

GSM based Home Automation System

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Abstract—Nowadays, every system is automated in order to face new challenges in the present day situation. Automated systems have less manual operations, so that the flexibility, reliabilities are high and accurate. Hence every field prefers automated control systems. Especially in the field of electronics automated systems are doing better performance. Probably the most useful thing to know about the global system for mobile communication is that it is an international standard. If you travel in parts of the world, GSM is the only type of cellular service available. Instead of analog services, GSM was developed as a digital system using TDMA technology. The application of this system comes in handy when people who forget to do simple things such as turn ON or OFF devices at their home or in their office, they can now do so without their presence by making a call from their mobile phone. In this paper, the development, I believe, will ultimately save a lot of come back for simple things such as to turn OFF switches at their home or at their office once they set out for their respective work.

Index Terms— Home Automation, Global System for Mobile Communication (GSM), Short Message Service (SMS), Microcontroller, RS232 interface, AT89C51.

I. INTRODUCTION

A. Brief History

Early home automation began with labour-saving machines. Self-contained electric or gas powered home appliances became viable in the 1900s with the introduction of electric power distribution and led to the introduction of washing machines (1904), water heaters (1889), refrigerators, sewing machines, dishwashers, and clothes dryers.

In 1975, the first general purpose home automation network technology, X10, was developed. It is a communication protocol for electronic devices. It primarily uses electric power transmission wiring for signalling and control, where the signals involve brief radio frequency bursts of digital data, and remains the most widely available. By 1978, X10 products included a 16 channel command console, a lamp module, and an appliance module. Soon after came the wall switch module and the first X10 timer.

According to Li et al. (2016) there are three generations of home automation

1. First generation: wireless technology with proxy server, e.g. ZigBee automation;
2. Second generation: artificial intelligence controls electrical devices, e.g. Amazon Echo;
3. Third generation: robot buddy who interacts with humans, e.g. Robot Rovie, Roomba.

B. Need for the Work

Technology has advanced so much in the last decade or two that it has made life more efficient and comfortable.

The comfort of being able to take control of devices from one particular location has become imperative as it saves a lot of time and effort. Therefore, there arises a need to do so in a systematic manner which we have tried to implement with our system. The system we have proposed is an extended approach to automating a control system.

With the advancement and breakthroughs in technology over the years, the lives of people have become more complicated and thus they have become busier than before. With the adoption of our system, we can gain control over certain things that required constant attention. The application of our system comes in handy when people who forget to do simple things such as turn ON or OFF devices at their home or in their office, they can now do so without their presence by making a call from their mobile phone. This development, I believe, will ultimately save a lot of come back for simple things such as to turn OFF switches at their home or at their office once they set out for their respective work.

C. Aims and Objectives

1. The goal of the project is to develop a system, which uses Mobile technology that keeps control of the various units of the automobiles, which executes with respect to the signal sent by the mobile.
2. For utilization of appliances the new concept has been thought to manage them remotely by using GSM, which enables the user to remotely control switching of domestic appliances. Just by dialing keypad of remote telephone, from where you are calling you can perform ON / OFF operation of the appliances.
3. The objective of this project is to develop a device that can automatically regulate power surge in the home and allow its users to remotely control and monitor multiple home appliances using a cellular phone. This system is a powerful and flexible tool that will offer this service at any time, and from anywhere with the constraints of the technologies being applied. Possible target appliances include (but are not limited to) climate control system, security systems, lights; anything with an electrical interface. The proposed approach for designing this system is to implement a microcontroller-based control module that receives its instructions and command from a cellular phone over the GSM network.

II. SCOPE OF THE WORK

The project "GSM BASED HOME CONTROL" is intended to automate the certain functions of home appliances. Smart home technologies have been around for about 30 years, mostly relying on some proprietary technologies and applications. With the recent expansion of communication networks, smart home applications can be further enhanced with new dimension of capabilities that were not available before. In particular, wireless access technologies will soon enable exotic and economically feasible applications. The device is much helpful in controlling home. It reduces the wastage of valuable time and our daily life become easier and flexible. The future implications of the project are very great considering the amount of time and resources it saves.

The project we have undertaken can be used as a reference or as a base for realizing a scheme to be implemented in other projects of greater level such as weather forecasting, temperature updates, device synchronization, etc. The project itself can be modified to achieve a complete Home Automation system which will then create a platform for the user to interface between himself and the household.

