



A STUDY ON MOBILE COMMUNICATION BASED HOME AUTOMATION SECURITY SYSTEM

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ABSTRACT:

Home security system is needed for occupants' convenience and safety. In this paper, we present the design and implementation of affordable, low power consumption, and GSM (Global System for Mobile Communication) based wireless home security system. In existing system, the home network is engaged with non-wireless technology, where the installation and maintenance is difficult. So the system cost is very high. In our proposed system, these difficulties are overcome by introducing a wireless home network which contains a GPRS Gateway and three kinds of security nodes namely door security node, anti intrusion node and SMS node to inform the user. The nodes are easy installing. All the three nodes are connected to the microcontroller. Easy Home or Home automation plays a very important role in modern era because of its flexibility in using it at different places with high precision which will save money and time by decreasing human hard work. Prime focus of this technology is to control the household equipment's like light, fan, door, AC etc. automatically. This research paper has detailed information on Home Automation and Security System using Arduino, GSM and how we can control home appliances using Android application. Whenever a person will enter into the house then the count of the number of persons entering in the house will be incremented, in Home Automation mode appliances will be turned on whereas in security light will be turned on along with the alarm. For the home security system we are using an antitheft reporting system which will report the owner by ringing an alarm and by sending an SMS. Also for the safety system in case of fire or gas leakage it will report the owner by sending a SMS and also by ringing an alarm. Thus by using GSM technology, it provides the wireless access to the devices to be controlled.

Key words: Home Automation, Global System for Mobile Communication (GSM), security

1.0 Introduction:

Today we are living in 21st century where automation is playing an important role in human life. Home automation allows us to control household appliances like light, door, fan, AC etc. It also provides home security and emergency system to be activated. Home automation not only refers to reducing human efforts but also energy efficiency and time saving. The main objective of home automation and security system is to control home appliances by using different techniques like android application, web pages, GSM when a person is away from home. The system alerts the person in case a burglar enters the house by sending SMS on person's mobile phone which will enable them to protect their home from burglars. The system also helps old people by controlling home appliances with the help of their mobile phones as they do not need to go to different locations for turning the appliance ON or OFF.

The wireless communication is increasing day by day. This has motivated us to use mobile 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 a remote appliance control system which can control different household appliances by sending a SMS from a

mobile phone and monitor the safety and security of the house just by a SMS. This controller is extremely handy 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 in this world. The microcontroller would then control the home appliances based on the information given to it and send a feedback during a security breach and it also send a feedback during gas leakage or if a fire takes place. The proposed solution is easy to use, simple, secure, and robust and can also be controlled through android mobile phones through and android application. In this paper we describe a simple remote home appliance control, security and safety system using GSM SMS (Short Messaging Service). A remote household appliance control has been described in using internet.

2.0 LITERATURE REVIEW:

Ameer.Suhail, (2015) - In recent years, the home environment has seen rapid introduction of network enabled digital technology. This technology offers new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation. Mobile devices are ideal in providing a user Interface in a home automation system, due to their portability and their wide range of capabilities. This paper evaluates development of a low cost surveillance system using different sensors built around the microcontroller. This surveillance system has a better percentage of security with respect to other security system available.

Mali Swati Nimba, (2016) Home security and control is one of the basic needs of mankind from early days. But today it has to be updated with the rapidly changing

technology to ensure vast coverage, remote control, reliability, and real time operation. Deploying wireless technologies for security and control in home automation systems offers attractive benefits along with user friendly interface. In this paper, implementation of a novel security and control system for home automation is presented. The proposed system consists of a control console interfaced with different sensors using ZigBee. Suspected activities are conveyed to remote user through SMS (Short Message Service) or Call using GSM (Global System for Mobile communication) technology.

Pawan Singh, (2016) - Home automation system is used to control the home appliances remotely. There are many home automation technologies available in market out of which the popular technologies are X10, Z-Wave, Zigbee, GSM technology, INSTEON, and EnOcean. All these technologies have its pros and cons. The proposed system is user friendly and easy to use. The system is using Global System for Mobile Communication (GSM) modem to control home appliances via Short Message Service (SMS).

3.0 ANALYSIS:

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 (ATMega2560), a GSM handset with GSM Modem (SIM900), relay module, sensors (MQ2, MQ7 and ultrasonic sensors). The software part consists of programming in arduino and an android based application run on android phone. The GSM modem provides the communication media between the home owner and the system by means of SMS. The SMS consists of commands to be

executed. The format of the message is predefined. The SMS message is sent to the GSM modem via the GSM public networks as a text message with a definite predefined format. Once the GSM modem receives the message, the commands sent will be extracted and executed by the microcontroller. The system will interpret the commands and turn the appliances ON/OFF accordingly via the switching module.

