# GREEN HOUSE MONITERING AND CONTROLLING USING GSM AND ANDROID

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## Abstract:

Greenhouse monitoring is a needed one for variable climate changes. GSM technologies have been rapidly developing wireless technology during few years. Starting from industrial controls and telecommunication, it is now being applied in environmental monitoring and agriculture.

The existing system has the ability to yet lack the ability to control indoor humidity and other parameter. This paper propose modern greenhouse measurement system, the GSM-SMS and sensors are used to sense necessary green house parameters and transmit data useing wireless communication. This project is used to measure the various parameters like Temperature, Humidity, light and Soil moisture. Values of these sensors are displayed on a LCD. These parameters are sensed by sensors and sensor output is amplified and given to ADC. Microcontroller controls these parameters and keeps them at some predefined values using relay interface. These relays can be connected to Fan, sprinkle, rooftop etc. At the same time these current values of all parameters are sent through SMS using a GSM modem.

**Keywords:-** Green House, ATMEGA16, Keil Software, T110, HIH 4000, GSM, Wireless Sensor Network.

## A. INTRODUCTION

We live in a world where everything can be controlled and monitored automatically. But there are still few important fields where automation is needed like agriculture. Since farming is the primary occupation in our country. Green house forms an important part of agriculture which is use to control environmental condition for optimum production. Automation is the process for Green house controlled parameters automatically by replacing the human efforts.

In this system user communicates with the centralized unit useing SMS. This unit communicates with the system through SMS which will received by the GSM with the help of SIM card. The GSM send its data to ARM 7 which is also continuously receives the data from sensors. After this data is displayed on the LCD. After receiving the activation command from the subscriber first it checks all the conditioned gives detailed feedback to the user.

In this system we are controlling the four main parameters of green house like humidity, temperature, light intensity, soil moisture. And we have used different sensors for sensing these different parameters. Also some predetermined threshold values are set for all these parameters by the user according to the need of climatic conditions required in greenhouse. The paper purposes GSM/Bluetooth based remote controlled embedded system for green house. System gives the information about the conditions of parameter like changes in the temperature, water contained in soil, light intensity and humidity in the atmosphere and set the greenhouse time depending on the temperature humidity light intensity and soil moisture reading from sensors and type of crop. To control these parameters of green house different relays are used. Relay is an electrical switch that open and closed under the control of another electrical circuit. Relay is able to control output circuit of higher power than input circuit .For e.g. If the humidity is considered there are three kinds of activities occure. 1, monitor the humidity level in the green house. 2, if the green house is too dry the water sprayer can be on, to increase the level of humidity level. 3, if the green house is humid roof top can be opened to

current status of system is provided to the user through the GSM and Bluetooth. If the user is nearer to the field then the information is provided to the user through the Bluetooth and if the user is far away from the field then the information is provided to the user through the GSM modem. Also these current values are displayed on the LCD.

The global system for mobile communication is a standard to describe communication technologies developed by the European Telecommunication standards institute.

## B. DESIGN OF GREEN HOUSE MONITORING AND CONTROLLING SYSTEM

This system for monitoring and controlling the green house is according to measuring the humidity and temperature by sensor that located at different places. The parameters needed in green house monitor and controlled are conducted through Android Smartphone.

decrease the humidity level. Like this if there is change in temperature, then fan will turn on automatically. If there is change in light intensity then artificial lights are used to reached it too the predefined threshold value. Here we used microcontroller and keil software also. When the user is in a limited range of few meters to the designed system, bluetooth model is interfaced with the main microcontroller chip which eliminates the SMS charges. The system provides the flexibility of operation of controlling and monitoring. The

## 2.1  HARDWARE DESCRIPATION

To control the environment condition of green house to get proper condition design of hardware for green house monitoring and controlling are used. There are some parts used in hardware.

- Sensors: Temperature sensor, Soil moisture sensor, Light sensor, Humidity sensor.
- Liquid Crystal Display.
- Actuators-relay.
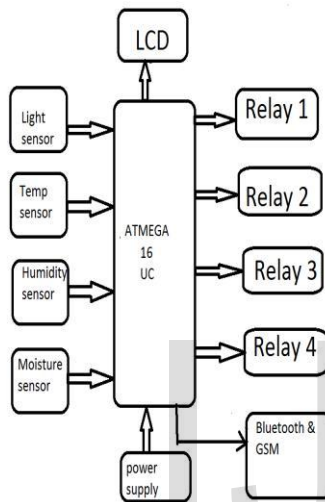- Devices controlled: Water pump, Sprayer, Cooler, Artificial light.



