JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A Remote Home Security System Based On Wireless Sensor Network And GSM Technology

M.Kavitha[1], Kodil Nageshwari[2], Mohammed Muzammil Hussain[3], Vantari Akhila[4], G Spurthi Sankeerthana[5]

[1]Assistant Professor, [2,3,4,5]Final year Students

Department of Electronics and Communication Engineering, MNR College of Engineering and Technology

Abstract

In the present day, no space is uncovered by technology. Home security is no exception. Everyone is connected to technology in one or another form. A major concern of Home security is when a house owner is at a remote location. Technology can be effectively used to make home security foolproof even from a remote location. In the present work, the Arduino Uno platform is used. Global System for Mobile (GSM) is used to monitor and control security systems. In the present work, Proximity Infra-Red, Smoke, and Fire sensors are used. A buzzer is used to alert the people at home. The prototype is successfully designed and demonstrated in this regard. Further, this technology can be extended to shops and offices also.

Keywords: Home security, Sensor, Arduino Uno, Global System for Mobile.

I. Introduction

Modern-day life has become tricky and difficult due to security-related issues. Home security has become an important pursuit of people, especially in urban localities. As can be seen every House in the cities is equipped with Home security devices. Home security devices in terms of monitoring intruders, and detecting smoke and fire to avert life and assets damage are the key issues taken up in the present work. Further, a buzzer is deployed at strategic locations of the home to make the residents alert and act accordingly. Technologies related to Home security are available which are affordable to the common people. Studies have shown that a major number of crimes could have been averted with security systems. Particularly vacant houses, banks, and offices during off hours are the chief targets for criminals. Human negligence is also one of the reasons which lead to fire accidents in homes, banks, and offices. Deploying the appropriate sensors at vulnerable places along with alarming systems would create a foolproof security system.

Arduino Uno embedded platform is used as the central device to which all other devices are connected. A GSM module connected to the Arduino board facilitates wireless communication with the phone. This module helps the owner of the house to monitor the status of the sensors from the remote site. In the present work, a prototype is designed and implemented. However, the same can be deployed in a real-time environment with few modifications.

II. Literature survey

The system proposed by the authors [1] is based on the M2M concept. GSM is used for providing communication. GSM offers SMS, GPRS, and Dual Tone Multi Frequency options. Authors have used the SMS option using AT commands for communication with the PC as a controller. The received messages are decoded by the PC via SMS and perform the operations required. As per the applications, the system can be programmed. The system also can control mechanical appliances, through sensors. However, this system requires it to be on all the time.

In this work [2] the Authors used a home server built upon an SMS/GPRS mobile cell module and a microcontroller. This facilitates the user to monitor and control all appliances at home with any Java-enabled cell phone. A User-friendly interface is facilitated by Mobile phones, which are used to send commands and receive feedback from the system.

Real-time monitoring is an essential feature of home automation systems. Authors [3] proposed three choices for home automation: through speech, GSM network, and the Internet. The change in the device status will be intimated in real-time.

The work presented in [4] makes use of a cell phone and Bluetooth technology. The merits of Bluetooth technology are security and low cost. Arduino Bluetooth board is used here. The user interface is provided by an interactive Python program on the cell phone. The I/O ports of the Bluetooth board and relays are used for interfacing with the devices to be controlled. The Bluetooth is secured by a password. Bluetooth has a range of 10 to 100 meters, 2.4 GHz bandwidth, and 3Mbps speed. However, the system is limited by the Bluetooth range.

The authors [5] in their work proposed a system for controlling devices remotely for elderly people. The communication is channeled through GSM. Voice commands are given to an Android mobile phone and are converted into text. This is sent as an SMS to another phone through the GSM network. The other phone uses Bluetooth and sends text commands to the Bluetooth module. This module is connected to a controller which interprets the commands and performs the appropriate actions.

Home automation based on ZigBee, GSM, and Bluetooth technologies was presented by the authors [6]. Android application is used for user interfacing. This application takes the voice input of the user and converts it into text messages. SMS service is used to send to another phone at home. Further, these commands are sent to the controller via Bluetooth. Then commands are sent to a ZigBee transceiver followed by the main controller. The controller interprets the commands and performs the required functions.

Home appliances control is implemented with a PIC16F887 microcontroller [7]. GSM module is made used for controlling the appliances and is based on SMS. The control of home appliances is done primarily through SMS codes. AT commands are sent through the GSM network for controlling the home devices.

A GSM network via SMS [8] to control the home appliances presented in this work. The Arduino platform is to control the appliances. Appropriate peripheral drivers and relays are used to achieve the interfacing. The 'App Inventor' visual programming tool is used to develop the interface. The app generates SMS messages based on the user commands and sends them to the GSM modem attached to the Arduino for controlling the home appliances.