A. HARDWARE USED

1) GSM Mobile Handset: Cellular phone containing SIM (Subscriber's Identifying Module) card has a specific number through which communication takes place. The mode of communication is wireless and mechanism works on the GSM (Global System for Mobile communication) technology. Here, the user transmits instructions to the system to control the appliances in the form of SMS through an android application.

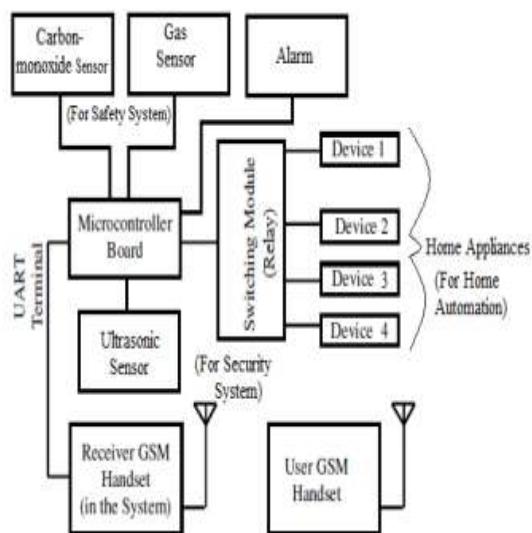


Figure 1: Block diagram of the paper

2) Receiver GSM Handset The receiver GSM handset is used to receive the SMS sent by the user and then to transmit an acknowledgement or status to the user's mobile. The receiver handset has to be equipped with an AT Modem and a valid SIM card. The handset has a built in AT

modem with UART interface and supports most of the AT command instructions. AT commands are instructions used to control a modem. AT is the abbreviation of Attention. Every command line starts with "AT" or "at".

3) Microcontroller Board ATmega 2560 This is the main module of the whole system. On receiving a SMS text words are checked with predetermined format which contain commands to control the appliances and accordingly the appliances are switched ON or OFF. In case of home security the microcontroller is connected with sensors and in case of any discrepancy it will send a SMS to the owner.

4) Relay Module The relay module drives (switches ON/OFF) the appliance according to the command sent in the SMS. The relay module is controlled by the microcontroller. It allows a low power 5V circuit to switch a relatively high current on or off for example a bulb connected to the 220V mains supply.

5) Sensors A sensor is a transducer whose purpose is to detect some characteristic present in the environment. It detects events or changes in quantities and provides a corresponding output, generally as an electrical or optical signal; for example, in our project we are using gas sensor (MQ7), smoke sensor (MQ2) and ultrasonic sensors which sense the gas, smoke and distances and send a certain voltage output to the microcontroller. The different sensors used in our project are explained as follows:-

a). Ultrasonic Sensors Ultrasonic sensors are those sensors that convert ultrasound waves to electrical signals. In our project we are using ultrasound transceivers as it is both sending and receiving the ultrasonic sounds. This device work on a principle similar to that of transducers used

in radar and sonar systems, which evaluate attributes of a target by interpreting the echoes from radio or sound waves, respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object.

b). MQ2 They are used in gas leakage detecting equipment in houses, industries and are suitable for detection of LPG, Ibutane, propane, methane, alcohol, Hydrogen, smoke. In our project we are using it for detection of LPG gas leakage. If it detects any gas leakage then it will report to the microcontroller and the microcontroller will ring an alarm and send a feedback SMS to the owner through GSM modem. c). MQ7 They are used for detection of carbon monoxide gas. In our project we are using it for detection of smoke. If it detects any smoke then it will ring an alarm and report to the microcontroller and the microcontroller will ring an alarm and send a feedback SMS to the owner through GSM modem.