Figure 1.  Block diagram of the system

Block diagram of system is shown in figure 1, in this four sensors are used for four parameters which is important for green house like soil moisture, humidity, light intensity, temperature. To monitoring and controlling of green

# Greenhouse Monitoring And Controlling Using Gsm and Android Application

house component consist of sensors for parameter, microcontroller, wireless connection, LCD, model of green house, power supply unit. Sensors are placed in a soil. The output of sensors gives to the input of microcontroller .Microcontroller is used to measurement value of sensors, and gives input to the relay use to control parameters, anolog –digital converter. Microcontroller gets the analog voltage from sensors and converts into digital signal, and sends the value to the android for status of parameters.

## 1. SENSORS:

In this system consist of various sensors, like soil moisture, humidity, temperature and light intensity and sent to analog to digital converter. A Sensor is a device that detects or measures a real-world condition, such as motion, heat or light and converts it to analog or digital representation.

## 1.1. Soil Moisture Sensor:

In green house soil moisture sensor is used to determine the level of water in soil. In the circuit designed of this sensors 5v supply is, 100 ohm fixed resister,10kohm variable resister,2N222N transistor, and main two copper leads as the sensor probes are used. Hence, it gives output voltage to conductivity of the soil. Conductivity of soil depends on the moisture of soil. Variable resister is used for adjust the sensitivity of sensors which connected to transmitter. Here leads act as a sensors probe which used to test the water level in soil. If the soil is dry then no conduction path between the two copper leads the sensor circuit remains open. When water level added then leads to an increase in its conductivity forms conduction path between the two sensors probes leading to close path for the current flowing from supply to transistor through the sensor probes. Steady conduction path is established between the two leads and output voltages increases, when water level is excess.

## 1.2. Light Sensor:

Light Dependent Resistor also knows as photoconductor or photocell is used to vary according to the amount of light falling on its surface. It is very sensitive visible light range.LDR decreases as intensity of light falling on it increases. Here LDR and normal resistor are wired in series across a voltage, depending on this which tied 5v and 0v will either rise or fall with increasing light with increasing the sensor node. After this the sensor node voltage is then compared with threshold voltages for different level of light intensity.

## 1.3. Humidity Sensor:

In the green house humidity sensor HIH4000 is used for sensing the humidity. Relative humidity is a measure in percentage, at a given temperature the vapors in the air compare to the total amount of vapors. It is low power design, high accuracy with fast response time.

## 1.4. Temperature Sensor:

LM35 IC is used to sensing the temperature. It is an integrated circuit sensor that can used to determine temperature with an electrical output proportional to the temperature. It is low self heating.

## 2. ATMEGA 16 MICROCONTROLLER:

Output of sensor is given to the to take the values of status and given to relay control the parameters and display unit to display the current
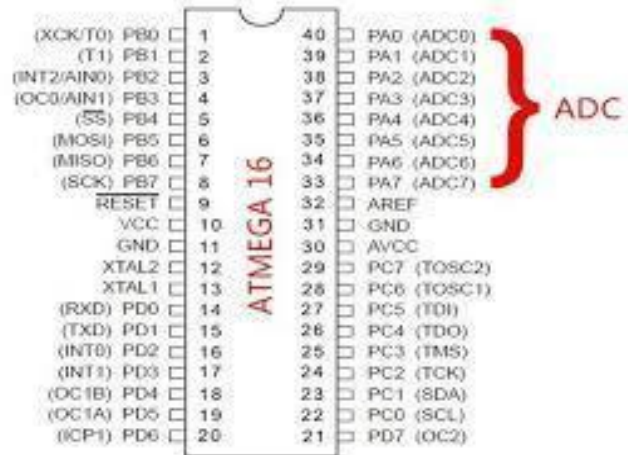
NCSC2D-2016



Figure 2 Pin diagram of ATMEGA 16

Here Arduino is process signal from these sensors, where right value obtained from result. In this sensor, LED is to show whether the sensor is on or off.

## 3. LIQUID CRYSTAL DISPLAY:

A liquid crystal display is used to display the current status of parameters .When LCD is not display is not enabled, data lines are tri state and they do not interact with the process of the microcontroller .Data can be placed at any location on the LCD.