TABLE I. COMPONENTS AND THEIR SPECIFICATIONS

S.No.	Equipment	Specifications
1.	Microcontroller (AT89S52)	4.0V–5.5V, 256K RAM, 8-bit uP, 8Kbytes memory
2.	8051 Developer Board	4.0V–5.5V, 128K RAM
3.	SIM 800A GSM Module	3.4 ~ 4.4V, 900/1800MHz, 85.6kbps
4.	Relays	50/60Hz, 10A , 120VAC
5.	MAX232 IC	5V, 8mA
6.	Transformer	230V, 50Hz
7.	Liquid Crystal Display	16X2, 12V DC

III. EXPERIMENTAL MODEL

The primary function of a power supply is to supply electrical energy to an electrical load and also sometimes convert it from one form of electrical energy to other. The supply used here is fit/built into large devices like desktop computers or other consumer electronic devices along with their load. Crystal Oscillator is used in the circuit for generating clock pulses for the microcontroller. The 5 volt voltage regulator is used to provide a regulated 5 V supply to the whole circuit.

The main principle of this circuit is to interface a GSM modem with the microcontroller. The microcontroller used is AT89C51 microcontroller. To communicate with GSM modem, AT commands are required. Microcontroller sends these commands to the GSM modem, which is then activated to perform the required operation.

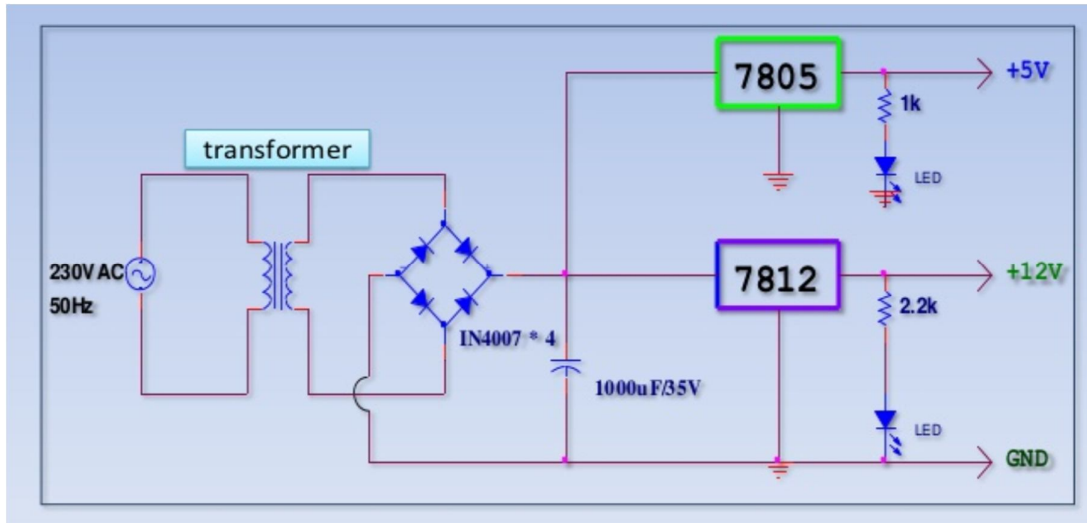


Figure 1. Circuit Diagram

IV. WORKING MECHANISM/PROCEDURE

The circuit of interfacing GSM to AT89C51 microcontroller mainly consists of GSM modem and 8051 family microcontroller. GSM has RS232 interface for serial communication. In between the GSM module and the microcontroller MAX232 IC is connected. MAX232 IC is used for converting the logic levels. RS232 logic levels of GSM are converted to the TTL logic levels of the microcontroller using this MAX232 IC. MAX232 IC has 16 pins. This is a dual driver IC as it has two transmitters and receivers. Interfacing of GSM to AT89C51 microcontroller uses only one transmitter and receiver.

Transmit unit at the most left side is mobile phone which send information through shot messaging service i.e. SMS to GSM modem. GSM modem receives information and transfer this information to microcontroller through serial communication. Serial communication is type of communication in which data transfer bit by bit to microcontroller. Unlike, parallel communication which transfer all bits at a time. Microcontroller receives data and makes decision according to program written inside it and after making decisions microcontroller energize or de-energize relays through relay driver circuits. In other words, it turns on or turns off home devices. This is how home devices control system works. The idea behind this project is to use the existing GSM infrastructure. So, all the operations involve the gsm system also. As we send any SMS, it goes through the gsm system. Any sent SMS can be received if we use a SIM card and gsm module. To operate any gsm modem, we have to use the AT commands to operate them. For example, if any SMS arrives the gsm modem sends the serial data in ASCII format. We can read these data if we connect the modem with the serial port of the microcontroller at the baud rate of 9600. As the microcontroller comes to know, that a SMS has been arrived, it can sent a proper AT command to read the syns. The reading of syns returns the mobile no of sender, the time and much more information. We have to select the syns part of the message. The starting string of the SMS is used as the password. As the password is matched, then the SMS arrival is assumed to be valid by the microcontroller otherwise, it ignores the SMS.