A more flexible home automation system is reported by the authors [9] which used a combination of GSM with an FPGA system. The programmability of FPGA helps to create custom-tailored applications. Further, it is cheaper than a microcontroller. This helps to decrease the price of the system. The FPGA and GSM modem is interfaced. The communication with the devices is affected by the modem. The FPGA makes the decisions regarding the control of devices.

Home automation based on ZigBee wireless communication technology is proposed by the authors [10]. Voice recognition and PIC microcontroller are used for this purpose. The voice commands are transmitted by the PIC microcontroller which sends the commands through ZigBee to the receiver. The receiver unit processes the command through another PIC microcontroller. relays are used to control the respective appliances. However, the system has the drawback of low-range communication.

III. Present work

A prototype is designed for the home automation system. Four sensors are used namely PIR(Passive IR), Smoke, Fire, and IR in the present work.

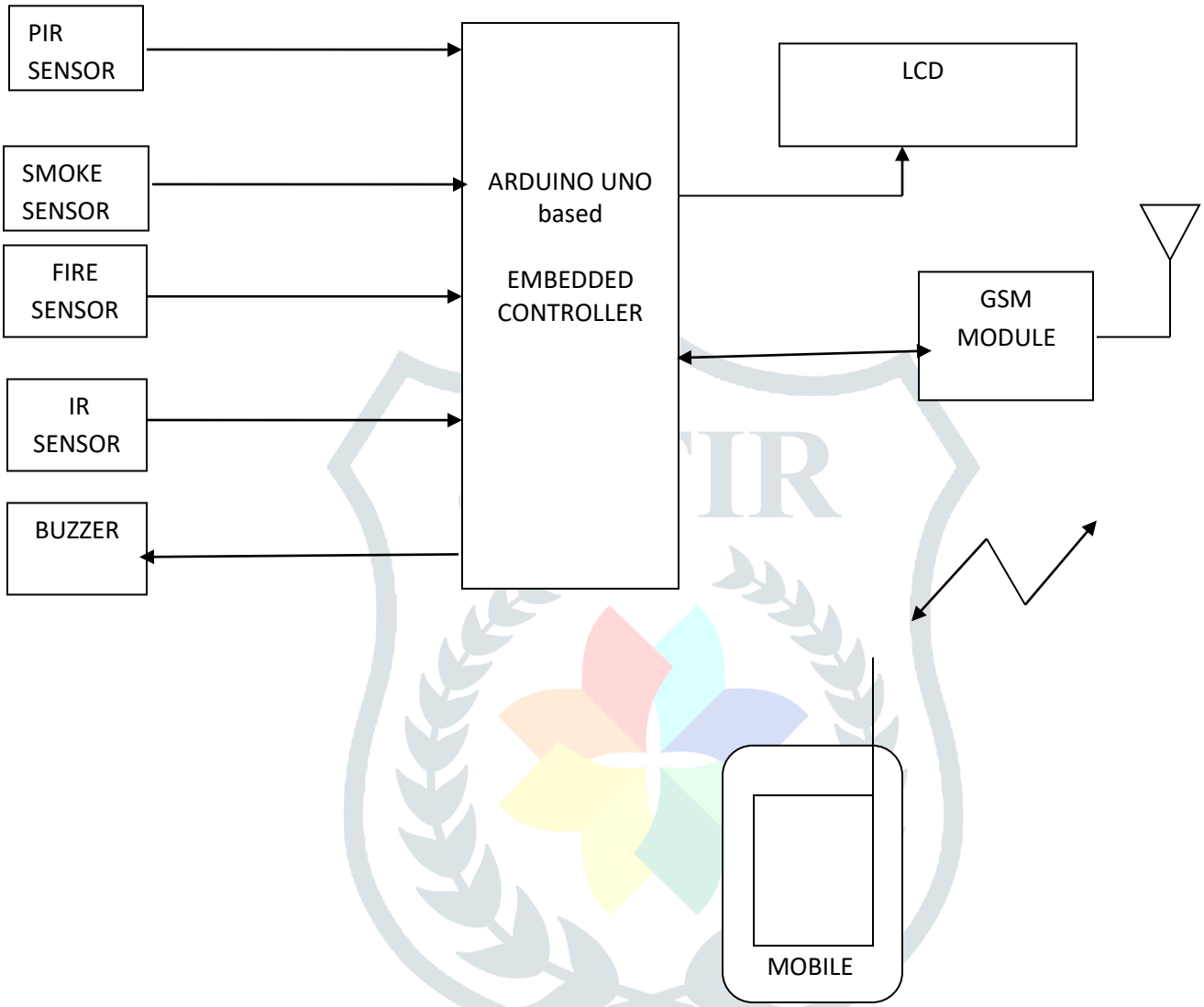


Fig.1 Block diagram of the proposed system

A PIR sensor is used for motion detection. These sensors detect changes in the levels of energy around the area. They are normally used in security, motion detection alarms, and automatic lighting applications. A passive infrared sensor recognizes infrared light emitted from nearby objects. Passive infrared sensors have a pair of pyroelectric sensors to detect heat energy in the neighboring area. These two sensors sit next to each other, and when the signal differential between the two sensors changes, the sensor will detect. The detected signal may be used to trigger an alarm, keep authorities notified, or maybe used to turn on a floodlight.