## 4. RELAY:

For green house automation sugar cube relay used. Relays are switches, the terminology applied to switches is also applied to relays. There are four relay are placed for four parameters.

## 5. GSM

A GSM modem is a wireless modem that works with GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that first they dial-up modem sends and receives data using a fixed telephone line while a wireless modem sends and receives data from radio waves. Like a GSM mobile phone, a GSM modem requires a SIM modem requires a SIM card from a wireless carrier in order to operate. The connections between two mobiles are done by using GSM. The GSM receiving modules play as a gateway in this operation. Then this receiving module can be a GSM/GPRS modem, mobile phone or any SMS send/receiving device. After that device connects with microcontroller and computer through USB or serial cable.
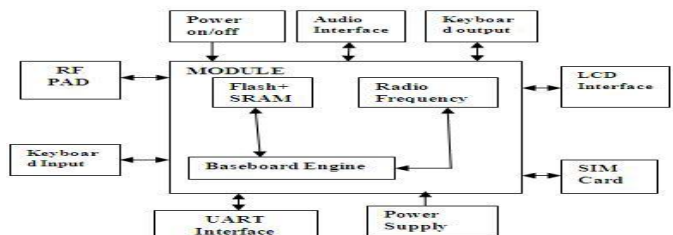
status.ATMEGHA16 is high performance ,low power microcontroller. The reading program,converter,program to controlling is one in C language .Value read from sensors, anolog to digital converter, and for controlling is done in microcontroller which use ATMEGHA16 .Architecture of ATMEGHA16 is shown in figure 2.

Figure.3 GSM module structure

Greenhouse Monitoring And Controlling Using Gsm and Android Application

## 6. ANDROID ARCHITECTURE

Based on a modified version of Linux Android is a mobile operating system. It was originally developed by a startup of the same name Android . In 2005, as part of its strategy to enter the mobile space, Google purchased Android and took over its development work.

The following Fig.2 shows the major components of the Android operating system. There are some main advantage of Android is that it offers a unified approach to application development and their applications should be able to process on number of different devices, as long as the devices are powered using Android.



Figure 4. GSM based Green House control system by using an android mobile

Further, it will help users to take advantage of the GSM networks to provide value added services. The pump switching system was tested for functionality. By using a simple code to perform on-and-off operation of the LED. By connecting it to the microcontroller board the functionality of the GSM was tested which was programmed to turn on-and-off an LED using SMS from a mobile phone. Here the major term of the present work are:- The system supports water management decision, which determines the controlling period for the process and monitoring the whole system through GSM module, The system continuously monitors the level in the water tank

### C. SOFTWARE IMPLEMENTATION

The software is implementing to operate the parameters value, monitoring and controlling the green house. This includes the various measurements of sensors, anolog to digital converters, send parameters certain value from sensors to microcontroller. To convert anolog to digital the microcontroller arduino UNO is used, and send the value of sensor through serial communication to system, to control the relay and updating the user.

