# GSM Based Home Automation System

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*Abstract:* The study and implementation of home automation technology using Global System for Mobile Communication (GSM) to control home appliances such as lighting loads, air conditional systems, and security systems via Short Message Service (SMS) is presented in this paper. The proposed research work is focused on functionality of the GSM protocol, which allows the user to control the target system away from residence using the frequency bandwidths. The concept of serial communication and ATmega-commands has been applied towards development of the smart GSM-based home automation system. Home owners will be able to receive feedback status of any home appliances under control whether switched on or off remotely from their mobile phones. Arduino with the integration of GSM module provides the smart automated house system. This system is intended to help and give help to satisfy the needs of the elderly and the handicapped at houses. Additionally, the idea of home automation system will improve the normal living status at houses. The fundamental control system uses GSM wireless communication for controlling home appliances. The system design does not remove the existing electrical switches and gives a safer control over the switches with low voltage usage technique. This system is designed to control electrical devices throughout the house with ease of installing it, ease of use and cost effective design and implement.

*Keywords:* Home Automation, Arduino, GSM, Automatic switching, SMS.

## 1.  INTRODUCTION

Home automation system is getting popular and widely used in a lot of houses worldwide. It has tons of advantages to users even more to the handicapped and/or elderly users in which it will make it easier for them to control their home appliances. Home automation systems can be labeled to two medium in which how it is connected and they are either wired or wirelessly connected. The main difference between these two kinds is that home appliances are linked wirelessly a central controller if it a wireless home automation system. On the other hand, the appliances are connected to a central controller if the medium use wired communication method. Wireless system had been introduced in order to dispose of wired communication among home appliances. Arduino based, Bluetooth based home automation will be applied.

Convenience and ease of using home appliances is what home automation is offering. Home automation offers a futuristic way of life in which an individual gets to control his entire house using a smart phone, from turning on a TV to locking/unlocking doors; it also offers an efficient use of energy.But to get or acquire such system installed will cost a lot of money and that is the major reason of why home automation has not received much demand and attention, adding to that also the complexity of installing it and configuring it. Thus it is essential to make it cost effective and easy to configure, if this is granted to people then they will be willing to acquire it in their homes, offices and schools. In other words, a system modification for the home automation is required in order to lower the price of applying it to houses. Also home automation offers ease of mind and body to handicapped and/or elders in their houses by just one click to do what they want as stated above.

## 2.  SYSTEM DESCRIPTION

The system consists of two parts namely hardware and software. The hardware consists of an embedded system consisting of a GSM module(SIM900A), arduino uno(ATmega 328 microcontroller), relays and loads. The software consists of programming in arduino system and software for pcb designing .The GSM SIM 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 SIMvia 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.

**Table: Components & their specifications**

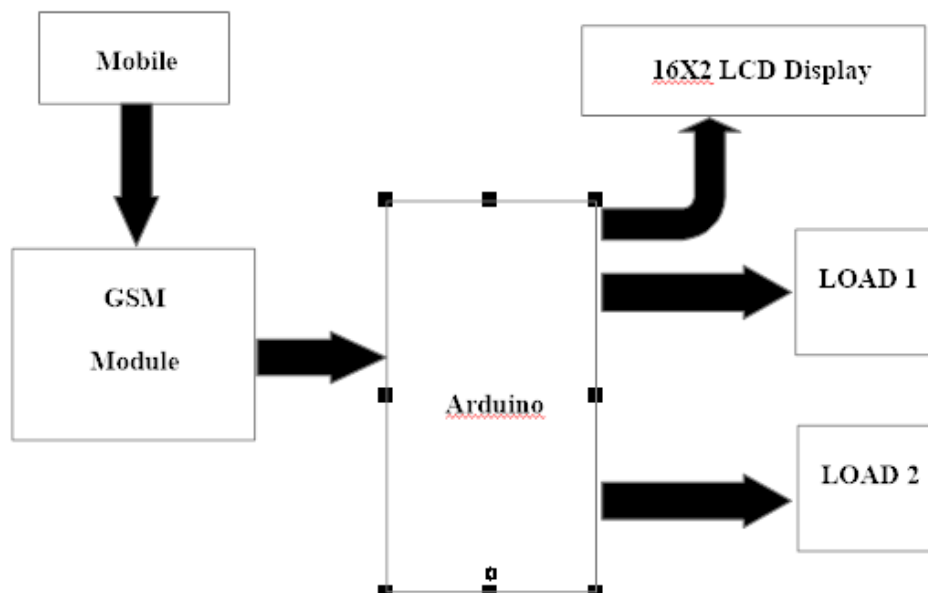| S.No. | Equipment | Specifications |
|---|---|---|
| 1. | Arduino Uno | 5V DC,32KB,16MHz |
| 2. | LCD display | 16x2, 12V DC |
| 3. | GSM Module | 900MHz, 12V, 9600 bps |
| 4. | Relay | GH-1C-6L, 6A, 250 V AC |
| 5. | Transformer | 12-0-12 |
| 6. | Voltage Regulator | 7805 IC |
| 7. | Transistors | NPN, 300MHz |



**Fig 2.1: Block Diagram of GSM based home automation**

**2.1 Hardware Used**

**2.1.1  Cell  phone:** Any cellphone  with a SIM card can be used through which communication takes place. The communication takes place through wireless medium through GSM technology.

