELATED WORK

Present system has the ability to monitor and control Greenhouse environment parameters using android mobile application through wireless communication and Personal Computer. Android mobile phone, connected using Wifi to a central server which connects via serial communication to a microcontroller and sensors[1].

The research includes Measurement and Control System of Soil Moisture of Large Greenhouse Group Based on Double CAN Bus. The system consists of host, outside CAN bus, slave unit, inside CAN bus, and sub-slave unit. By using the system combined with the agricultural expert system, not only centralized control and management, but also measurement and control in partition according to need can be achieved [2].

The new environment parameters monitoring and control system for green house based on master slave distributed system. The system consists of Personal Computer, soil moisture measurement and control module, temperature and humidity and CO2 monitoring and control module [3].

This paper introduces Development of multispan Greenhouse measure and control system. The monitoring system of greenhouse environment parameters is developed, such as temperature, humidity, carbon dioxide concentrations and soil moisture content. The system uses modular design of the master-slave structure using single chip microcomputer STC12C5A6052 [4].

Green house environment monitoring technology has continuously improved, and good greenhouse environment can improve crop quality, short the growth cycle and increase production, which have very important theoretical significance and value for study. This system use Android mobile phone as monitoring terminal, monitoring green house environment [5].

The hardware design is an embedded system which will closely monitor and control the climate parameters: humidity, temperature, soil moisture, light of a greenhouse on a regular basis [6].

The microcontroller then performs the needed actions by employing relays until the strayed-out parameter has been brought back to its optimum level. The program implements the Control Algorithms, sending control signals to the smart sensors in order to reach the desired conditions. 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 [7].

III.DESIGN OF THE SYSTEM

The designed embedded system for green house environment parameters monitoring on Android Mobile phone and controlling the environment parameters by sensors and relays that are located at different places. The monitoring and controlling is conducted through Android mobile via GPRS network.

3.1 System and structure

The structure of the system is shown in fig. This embedded system for monitoring and controlling the green house is based on measuring the parameters like temperature, humidity, moisture, light by sensor that located at different places and using microcontroller Atmega 328. This parameters monitoring and controlling using Android mobile platform. The devices can sense, compute, act and intelligently become parts of the so called Internet Of Things.

The system adopts modularization design of the embedded system. According to the structure can be divided into hardware for microcontroller interface with sensors and relays, GPRS network, Android mobile phone as receiver. Green house regional placed site controller , complete data acquisition and integration and remote manager is the greenhouse environment data monitoring and controlling , pooling all greenhouse field controller temperature, humidity, moisture, light data. Arduino uno microcontroller as hardware system, remote manager using mobile phone as terminal, GPRS is responsible for communication between greenhouse field controller and remote mobile phone.
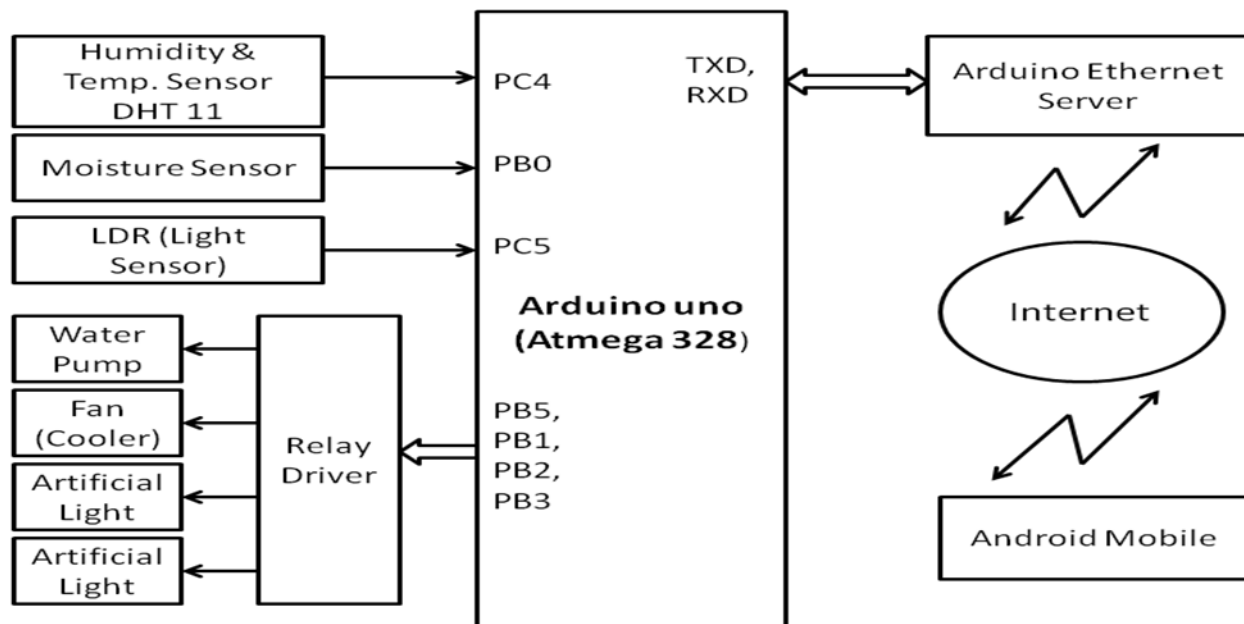

