

# Implementation of Green House Environment Controlling and Monitoring System Based on Android Mobile Platform

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**Abstract:** The embedded system we have proposed is real time controlling of the greenhouse parameter and monitoring 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, and 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 greenhouse parameters. The values of proposed green house environment parameters are represented graphically with latest value highlighted. These values are displayed on thingspeak.com website.

**Keywords:** Embedded system, green house, Arduino uno, android mobile, wireless network, sensors.

## I. INTRODUCTION

Many research and projects have been done in order to improve the conditions and cultivation of crops under greenhouse. Facilities the agriculture is one of the emerging interdisciplinary researchfield, which results 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. Android Mobile Platform have recently received a lot of attention in research community because of their continuous advancement. 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. For different plants or crop in the greenhouse requires the different environment parameter condition for the developing and growing. So controlling and monitoring greenhouse parameter is needed to improve the production.

## II. DESIGN OF THE SYSTEM

The designed embedded system for controlling of greenhouse parameters through Arduino microcontroller and monitoring

using Android mobile phone. Based on measuring the greenhouse environment parameters by sensors that are located at different places. The monitoring is performed conducted through Android mobile via GPRS network.

### A. System and structure

The structure of the system is shown in fig.

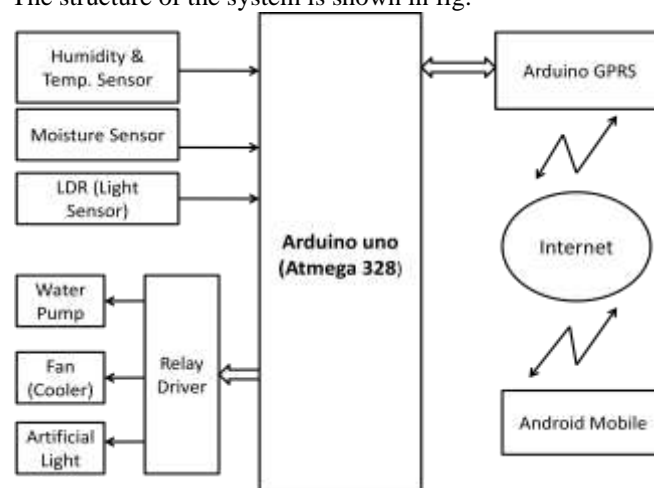


Figure 1. Block Diagram

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 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 is regional place, complete data acquisition and integration and controlling using Arduino microcontroller at that place. Remote manager can monitor the data of greenhouse parameter like temperature, humidity, moisture, light data. Arduino microcontroller as hardware system, remote manager using mobile phone as terminal, GPRS

module is responsible for communication between greenhouse field controller and remote mobile phone. The internet is used to form communication between the GPRS module and Android mobile phone. The hardware structure of module of temperature, humidity, light and moisture and Android mobile as shown in fig.

### B. Hardware Description

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

The environment parameter values read by the sensors periodically. The microcontroller is the heart of the proposed embedded system. 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 and Temperature Sensor :-

Temperature and humidity are also important effect factors in irrigation control in the greenhouse. And choose the new intelligent humidity and temperature Sensor DHT11 module. Different crop species have different optimum growing temperatures and humidity. Typical greenhouse temperatures vary between 10-40°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 LDR 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 devices to be controlled are: i. Water Pump ii. Cooler (fan) iii. Artificial Light.

#### 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 :-

SIM900,Quad-Band 850/ 900/ 1800/ 1900 MHz  
SIM application toolkit, Supply voltage range 3.4-4.5 V, Low power consumption, Operation temperature:-30 °C to +80 °C

7) **Android mobile phone:-**The mobile phone of Android version 4.1.2 of above and GPRS module used communication between Microcontroller and Android mobile.

### C. 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 Android mobile application and controlling by using Arduino microcontroller.

