

# **Advance in GSM Based Home Automation Saving Energy in Home by Using Android Phone**

By

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## **ABSTRACT**

**In this paper, it is described how to control home appliances and save energy in home. The GSM network has been made for using of control system. This system acts as embedded system, which can be used for controlling the appliances. Advantage of using GSM SIM is that the owner can control the home appliances by android phone from any place in the world. This system allows the owner to control and receive a feedback status of the home equipments by sending instructions in form of SMS. For saving energy in home, all home appliances have been connected through microcontroller with GSM SIM by which if any appliances is left Turned-ON then GSM SIM will send SMS to owner and owner can Turn-OFF the appliance from any place and GSM SIM send feedback to owner that home appliance is Turned-OFF, by which owner can save energy. Thus by using GSM technology, this provides the wireless access to the device to be controlled.**

## **Keywords**

Global System for Mobile (GSM), home automation, Android phone, Short Message Service (SMS), Subscriber Identification Module (SIM), Microcontroller, Arduino Software and Proteus software.

## **1. INTRODUCTION**

The wireless communication is increasing day by day. This is motivate us to use cell phones to remotely control household appliances and to receive a feedback SMS about the security and safety of the house. In this paper we describe remote control appliances by sending SMS from a mobile phone. The controller is very important at places where we have to control the ON and OFF switching of the devices as no wired connection is required between the switch and the home appliances as it can be controlled from any place. The microcontroller would then control the home appliances based on the information given to it and send a feedback during turning- on the load. The proposed solution is easy to use, simple, and robust and can be controlled through android mobile phones. In this paper we describe a simple remote home appliance control by using GSM SIM with SMS.

## **2. SYSTEM DESCRIPTION**

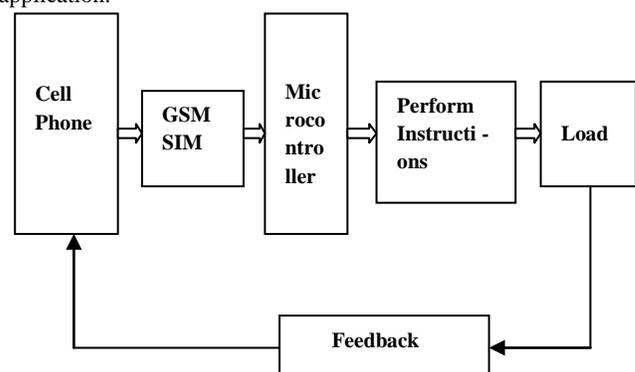
The system has two parts, namely hardware and software. The hardware architecture consists of a stand-alone embedded system that is based on 8-bit microcontroller (ATMEGA328P-PU), a GSM hand set with GSM SIM (SIM900), relays, regulator and transistors. The software part consists of programming in Arduino and an android based application run on android phone. The GSMSIM provides the communication media between the home owner and the system by means of SMS. The SMS consists of commands in written form to be executed. The format of the message is predefined. The SMS message is sent to the GSM SIM via the GSM networks as a text message with a definite predefined format. Once the GSM SIM receives the message, the commands sent will be extracted and executed by the microcontroller and turn the appliances ON/OFF accordingly via the switching module. For the on load like fan, AC, CFL etc. microcontroller will send a feedback message through the GSM SIM to the android phone. The detailed description about the hardware and software is as follows:

### **2.1 Hardware Used**

The following hardware is used in the project which is explained as follows:

#### *2.1.1 Cell Phone*

Cellular phone containing an SIM card which has a specific number through which communication takes place. The mode of communication is wireless and mechanism works on the GSM technology. Here, the user transmits instructions to the system to control the appliances in the form of SMS through an android application.



**Fig.1 System block diagram**

**2.1.2 GSM SIM**

GSM SIM is built with dual band GSM engine-900, works in range 900-1800 mhz. GSM SIM received SMS from cell phone and transmit that SMS to microcontroller.

**2.1.3 Microcontroller ATMEGA328**

Microcontroller is a heart of GSM module. It is a small chip on a single integrated circuit containing a processor core, memory and programmable input output peripherals. Microcontroller is encoded and decoded to data.

**2.1.4 Perform required instruction**

Here relays, regulator, oscillator, crystal and diodes are installed by which these devices can turn-on and turn-off to light, fan and ac. According to given command by microcontroller.

**2.1.5 Load**

Here any type of load can be connected and be controlled. In this project connected load are light fan and AC.

**2.1.6 Feedback**

It is an intermediate part of system. By which feedback, makes to system more reliable and more efficient. Feedback provide loop between GSM SIM and android phone.

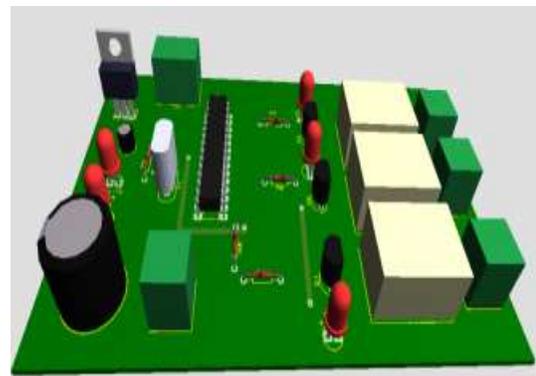
**3. DESIGNING OF PCB**

In this project, the circuit has been designed by Proteus software. In Proteus software first select a microcontroller pin box. Now first define receiving pins and transmitting pins. In this project we select three relay for three load (Light, Fan, AC). Here capacitors are used for converting AC to DC by which electronics devices can operate smoothly. Cristal oscillator used for providing clock pulses to microcontroller. Transistors are used for turning on and turning off to loads. Resistors are connected series with electronic equipments by which electronics devices would be safe from high voltage and current.