Figure 1. Block Diagram

3.2 Hardware Desription

The hardware for the monitoring and controlling of greenhouse component consists of sensor for the parameters humidity, temperature, moisture and light, Arduino UNO microcontroller, GPRS network wireless connection, motor, light bulb, LED nodule, model for greenhouse, Android mobile, power supply unit.

The environment parameter values read by the sensors periodically. The devices fan , motor, bulb are to be controlled for a set value. And this data also pass to the Android mobile using wireless network.

1) Humidity & Temperature Sensor :-

Temperature and humidity are also important effect factors and choose the new intelligent humidity & temperature Sensor DHT11 module. Different crop species have different optimum growing temperatures and humidity. Typical greenhouse temperatures vary between 10-30°C. humidity varying between 20 and 70 %RH.

2) Moisture Sensor:-

It is used to detect soil moisture. When the module cannot reach the threshold value of soil moisture , output high, when the soil humidity exceeds a set threshold value, module output low. The soil is dry or slurry or optimum level is detected by the soil moisture sensor module.

3) Light Sensor (LDR):-

A simple light intensity sensor can be constructed using light dependent resistance (LDR). By using light sensor the illumination of light is detected for optimum or dim or dark or night.

4) Relays:-

A relay is an electrical switch that opens and closes under the control of another electrical circuit. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

The relay driver circuit can be used to devices controlled are:

 i. Water Pump(simulated as motor)   ii. Cooler (simulated as fan)

 iii. Artificial Light(simulated as bulb)   iv. Heater(simulated as bulb)

5)Arduino Uno microcontroller(Atmega 328):-

High performance, Low power 8-Bit Microcontroller, temperature range:-40°C to 85°C, low power consumption at 1 MHz, 1.8V, 28-pin PDIP with Advanced RISC Architecture, Special Microcontroller features.

6)GPRS Module and Android mobile phone:-

The mobile phone of Android version 4.1.2 and above and GPRS module used communication between Microcontroller and Android mobile with GPRS Shield SIM900.

3.3 Software description

The software is designed to process the humidity, temperature, moisture and light values, monitoring and controlling the green house. The software includes various measurements of sensors and continues to display the value in application at Android, control the microcontroller from the application in Android and update to user by sending the values of sensors for monitoring the greenhouse. The Android platform application is developed as most of the phones and handy devices support Android OS. Java programming language using the Android Software Kit (JDK, SDK) has been used for the development and implementation of this system.

