HOME MONITORING AND SECURITY SYSTEM

Suresh.S
Department of Information Technology
SRM University
Kattankaluthur Campus, Tamillnadu, India
suresh.sa@ktr.srmuniv.ac.in , pessuresh@hotmail.com

J.Bhavya, S.Sakshi, K.Varun and G.Debarshi
Department of Information Technology
SRM University
Kattankaluthur Campus, Tamilnadu, India
Bhavyajain99999@gmail.com , sakshidinesh@gmail.com , varunkamat.kamat@gmail.com , debarshi.gosh06@yahoo.co.in

***Abstract*— Home security is becoming necessary nowadays as the possibilities of intrusion are increasing day by day .Lot of Security companies are available towards protecting house from getting vandalized or so. But still there is no much guarantee that the house be safe or even if the house vandalized, security personnel safe and sound to report to police nearby. This leads to property loss and damage.**

Lot of research been carried out employing sensors like PIR, Sensor Camera, GSM towards detecting the intruder at home. But the drawback in all these systems is that they are all expensive to be deployed integrated with LCD panel or Camera. Again with PIR sensor or Ultrasonic Sensor integrated with GSM, there is good possibility of false intruder detection based on line of sight cut by any entity and not necessarily an intruder. Currently homes in India still rely on security service personnel and no home security system been employed so far.

So taking the above mentioned aspects into consideration, we here have developed an economical and affordable Home security system which have integrated the security component by making use of sensors like PIR, Temperature, humidity etc to sense the motion, change in temperature and humidity in room from normalcy rather relying on PIR sensor for change in motion only . The owner of the house is informed about any intruder by sending a text message by using of GSM module. All these activities are controlled by AtMega microcontroller of Arduino. This system would help all the users at any level of income to have one at their home and secure home from any vandalizing

Keywords—PIR, GSM, ATMega, Arduino

I. INTRODUCTION

Home Security is very important aspect these days particularly with the kind of theft or vandalizing we hear. In olden days people secure the homes when they leave by using locks and key. But now such kind of systems can be easily broken and owners are not aware of it. Today, the home security system has moved to a next level where the control lies in the hand of the house owner.

978-1-5090-5515-9/16/$31.00 ©2016 IEEE

Research has been conducted in regards to automated home monitoring using Web camera [1] and accordingly information delivered to user's phone via GSM.

Also research been conducted by employing wireless sensors [2-5] and GSM towards theft and also leakage of gas and fire too. Research also been conducted by employing Arduino Atmega Microcontroller towards Home Automation, Safety and Security too.

But there are lots of drawbacks in the above mentioned research which leads to our system which is economical and affordable. In one research, the presence of intruder is determined by using Web camera which are quite expensive and not affordable. Some use infrared sensor along with LCD display for controlling the appliance. But again drawback is that there can be false alarm based on PIR sensor when there is line of sight cut by any entity which can be sent to home owner's mobile. Some researchers have employed ultrasonic sensors where drawback again is reduction in distance based on presence of intruder which again can be false alarm based on presence of any entity and not intruder .

So accordingly we in our research have employed not only Pyro electric sensor but also temperature and humidity sensor towards detecting the intruder. PIR sensor detects when line of sight is cut by any entity and there is change in infra-red energy. So along with this, Temperature sensor also employed which measures the surrounding temperature change when someone has entered. The motion of intruder is detected and text message sent to user's mobile phone via GSM and indicating the change in every step. This makes security system more interactive. The major benefit of home security system is that it is easy to install and the cost is comparatively very low compared all the above mentioned system. The house owner is informed through the text message and so no special software or app is required. This increases the efficiency of this research and cuts the battery drainage that might have occurred while using any special app or software. The entire system been developed using Arduino

Uno Microcontroller, PIR sensor, DHT11 Temperature & humidity sensor, GSM SIM 900. The rest of the paper is organized as follows. Section 2 talks on hardware and software design pertaining to Home Monitoring and Security System. Section 3 gives the implementation of Home Monitoring and Security System using Arduino and GSM. Section 4 is the conclusion and Future Work.

II. Literature Survey

In this section, latest Home based Security detection technologies been discussed.

In one system, web camera [1] been deployed in the house where there is motion in camera and accordingly information delivered to user's phone through GSM module. Also there has been research [2] conducted on using a low-power consumption remote home security alarm system by using wireless sensors and GSM. The system would detect not only theft in house but also leaking of raw gas and fire and send alarm message remotely using GSM. The researchers have used single chip C5081F310, wireless receiving and sending chip CC1100 as well as the SIMENS TC35 GSM module. The system software was developed in C51 language.