The software implementation, shown in figure which flow of software in monitoring and controlling the green house. C program for arduino to measure parameters use necessary in green house send the value to system then to android using communication .After that next receive input from android phone then control module. Modules for application in android, C program are writing at last .
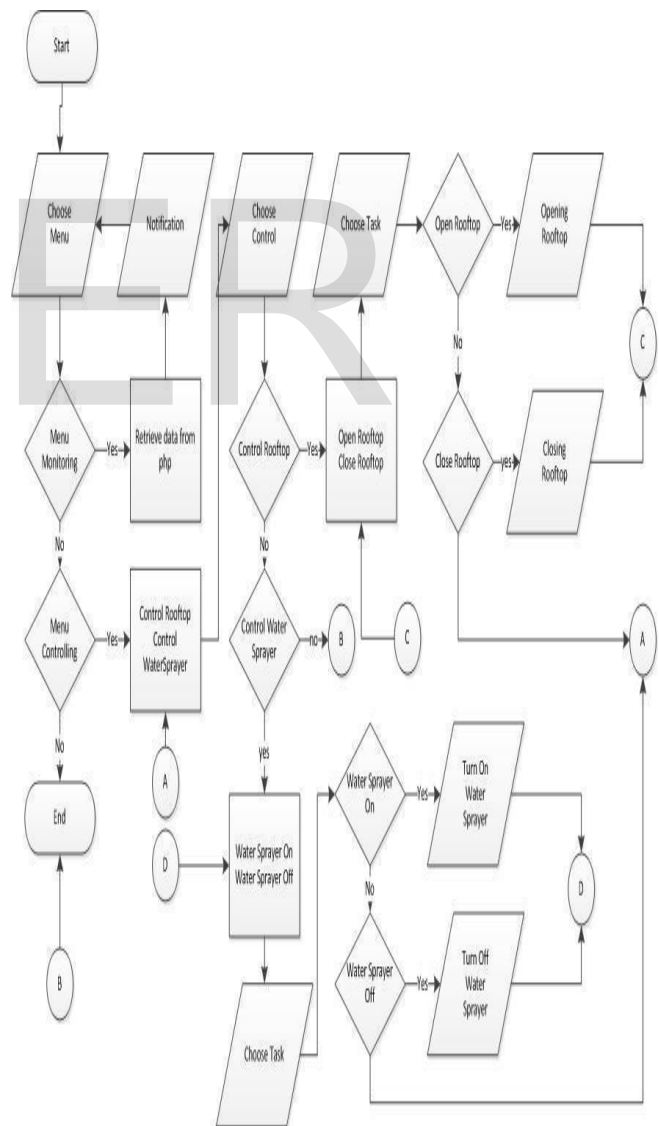
and provide required amount of water required to the plant or tree (crop), The system checks the temperature, humidity, Light Intensity, Soil Moisture and dew point so as to forecast the weather condition, Lower cost and less power consumption using sensors for remote monitoring and controlling devices which are used to controlled by SMS using a GSM using android.

Figure 5. Software Flowchart Design

# Greenhouse Monitoring And Controlling Using Gsm and Android Application

### Android Software development kit

Android software development is the process by which for the Android operating system new applications are generated. Applications are usually developed in the Java programming using the Android Software Development Kit. There the Android software development kit (SDK) includes a comprehensive set of development operator. After that these include a debugger, libraries, a handset emulator based on QEMU, documentation, tutorials and code. The SDK supports older versions of the Android platform in case developers wish to target applications at older devices. Development tools are downloadable components, so after one has downloaded the latest version and platform, tools and older platforms can also be downloaded for compatibility testing. Android applications are packed in apk format and stored under app or data folder on the Android OS (the folder is accessible only to the root user for security reasons).

## D. OUTPUT

The various parameters like Temperature, Humidity, Soil Moisture and Light are measure and controlled. Values of these sensors are displayed on a LCD. These parameters are sensed by respective sensors and after that sensor output are amplified and gives to ADC. Last microcontroller controls this parameter and keeps them at some predefined levels using relay interface. These relay can be connected to fan, rooftop and sprinkle. At the same time these predefined values of all parameters are sent by SMS using a GSM modem. In this system, parameters like Temperature, Humidity, Light and Soil Moisture are monitor and controlled. For Temperature the fan is used to decreases the temperature when temperature is above the predefined value, similarly for Humidity, when it is less than predefined value then sprayer is ON and when it is more than predefined value then Roof Top is open to reduce the Humidity in atmosphere.

For Light Intensity artificial light or bulb is used to contorted the light intensity. For Soil Moisture, the sprinkler is used to moisture the soil which is required for the crop.

## E. RESULT

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

The proposed system is an embedded system which will closely monitor and control the micro parameters which is required for green house.

Further improvements will be made as less expensive and more reliable sensors are developed for use in agriculture production.

## F. CONLUSION

In designing the microcontroller based system for monitor and control of four parameters which is needed for green house i.e. temperature, humidity, soil moisture and light intensity has been followed. By continuously monitoring the status of parameters, we can control these green house parameters and reduce wastage using GSM with sensors it can be controlled by just sending a message from our mobile. The measurement which obtained result has shown that the system is performance is reliable and accurate.

The android software is appropriate with the purpose in the starting, that is to get parameters value from green hose and input to control components in green house. After test for sensor's work is done and device properly worked.

Here automatic green house predefined sensors design could help to improve productivity of plants. We are introducing the facility that provides remote control to user.

Then in this system using both GSM and Bluetooth technology which reduce the cost of network usage to a extent by using Bluetooth when in the range of few meters with the devices. In this system is scalable and allows number of different devices to be added with no major changes. It can be conclude that the system, which are software and hardware is work properly and accurate.

Greenhouse Monitoring And Controlling Using Gsm and Android Application

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