IV. IMPLEMENTATION OF GREENHOUSE MONITORING AND CONTROLLING SYSTEM

4.1 Hardware Implementation

The hardware part consists of :

i. Microcontroller Atmega 328   ii. Wireless communication SIM900   iii. Sensors

iv. Relay driver circuit   v. Output devices:Fan,Motor,Bulb   vi. Android Mobile phone.

The connection has made up between the Arduino microcontroller, sensor circuits, relays also connected with Bulb, fan, dc motor. The DC supply is provided to the microcontroller, DC motor, fan while AC supply is provided to the

Bulb which acts as heater or cooler, light. The 12V DC supply provided to GPRS module SIM900 and DC motor. The 5V DC supply provided to microcontroller and other hardware module.
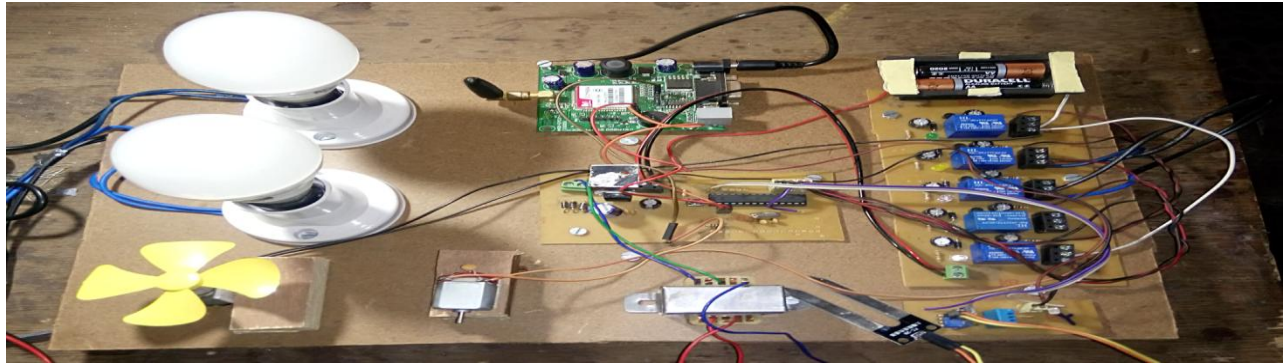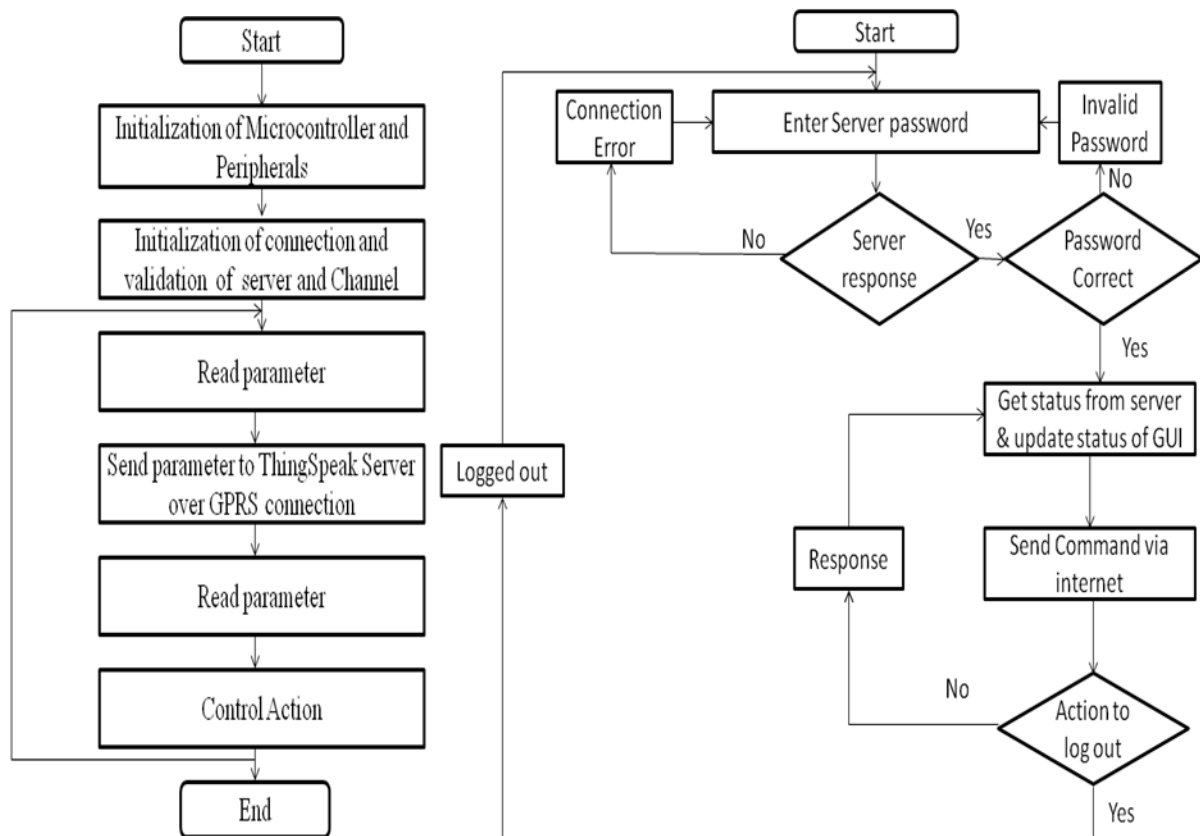