In addition, there has also been research [3] conducted in securing the homes using Sensor, Atmega Microcontroller, buzzer and relay to control the appliance. In this research, when IR sensor detects intruder at home, it sends signal to microcontroller which reads the status of sensor and accordingly switches keypad and LCD panel. LCD display shows as input from personnel with proper password for opening the door and message sent via GSM to user's mobile phone.

Also there has been research [4] conducted using Arduino Atmega microcontroller towards Home Automation, Safety and security where Android phone used for getting alerts. Sensors like MQ2 and MQ7 used for sensing gas and smoke. Ultrasonic sensor used for detecting the presence of intruder and message sent to user's phone via GSM for alert.

Also based on sensor input, relay controller used for switching the appliances at home. Finally research [2] has also been conducted using IR sensor and GSM module using Atmega Microcontroller of Arduino where the sensor detects if any person has cut and input sent to microcontroller. The presence of intruder sent to user's mobile via GSM module.

III. System Design

The system designed for Home monitoring and Security system consists of sensors which are used to collect the data that will be used by the owner to make smart decisions. PIR sensor is used to detect the motion and the temperature sensor is used to detect the temperature of the room. Various modules namely the PIR module, temperature module and the GSM module communicate with each other to coordinate and increase the security of the system which is shown in Fig.1.

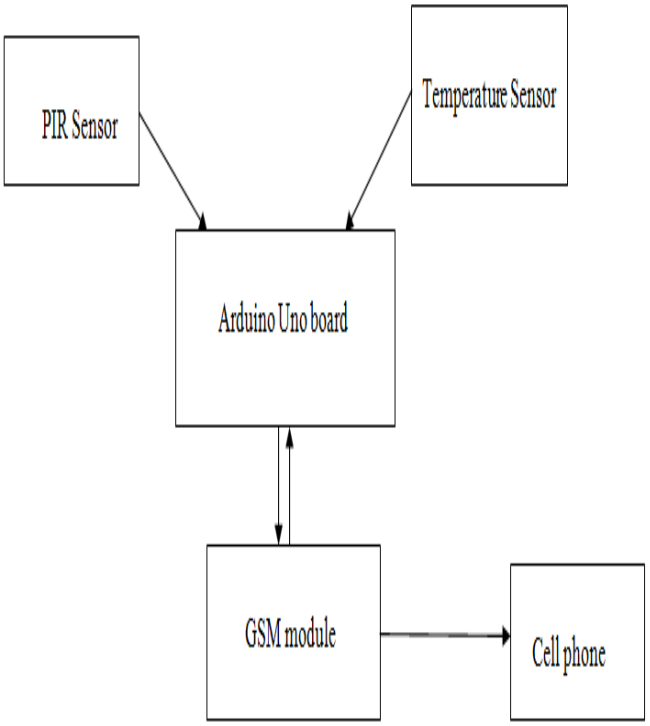

Fig.1 Home Security System Design

In this, the PIR Sensor and the Temperature Sensor are connected to the Arduino board. The digital signal is sent to the board. The GSM module is used to send and receive signal from the Arduino board. The received signal is sent to the house owner through a text message via GSM module's path. If the owner wants to switch off the alarm, he sends a signal to the GSM module.

The GSM module will send the signal to the Arduino board. The Arduino board converts this signal into the sensor understandable format and sends it to the sensors. The sensors are switched off immediately. The main component is the Arduino board. The motion detection, temperature sensor and GSM's code is burned in the Arduino chip. On activating the system, the SMS is immediately sent to the house owner. The desired phone number is embedded in the GSM module.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Fig.2 shows the user interaction as how the owner interacts with the system. Fig.3 shows the sequence diagram which shows sequence of events of our system.