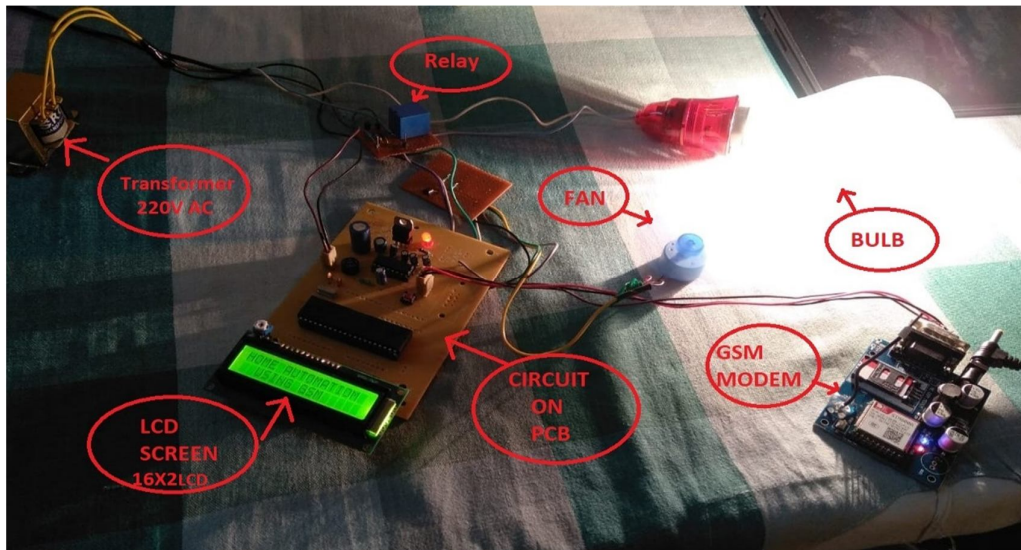


Figure 3. Prototype of proposed GSM based home automation system

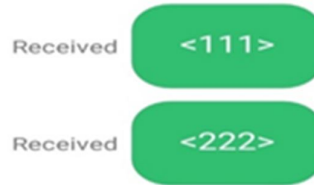


Figure 4. Commands sent via SMS for an instance to 'on' both the devices



Figure 5. Status displayed on the LCD for the above commands taken as instances

There are numerous applications of home devices control system. Some of the important application are given below:

- It can be used for home automation system, remote locations devices control, Security system for home and industry.
- It can also be used as a feedback system to save energy in countries which are victims of energy short falls and load shedding.
- Heating, ventilation and air conditioning (HVAC): it is possible to have remote control of all home energy monitors over the internet incorporating a simple and friendly user interface.
- Occupancy-aware control system: it is possible to sense the occupancy of the home using smart meters and environmental sensors like CO₂ sensors, which can be integrated into the building automation system to trigger automatic responses for energy efficiency and building comfort applications.
- Appliance control and integration with the smart grid and a smart meter, taking advantage, for instance, of high solar panel output in the middle of the day to run washing machines.

- Home robots and security: a household security system integrated with a home automation system can provide additional services such as remote surveillance of security cameras over the Internet, or central locking of all perimeter doors and windows.
- This can also be used in GSM based telemedicine system, ATM theft precaution system uses this to indicate the theft.
- GSM based vehicle security system uses this, this circuit can be used in GSM based green-house parameter monitoring system.

V. CONCLUSIONS

By GSM technology, a capable solution has been proved to be controlled remotely, to provide home security and is cost-effective as compared to the previously existing systems. Hence, we can conclude that the required goals and objectives of a basic model have been achieved. By this project we can control our home appliances and also the unnecessary electricity bills by giving the response to microcontroller. The ranges of appliances that can be controlled through tele remote systems are many in numbers and this depends upon the usage priority of the appliances i.e. Industrial appliances, Music Systems or other electrical / electronic appliances.

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