Figure 2. Hardware Implemented

4.2 Software Implementation

The first flow chart is for controlling action at the Green house environment parameters like temperature, humidity, moisture and light. And second flow chart is monitoring on Android mobile phone all the parameters of green house via GPRS network.

Figure 3. Flow chart for controlling at greenhouse and monitoring on Android mobile phone

V. RESULT ANALYSIS

The proposed system captures environmental parameter values from different devices inside the green house. The application on the Android mobile phone to monitor the values of greenhouse parameter is ThingView. This provides the channel on which data is present. All time values also monitored graphically as fallows. Sample graph for the greenhouse parameter gives the result of the proposed embedded system. The graph are from the screen of Android mobile phone.
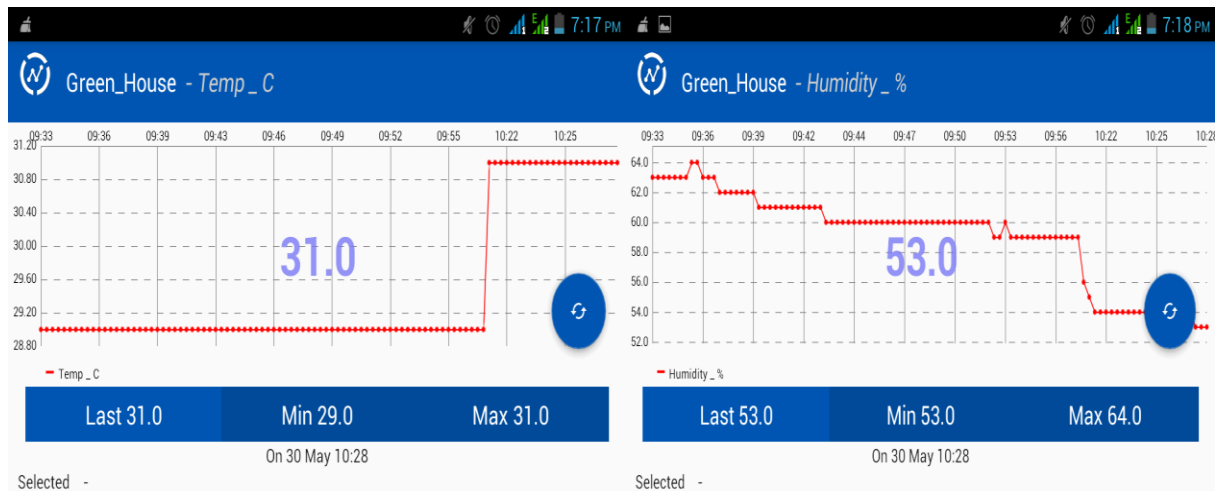
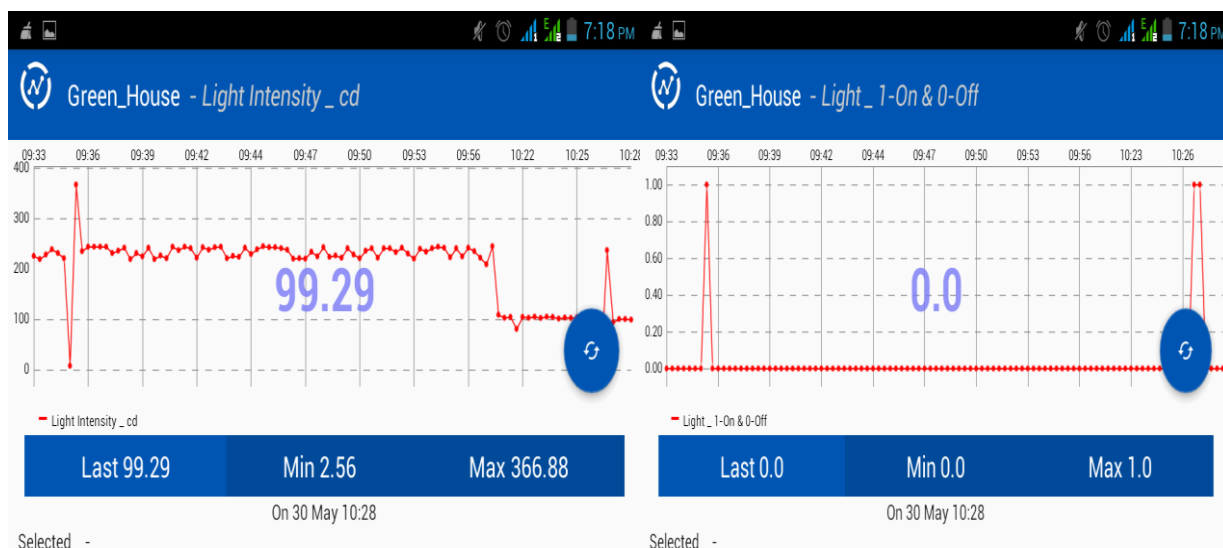**Figure 4. Graph of Temperature and Humidity**

Figure 5. Graph of Light Intensity and Light On and OFF

The data is stored on the server if required then can be export and downloaded. The file downloaded is in the feeds.csv form i.e. in the form of Microsoft Excel sheet. This data is always available online on the internet server. First go for thingspeak.com log in with user id and password. In that select the respective channel number. After that we will get the graph of the selected fields of the channel. There is also facility of exporting data of parameters read by channel. Here four fields are used which gives four graphs as shown in above figure.