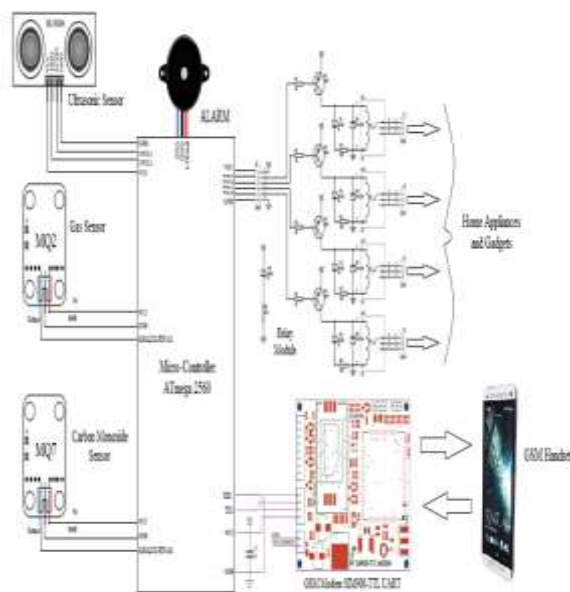


Fig 2. Circuit Diagram

6) Alarm A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. In our project we are using a piezoelectric buzzer which is used as alarm when any gas or burglar is detected.

B. SOFTWARE USED

a. 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 features, 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 for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors.

b. APP INVENTOR: App Inventor for Android is an open-source web application originally provided by Google, and now maintained by the Massachusetts Institute of Technology (MIT). It allows to create software applications for the Android operating system (OS). It uses a graphical interface, which allows users to drag-and-drop visual objects to create an application that can run on Android devices.

ALGORITHM:

Step1:- START

Step2:- Read SMS no.1 from SIM

Step3:- Store the SMS in a String

Step4:- Check whether the SMS is READ or UNREAD

Step5:- If the SMS is UNREAD, extract the message from the SMS

Step6:- Relay is controlled with the help of this message

Step7:- A feedback SMS is sent back to the owner's mobile

Step8:- If SMS is READ, delete the message

Step9:- Check if the value of MQ7 sensor is greater than 350 then jump to Step10 else jump to Step12

Step10:- Send a feedback SMS to the owner's mobile about gas leakage

Step11:- Ring an alarm

Step12:- Check if the value of MQ2 sensor is greater than 400 then jump to Step13 else jump to Step15

Step13:- Send a feedback SMS to the owner's mobile about the fire

Step14:- Ring an alarm

Step15:- Check if the value of Ultrasonic sensor is greater than 400 then jump to Step13 else jump to Step18

Step16:- Send a feedback SMS to the owner's mobile, warning him about the theft

Step17:- Ring an alarm

Step18:- Jump to step2

three parts which are home automation, home safety and security system. 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 the GSM modem used in our project. This will read the SMS and send it to the microcontroller. The microcontroller will extract the message from the received SMS and control the relay module. The relay will turn on or off the appliances as ordered by the owner. The advantage of the project is even if the owner does not have an android phone the can send a SMS to the GSM modem to control the appliances.

The microcontroller would send a feedback SMS to the owner through GSM modem and will also ring an alarm. The advantage in using this safety and security system is that the certain range at which the alarm rings and SMS is send is user defined so user can select any range accordingly at which the microcontroller will report.

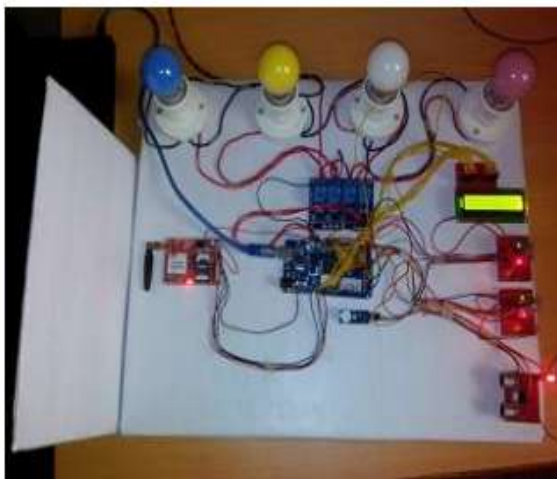
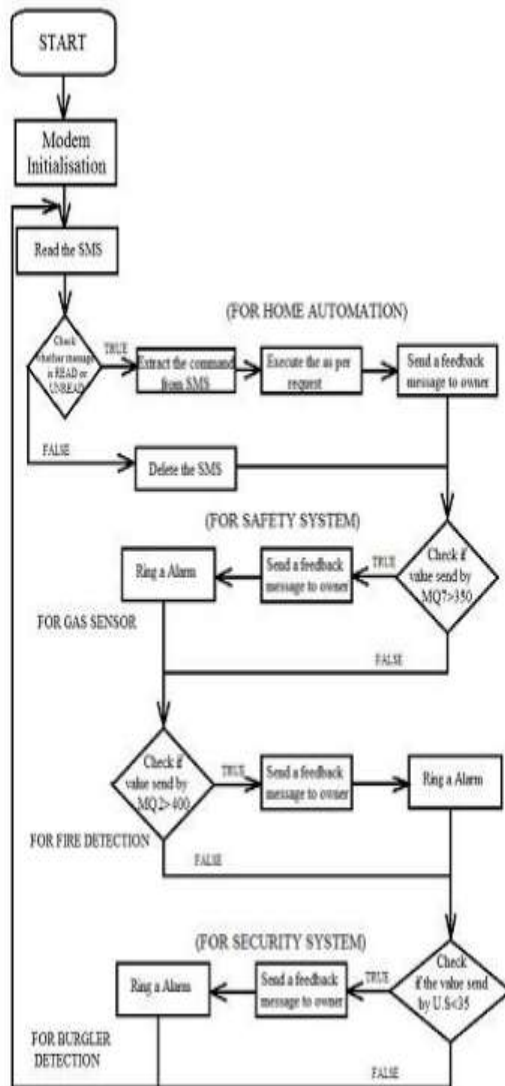