An infrared sensor is used to detect an intruder and can be used to count the intruders. It has both an emitter and a receiver. IR emitter shoots an infrared light beam to an inline receiver. If the receiver doesn't receive the light beam then it's an indication of the presence of an object. Yet in one more IR sensor setup, both the emitter and receiver are mounted. If there is no obstruction no signal is received by the receiver. In the case of any obstruction, the IR light beam is received by the receiver.

All smoke detectors consist of two parts: a sensor to sense the smoke and a very loud electronic horn to alert the people. The smoke particle scatters the light beam between the light-emitting and light-sensing devices. Thus the intensity of the

light beam received by the light receiver will be reduced which activates an alarming system. Smoke alarms save thousands of lives every year.

The fire or flame sensor is used to detect fire/flame sources or other light sources of the wavelength in the range of 760nm-1100nm. Typically an NPN silicon phototransistor is used which is a high-speed and highly sensitive sensor. Buzzer is used to alert the people.

All the sensors, buzzers, and GSM modules are interfaced with the Arduino Uno embedded platform. Arduino UNO platform is used in present work which is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic systems. It uses a Microchip Atmega328P microcontroller. The board is facilitated with digital and analog (I/O) pins that can be interfaced with various expansion boards and other circuits. The board has 14 digital I/O pins (six capable of PWM output), and 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts.

The GSM module facilitates communication between the user and the Arduino Uno. In the present work, SIM900A is used. The module offers GPRS/GSM technology for communication with the use of a mobile sim. It uses a 900 and 1800MHz frequency band and allows users to receive/send mobile calls and SMS. The keypad and display interface allows the developers to make customized applications with it. Furthermore, it also has modes, command mode, and data mode. In every country, the GPRS/GSM and different protocols/frequencies operate. Command mode helps the developers to change the default setting according to their requirements.

Fig.2 shows the developed prototype. The prototype is tested for various conditions for validating its proper operation.

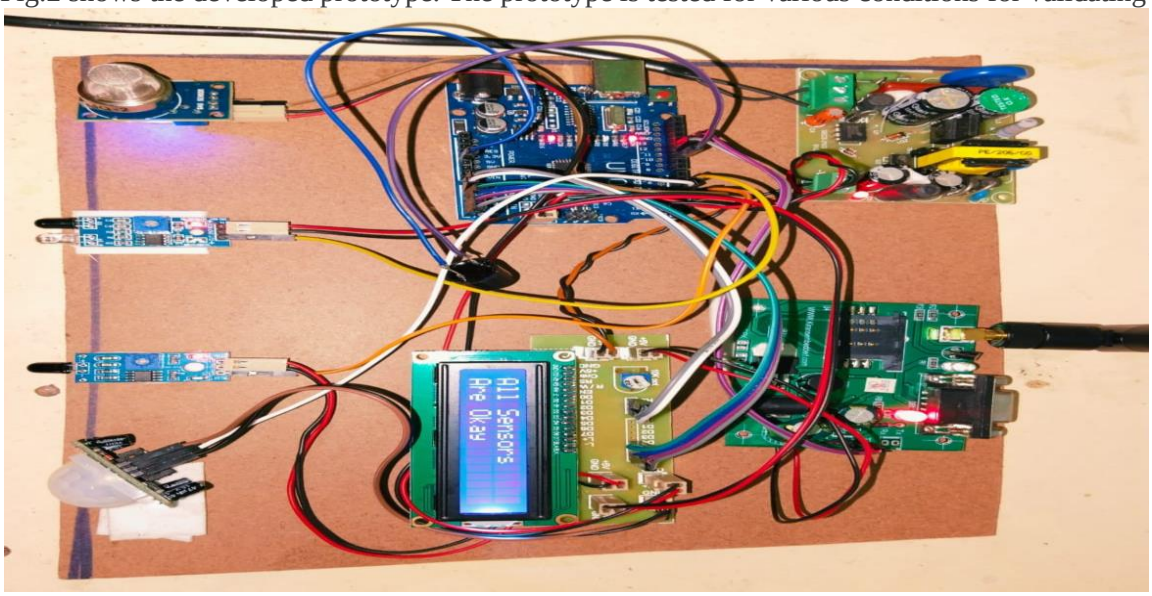
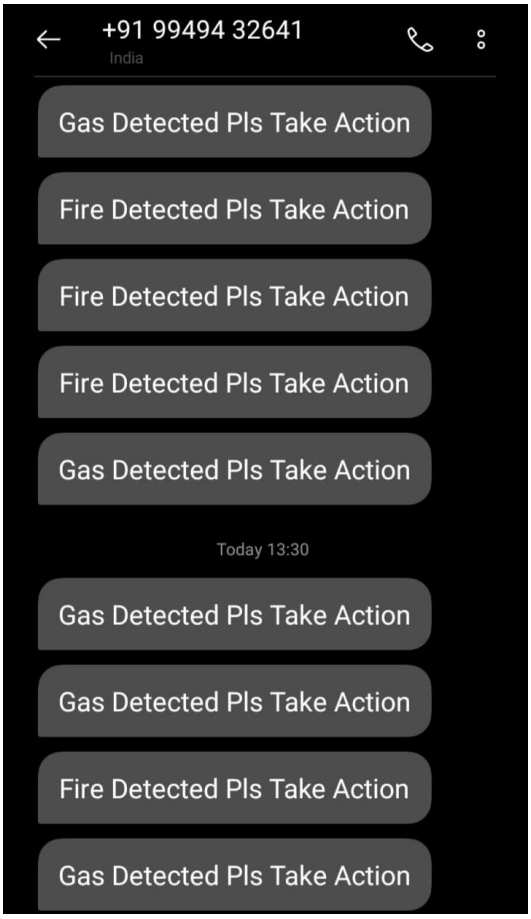