Also we can get the values of current status online. And select the required point for particular values of the respective parameter. The data will be automatically stored by the internet server and can be downloaded. Some of the downloaded data screen shot are taken on mobile as shown in figure below.
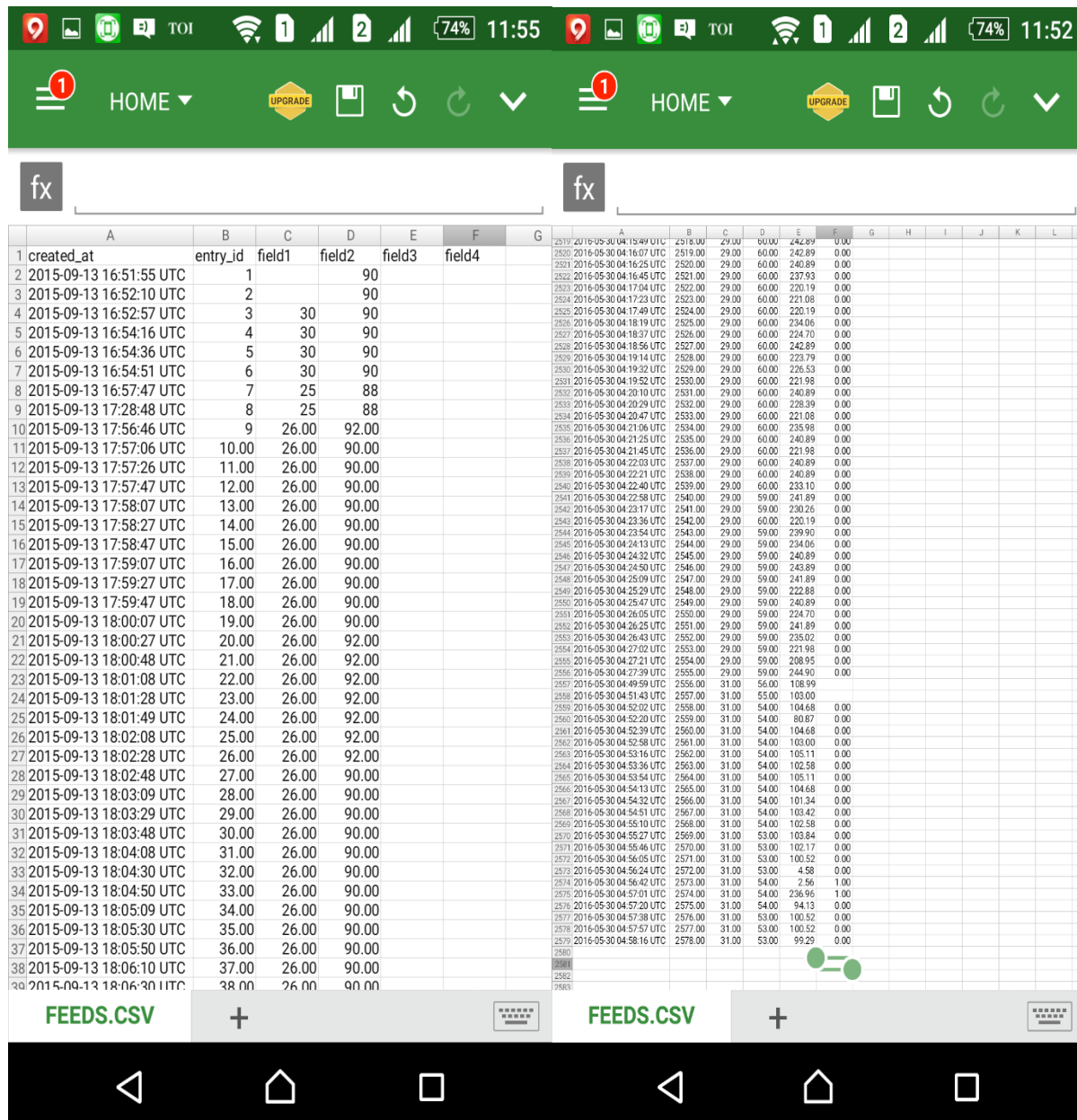
Figure 6. Screen of data stored on the server

VI.CONCLUSION

An internet based green house controlling using Arduino microcontroller and monitoring system on Arduino mobile phone depending upon user authentication is proposed and implemented. The Android based green house monitoring and controlling system communicates with the micro web-server via internet fully based web service thingspeak.com. Any android supported device can be used to install the green house, and control and monitor the

environment inside the green house. A low cost green house monitoring and controlling system has been developed which does not require a PC as all processing is handled by the microcontroller. Prospective future works include incorporating SMS and call alerts, and reducing the wiring changes for installing the proposed system in pre-existing green house by creating a wireless network within the green house environment for controlling and monitoring the green house environment

VII.ACKNOWLEDGEMENT

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