In the proposed system, the Android platform application is developed as most of the phones and handy devices support Android OS. The Internet On Things (IOT) platform used for communication. The channel on website thingspeak.com has been used for the development and implementation of this system. The Thingview application on Android mobile which displays the graph related to the greenhouse parameter. The channel is authenticated so the

### III. IMPLEMENTATION OF THE SYSTEM

The hardware of the proposed system consists of the following parts:

- 1)Sensors: DHT 11, moisture, LDR
- 2)Microcontroller: Atmega 328
- 3)Relays and output devices: fan, DC motor, Bulbs,
- 4)GPRS module SIM900 and 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 implementation

The greenhouse temperature and humidity read by DHT11 sensor controlling by fan and heater simulated as bulb through Arduino microcontroller. The light is detected by LDR and bulb ON/OFF action takes place according to the intensity of light required in the greenhouse. The moisture in the soil is detected by moisture sensor inserted in the soil, so if the soil is dry motor will ON and if the soil is wet the motor will OFF. All the controlling of the output devices take place by the Arduino microcontroller using relay driver. Relays are responsible for ON/OFF output controlling devices. Relays will work as switch for ON/OFF the output devices. The AC supply provided to the bulbs one is simulated for light and another simulated for heater.

The monitoring of the greenhouse parameters at remote distance on Android mobile phone. The ThingView is downloaded for mobile application on mobile.

The GPRS module SIM900 is placed in the greenhouse which will transfer all the data using Internet On Things(IOT) to the Android mobile phone. The internet used for wireless transmission and reception. The application on Android mobile to see all parameters is Thingview provided by the Thingspeak.com. In this application the channel is allocated and by using API key we can see all the values of the parameter graphically with latest value highlighted. As the representation is graphical for selected time the value can be read easily.

#### IV.RESULT ANALYSIS

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 3. Result of temperature sensor

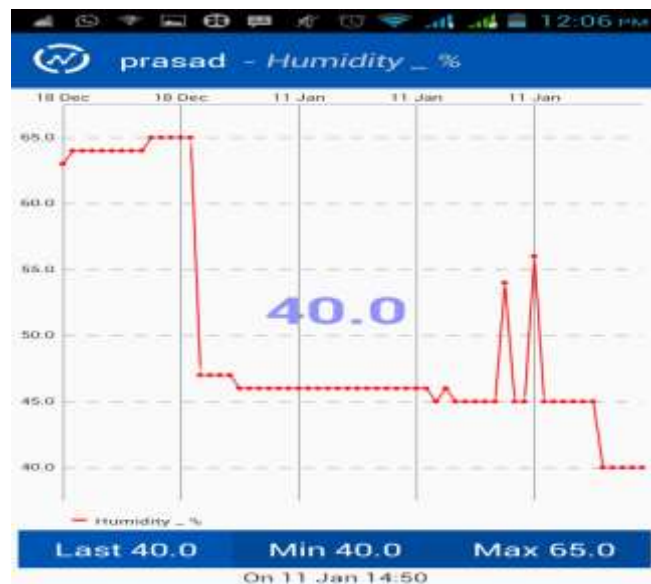


Figure 4. Result of humidity sensor

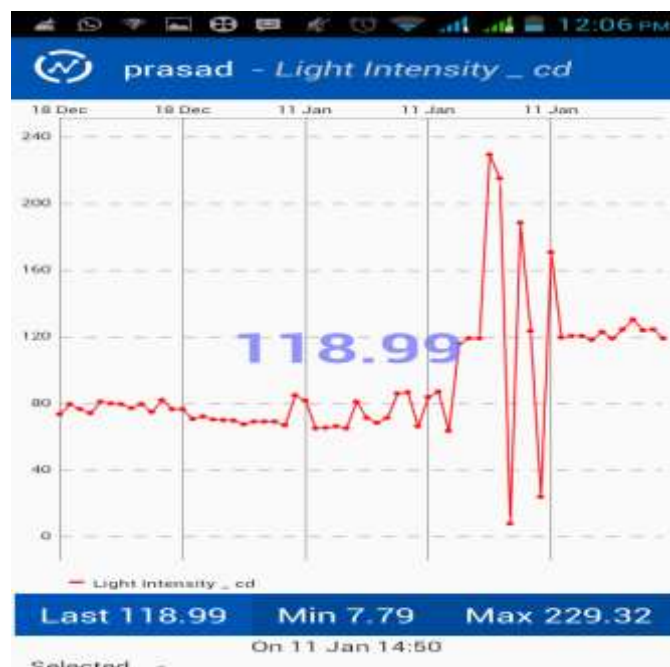


Figure 5. Result of light Intensity sensor

#### V. CONCLUSIONS

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.

A proposed system can be expanded for applications such as Healthcare or Industrial plant monitoring system where real time monitoring is required. With 4G technology it is also possible to monitor the plant Live in Video form due to increased bandwidth and faster data rates.

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