Fig.2 Prototype of the proposed Home automation system

IV. Results



V. Futur scope

An ideal Home automation system should be ubiquitous in terms of time and location. A GSM network fits into this condition aptly. However, if
Internet access is provided to the data channel of GSM Only the Internet can ensure its access is made available at all times. This will facilitate using of Internet protocol. Further, a web application for user interface with an associated mobile application can be designed. This would help all the people to access the system. Automation conserves energy. Before turning on the devices check the brightness and turn off lights if not necessary. The home automation system can have both features of home security and energy conservation. The present system can be deployed in a real-time environment with minor modifications.

References

1. A. Alheraish, “Design and Implementation of Home Automation System”, 2004, IEEE Transactions on Consumer Electronics, Vol. 50(4), pp. 1087-1092. 3
2. M. Van Der Werff, X. Gui and W.L. Xu, “A Mobile based Home Automation System, Applications and Systems”, 2005, 2nd International Conference on Mobile Technology, Guangzhou, pp.5. 4
3. Baris Yuksekkaya, A. Alper Kayalar, M. Bilgehan Tosun, M. Kaan Ozcan, and Ali Ziya Alkar “A GSM, Internet and Speech Controlled Wireless Interactive Home Automation System”, 2006, IEEE Transactions on Consumer Electronics, Vol. 52(3), pp. 837 - 843. 1
4. R.Piyare, M.Tazil, “ Bluetooth Based Home Automation System Using Cell Phone”, 2011, IEEE 15th International Symposium on Consumer Electronics, Singapore, pp. 192 - 195. 9
5. Faisal Baig, Saira Baig, Muhammad Fahad Khan, “Controlling Home Appliance Remotely through Voice Command”, 2012, International Journal of Computer Applications, Vol. 48(17), pp.1 – 5. 6
6. Faisal Baig, Saira Beg and Muhammad Fahad Khan, “ZigBee Based Home Appliances Controlling Through Spoken Commands Using Handheld Devices”, 2013, International Journal of Smart Home, Vol. 7(1), pp 19 -26. 17

7. Rozita Teymourzadeh, Salah Addin Ahmed, Kok Wai Chan, and Mok Vee Hoong, “Smart GSM Based Home Automation System”, 2013, IEEE Conference on Systems, Process & Control, Kuala Lumpur, Malaysia. 2
8. Mahesh.N.Jivani, “GSM Based Home Automation System Using App-Inventor for Android Mobile Phone”,2014, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 3(9), pp. 12121-12128. 5
9. Pooja S Chinchansure, Charudatta V Kulkarni, “Home Automation System based on FPGA and GSM”, 2014, International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, pp. 1 – 5. 20
10. V.Sathya Narayanan, S.Gayathri, “Design of Wireless Home Automation and security system using PIC Microcontroller”, 2013, International Journal of Computer Applications in Engineering Sciences, Vol. 3 (Special Issue), pp. 135- 140.