**2.1.2 GSM module:** GSM module acts as a connection between user and system. SIM900A is used. It works at frequency of 900-1800 MHz. GSM module receives messages from cellphone and transmits them to the microcontroller.

**2.1.3 ATmega328:** ATmega328 is a microcontroller. A microcontroller is the most important component of this system, because it controls the functioning of the home automation system. Its coding is done in Arduino.

**2.1.4 Relays:** Relays are used for switching of  loads. After receiving particular command through the phone, microcontroller commands the relay to switch accordingly. When more relays are used, transistors are used in parallel with relays so that switching can be done at low currents.

**2.2 Software Used**

**2.2.1 Proteus:** Proteus is a virtual system modelling and circuit simulation application. All the circuits are simulated in proteus before actually making them.

**2.2.2 EAGLE:**  EAGLE stands for Easily Applicable Graphical Layout Editor. EAGLE is a scriptable electronic design automation application with schematic capture, printed circuit board layout and computer aided manufacturing features.

**2.2.3Arduino IDE:** The open source arduino software makes it easy to write code and upload it to the microcontroller.

**2.3 Working**

The working of this project is comparatively easy, a message is sent from the cell phone which has a fixed format. The GSM module receives the message and then sends it to the microcontroller. The microcontroller which already has a code saved in it, reads and interpret the message and accordingly sends a signal to relays to either open or close as per the command received in the text message.
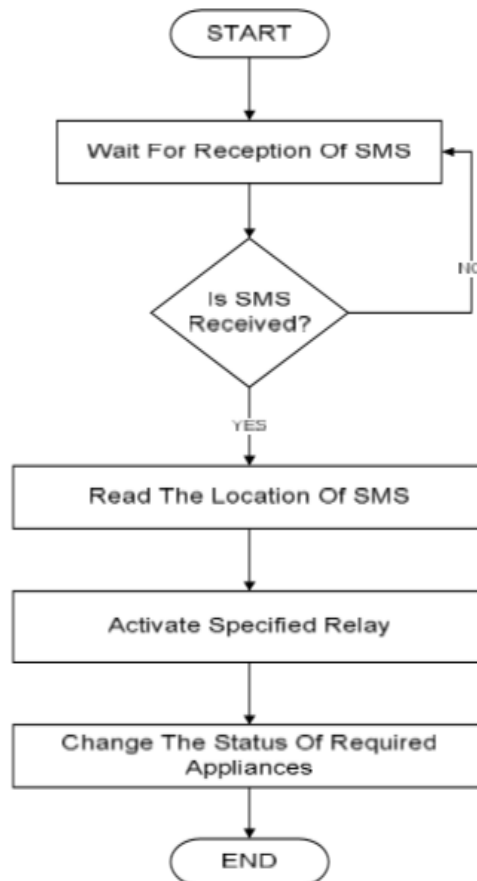
**2.3.1  Interfacing between GSM and Controlling devices**



Fig 2.2: Flowchart of Interfacing between GSM and Controlling devices

## 3.    FUTURE ASPECTS

Home automation is not the limit of this, automation currently has the vastest scope in research and development. The future of home automation will very much ride the digital age and develop along with the computer and networking systems in the years to come. Automation has applications in many fields including home automation, security systems, defence, power system, etc. It can be said that the future of all the technological advancements is connected directly or indirectly with automation.

## 4.    RESULT

Experimental result of system which is proposed in this paper is as below. Figure 4.1 shows hardware implementation of the project. Whenever a message is sent, GSM module receives the message and sends it to the Arduino. The Arduino gives command to the relays. According to the command, if relay 1 is turned ON, it leads to turning ON of Load 1 and if relay 2 is turned ON, it leads to turning ON of Load 2.
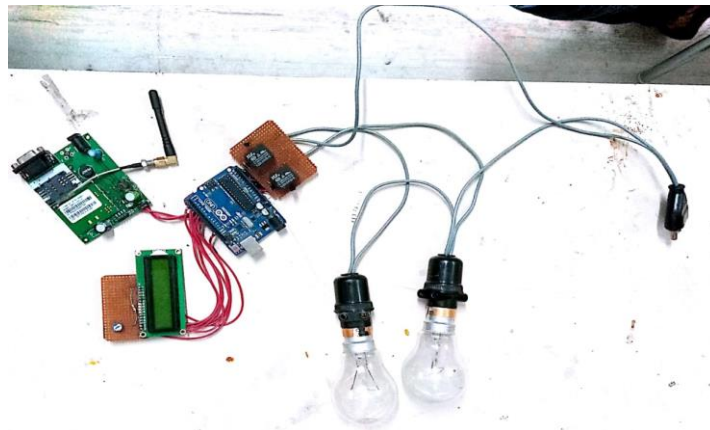
**Fig 4.1: Hardware implementation**

## 5. CONCLUSION

It can be concluded that HOME AUTOMATION SYSTEM USING ARDUINO was a success. This system consists of an Arduino-Uno board, a GSM Module, a GSM based phone, power sockets and home appliances. It is user friendly and it is cost effective.

Also it can be concluded that the objectives of this project has been successfully met and they are as follows:

- Constructed a wireless home automation system controlled by a GSM based phone.

- Designed and implemented cost effective home automation system yet an efficient one.

- Designed a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped.

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