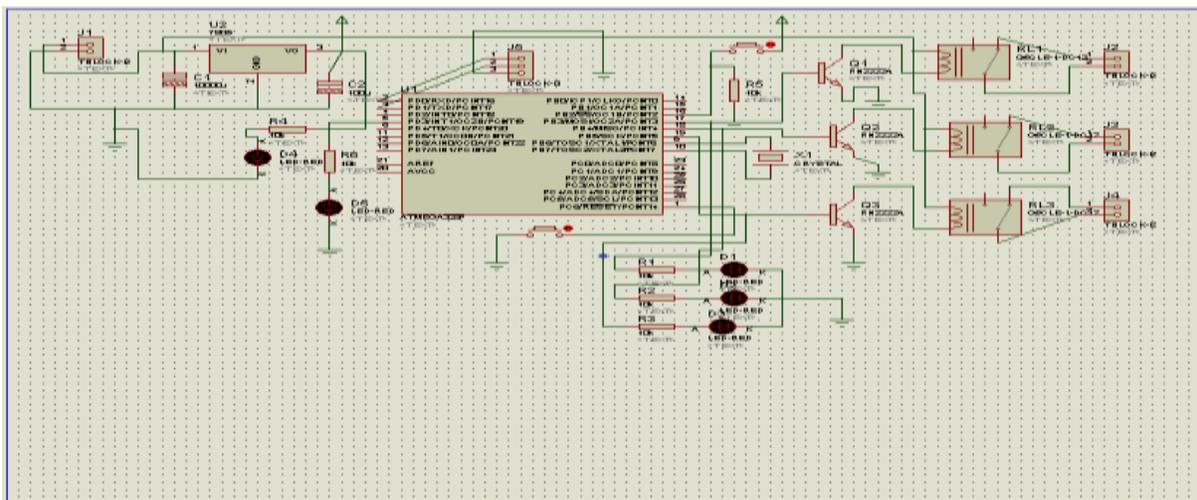
**Fig.2 Proteus software page**

Fig.2 shows the page of Proteus software in which loads, electronics equipments are programmed by which PCB layout can be designed.



**Fig.3 3D Image of PCB Layout**

First the PCB is designed by Proteus software. Then PCB is etched and continuity is checked by multi-meter. Then soldering of diode, transistors, resistors, capacitors, regulator and microcontroller are done on PCB.

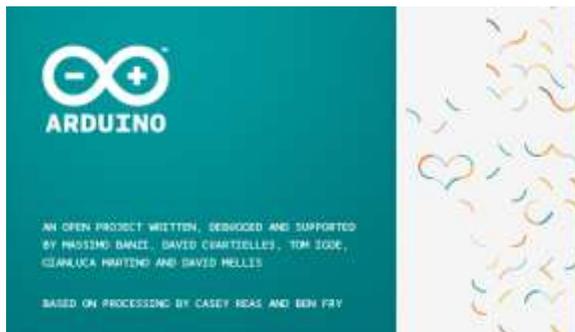


**Fig.4 Snapshot of Circuit Diagram of Bread Board**

#### **4. SOFTWARE USED**

##### **ARDUINO:**

The open- source Arduino environment allows user to write code and upload it to the I/O board. The environment is written in Java. The Arduino development environment contains a text editor for writing code, message area, text console, and toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. Arduino programs are written in C or C++.Arduino functions are capable of compiling and uploading programs to the board with a single click. Software written using Arduino is called sketches. These sketches are written in the text editor. Sketches are saved with the file extension '.ino'. It has features for cutting/pasting and searching/replacing text. The message area gives feedback while saving and exporting and also display errors. The console display text output by the Arduino environment including complete error messages and other information. The bottom right-hand corner of the window displays the current board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor. As the Arduino platform uses ATMEGA328 microcontroller ATMEGA'S development environment, may also be use to develop software for the Arduino.



**Fig. 5 ARDUINO Software logo**



**Fig.6 Snapshot of the project**

#### **5. FUNCTION OF ADVANCE IN GSM BASED HOME AUTOMATION**

The working of the project is dividing into two parts which are home automation and home security. For the home automation we have designed an android application through which we can control the home appliances. This application is used to send a SMS to GSM SIM used in our project. It will read the SMS and send to the microcontroller. The microcontroller will extract the message from the received SMS and control the relay module. The relay will turn on or turn-off the appliances as ordered by the owner. The advantage of project is if owner has an android phone and download apps of SMS automation then owner free of cost can send and received SMS.

For the home security system, we can use sensors which will check the distance between the two points. If some intruder passes between the two points then the distance between two points would decrease. The feedback of the distance is send back to the microcontroller. The microcontroller would send a feedback SMS to the owner through GSM SIM and will also ring an alarm. The advantage in using security system is that the certain range at which the alarm rings and SMS is sent to owner.

#### **6. FUTURE IMPROVEMENTS**

The future statement of the project will be very great, considering the amount of resources, time and money. All these considered amount will be save, which can be used for any other work.The future of this system will be small box combining the and GSM SIM. The hardware will be self-contained and cannot be prone to electric failure. This appliance will have its own encapsulated UPS and charging system.

#### **7. CONCLUSION**

In this paper we discussed our project on advance in GSM based home automation saving energy in home by android phone which is very useful and also very economical. It provides simple and easy way to control the household appliances with a single SMS or by using an android application. The main advantage is that even though the controlling can be done by the android application which has safety features but in absences of an android cell phone one can control it by sending a normal SMS to the GSM SIM. Also the safety and security system can be easily installed in the house and used. It informs the owner in case of turning on the loads even when the owner is not at the home.

#### **8. ACKNOWLEDGEMENT**

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