Fig 3. Snapshot of the project
Functioning Of Gsm Based Home Automation And Home Security System:-

The working of the project is divided into

FLOW CHART:-



Some of the snapshots of the results are shown in fig 4

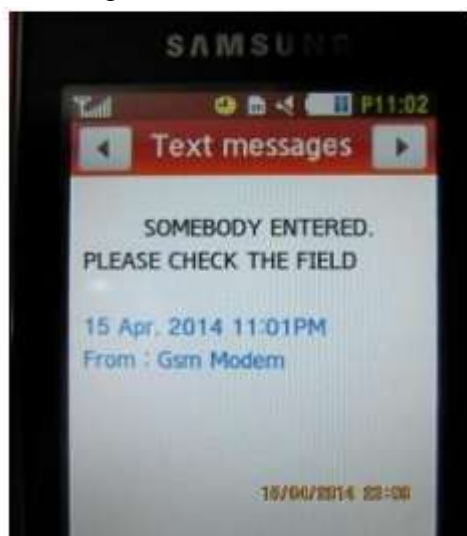


Fig 4: Outputs for PIR Sensor on Mobile phone

4.0 CONCLUSION

In this paper we discussed our project on GSM based home automation, safety and security system 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 here is that even though the controlling can be done by the android application which has safety features but in absence of an android mobile phone one can control it by sending a normal SMS to the GSM modem. Also the safety and security system can be easily installed in the house and used. It informs the owner in case of fire, gas leakage and theft even when the owner is not in the house.

1. N. Sklavos, (2012), "Cryptographic Hardware & Embedded Systems for Communications", proceedings of the 1st IEEE-AESS Conference on Space and Satellite Telecommunications, Rome, Italy, October, 2-5,
2. A.J. Bernheim Brush, Bongshin Lee, Ratul Mahajan, Sharad Agarwal, Stefan Saroiu, and Colin Dixon, (2011), "Home automation in the wild: challenges and opportunities", proceedings of the SIGCHI Conference on Human Factors in Computing Systems '11, ACM, USA,.
3. N. Sklavos, P. Kitsos, O. Koufopavlou, (2012), "VLSI Design and Implementation of Homophonic Security System", proceedings of IEEE Computer Society Annual Symposium on VLSI (IEEE ISVLSI'12), Amherst, USA, August 19-21,.
4. R.A.Ramlee, M.H.Leong, R.S.S.Singh, M.M.Ismail, M.A. Othman, H.A. Sulaiman, M.H. Misran, M.A. Meor Said, (2013), "Bluetooth Remote Home Automation System Using Android Application", The International Journal of Engineering And Science, Volume 2, pp. 149-153, January.
5. Vini Madan, S.R.N Reddy, (2012), "GSM-Bluetooth based Remote Monitoring and Control System with Automatic Light Controller", International Journal of Computer Applications, Volume 46-No.1, May.
6. B.Suresh Babu, Dr. C. Venkata Narasimhulu, (2014), "Robust Model to Access Consumer Appliances Using Android", International Journal of Research in Advent Technology, Vol.2, No.10, October.
7. P.Bhagyalakshmi, G.Divya, N.L.Aravinda, (2015), "Raspberry PI And Wifi Based Home Automation", International Journal of Engineering Research and Applications, pp. 57-60, January