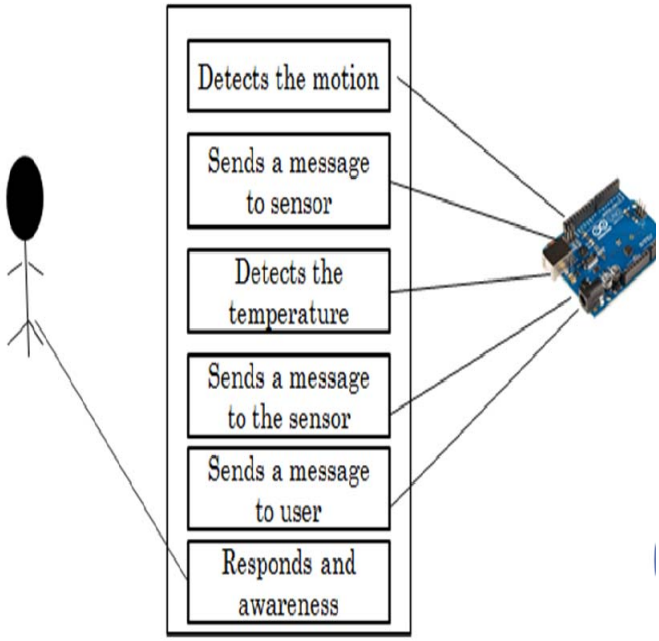

Fig.2 UML Diagram of Home Security System

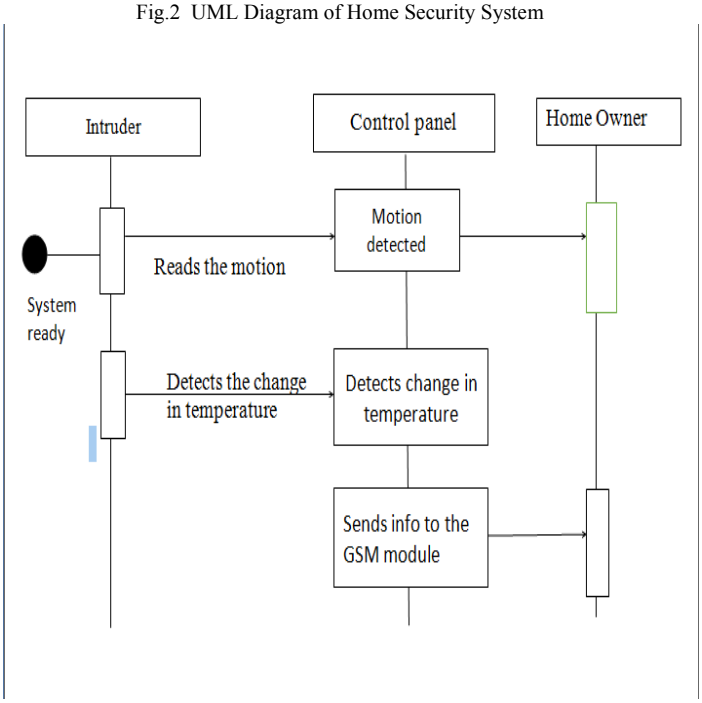

Fig.3 Sequence Diagram of Home Security System

A. Hardware Design

The hardware of the system mainly comprises sensor section, control unit, network module, and power supply.

B. Arduino Processing Unit

For controlling the signals from various sensors, and combined modules, Arduino [6] has been used. Arduino is a physical computing platform for managing and handling electronics. It has an open source platform independent IDE, that facilitates programmer to process the electronics signal from the attached components and control them. Most popular Arduino board Arduino Uno consists of 8-bit Atmel AVR microcontroller clock speed 16 MHz.. Also the board is not expensive, freeware and has very active developer's community. These are shown in Fig.4

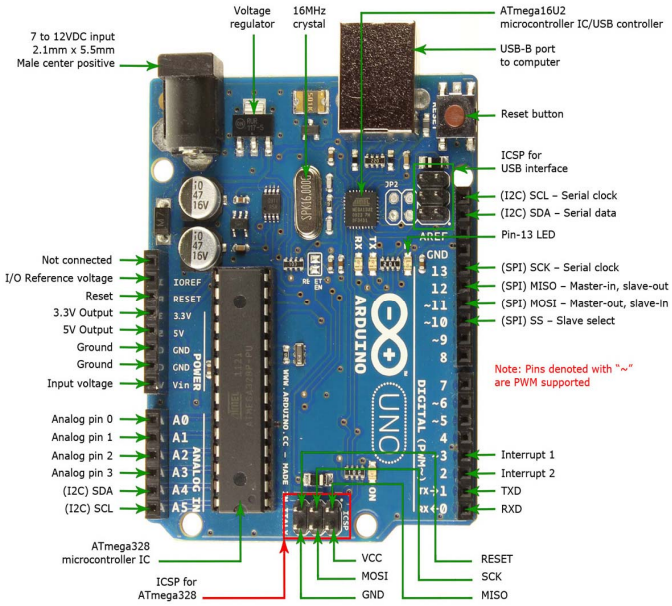

Fig.4. Physical outlook of Arduino Uno R3

B. PIR Sensor

PIR sensors allow you to sense motion whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors

C. Temperature and Humidity Sensor

This is a multifunctional sensor that gives you temperature and relative humidity information at the same time. It utilizes a DHT11 sensor that can meet measurement needs of general purposes. It provides reliable readings when environment humidity condition in between 20% RH and 90% RH, and temperature condition in between 0°C and 50°C, covering needs in most home and daily applications that don't contain extreme conditions. This sensor is capable of sensing the temperature and can be used to detect any deviation from normalcy.

