

# Greenhouse Monitoring and Controlling using Android App via Bluetooth

Prof. Rajeshree V. Ambulkar<sup>1</sup> Akash Upadhyay<sup>2</sup> Anand Kawade<sup>3</sup> Krishnakumar Kawale<sup>4</sup>  
Ahinsak Ukey<sup>5</sup>

<sup>1,2,3,4,5</sup>Priyadarshini College of Engineering, Nagpur, India

**Abstract**— Green house farmers cannot precisely detect level of level of humidity inside the green house. They only know the condition inside the greenhouse 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. 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.

**Key words:** Green House, Android App, Bluetooth

## I. INTRODUCTION

The proposed system is an embedded system which will closely monitor and control the climatic parameters of a greenhouse on a regular basis and an android application that works as an interface between the hardware and user 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.

There are three parameters that can be monitored:

- 1) Humidity.
- 2) Temperature.
- 3) Soil Moisture.

These three parameters are monitored with the help of sensors installed in the greenhouse each sensor monitors each 3 of these parameters very closely with the delay of 1sec. At the interval of 1 second these parameters are refreshed and these three parameters is controlled with the use of four mechanical devices installed in the greenhouse:

- 1) Exhaust fan.
- 2) Halogen Lights.
- 3) Water pump.
- 4) Air vents.

Each of these four devices helps maintaining the suitable environment in the greenhouse for the respected crop or plantation. The three sensors and four devices installed in the greenhouse are monitored and controlled with the help of an Android application which uses a Bluetooth connectivity to connect with the devices and sensors for monitoring and controlling purposes.

If temperature is high or low then it can be changed as per requirement by using the fan. If weather inside green house is moist, then rooftop can be opened to lower the humidity level. It can be used to open or close the rooftop based on the needs. Third, if the light intensity is above or below the threshold value, then focus light will be on. Fourth,

monitors the water level in the green house, if the green house is too dry, the water sprayer can be activated. To maintain the water level, sprayer can be deactivated. The monitoring and controlling is conducted through Android Smartphone which is based on Bluetooth Module.

## II. DESIGN OF GREENHOUSE MONITORING AND CONTROLLING VIA BLUETOOTH

The scope of the project was to produce a working prototype monitoring and control system for one small greenhouse. This system can be accessed remotely using a smartphone device that runs on an Android operating system via Bluetooth connectivity. This project could be easily expanded for use in a very large greenhouse and greenhouses with multiple plantation and crops that can be controlled and monitored simultaneously and could also make the use of Wi-Fi and internet for a wider range and to expand the coverage area. This system for monitoring and controlling the greenhouse using an Android smartphone is according to measuring the humidity and temperature by sensor that located at different places. The parameters needed in greenhouse for monitoring and controlling are conducted through Android Smartphone via Bluetooth connectivity.

The flowchart below explains the basic working principle of this project.

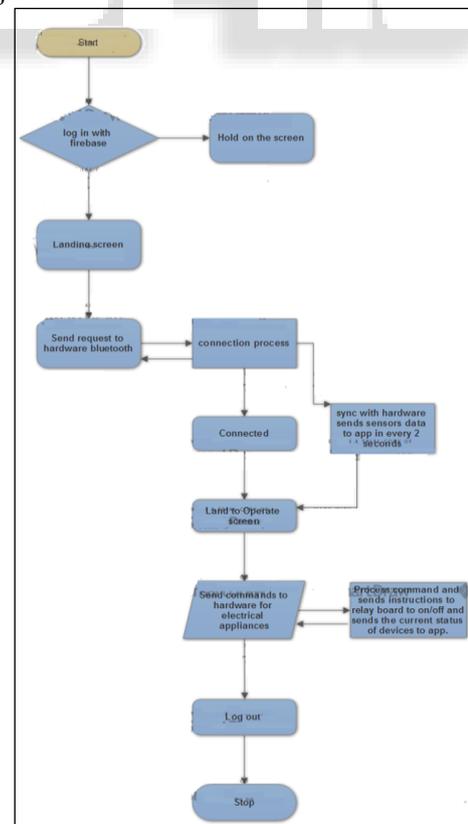


Fig. : Greenhouse monitoring and controlling Flowchart

From the figure above it can be clearly seen that the three sensors Temperature, Humidity and Soil are constantly providing data which is being monitored on an Android device with the help of Arduino UNO. And the environment of greenhouse and parameters of these three sensors can be controlled through the four devices Fan, Light, Water pump and air vents installed inside the greenhouse with an Android smartphone via Bluetooth that would enable the connection between the Arduino UNO and Android smartphone. These way we are using an Android smartphone not only to monitor the greenhouse but to also control it.

The Android application also has a web portal that will link user with the government websites for farmers and other useful farmer's websites where user can find relevant information about the crop, weather conditions, weather forecasting and other information which will help the user to increase productivity, efficiency and quality of the plantation.

The applications also has a Firebase security feature for Authentication. Firebase gives functionality like analytics databases, messaging and crash reporting. It uses the user's phone number to generate an OTP (One time password) upon which entering only the user can log into the application. These increases security and privacy so that no other user or intruder could just use an application to cause damage. Firebase is built on Google infrastructure and scales automatically, for even the largest apps.

### III. HARDWARE USED

#### A. Arduino Uno

Arduino is an open-source electronic platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language and the Arduino Software (IDE), based on Processing.

#### B. Sensors

Sensors are used for monitoring purposes and there are three sensors are used they are as followed:

##### 1) Humidity Sensor:

DHT11 sensor is used to measure temperature and humidity values, the output of this sensor is digital and it has fast response time, good accuracy, and high resolution.

##### 2) Temperature Sensor:

LM35 IC is used for measuring temperature. It is an integrated circuit sensor which is used for measuring temperature. LM35 IC senses the temperature and generates an electric signal as an output which is sent to the microcontroller Arduino UNO which then decodes the signal and generates the final output which is then shown onto the Android screen.

##### 3) Soil Sensor:

Soil sensor is used to measure moisture in the soil and to measure volumetric water content in soil.

#### C. Bluetooth

HC-06 Bluetooth was installed as a Bluetooth device. The HC-06 module is a slave only device. This means that it can connect to most phones and computers with Bluetooth but it cannot connect to other slave only devices such as keyboards and other HC-06 modules. The function of this module is to receive the data from different sensors and transmitting the data to the Master Bluetooth module so that required parameters can be monitored and controlled.

#### D. Relay

Relays are switchers that open and close circuits electromechanically or electronically. Relay is used to switch smaller currents in a control circuit and do not usually control power consuming devices except for small motors that draw low amps power. Nonetheless, relay can "control" large voltages and amperes by having amplifying effect because a small voltage applied to a relay coil can result in a large voltage being switched by the contacts.

### IV. SOFTWARE USED

#### A. Android Studio

Android Studio is a tool used for building Android application that can run on any Android based smartphone. Android Studio provides an efficient application developing framework along with Debugging, Performance tuning, flexible build system and an instant build and deploy system that helps Programmers/Developers to develop a high quality Android application.

#### B. Arduino IDE

Arduino IDE is an open source Software to write code and upload/burn it to the Arduino board. The environment is written in java and based on Processing and other open-source software. This software can be used to burn code into any Arduino board.

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