D. GSM Module

A GSM module [7] is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most

frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities. To perform these tasks, a GSM modem must support an "extended AT command set" for sending/receiving SMS messages, as defined in the ETSI GSM 07.05 and 3GPP TS 27.005 specifications.

E. Control Unit

The heart of the control unit is ATMega8L, a low power Atmel 8-bit AVR RISC-based general purpose computer. Optimized power consumptions, good processing speed, small physical dimensions, and lower costs make this microcontroller a perfect fit for our purpose.

F. Network Module

The alert message can sent to remote location by various technological means like Wireless networking, Ethernet, GSM Mobile network. Of all these network technologies, the most feasible and available among all user's today is GSM module as everyone possess mobile handset. These GSM module require Subscriber Identification module (SIM) from mobile carrier to send message. Also towards controlling the module and processing these short messages, AT commands are used in Arduino IDE as defined in GSM standards. For our system, SIM300CZ GSM kit has been used . The network module has been shown in the Fig.5. It operates on the 850/1900 MHz and 900/1900 MHz frequency bands, which is available throughout the globe

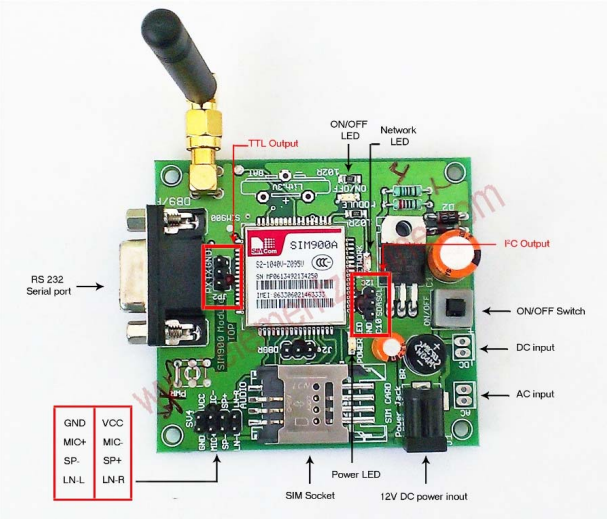

Fig.5 Physical overview of GSM module

G. Software Design

The entire functioning of Home Security system been developed using Arduino IDE which is written embedded C and built in micro C compiler. The programme is finally burnt into Atmega microcontroller for it to function.

IV. Implementation Using Arduino And GSM

The implementation of Home monitoring and Security system been implemented in Arduino Uno. PIR and DTH11 Temperature Sensor used to detect motion and temperature change in the premise towards sending warning message via GSM to owner's mobile about the presence of intruder. The complete hardware unit of the system is shown in Fig. 6 showing LM35 Sensor, Buzzer, GSM and Arduino board

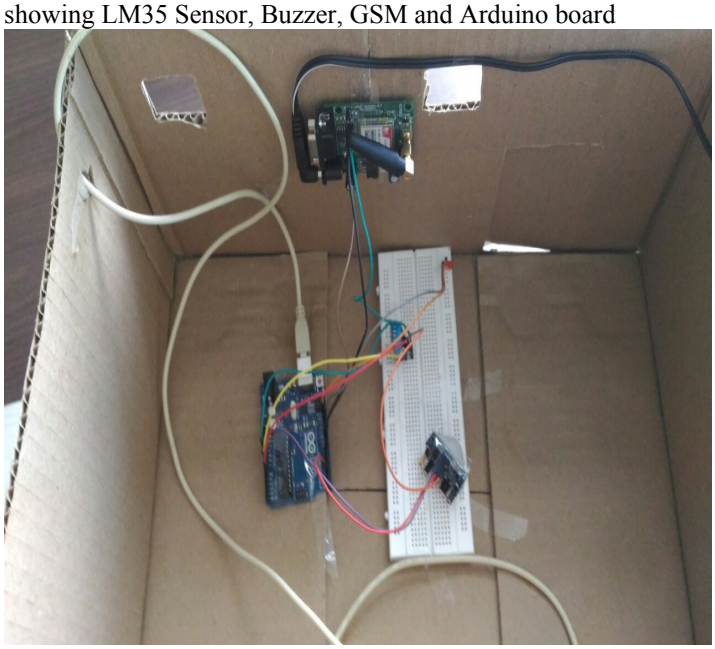

Fig.6 Hardware Unit of Home Security System

In the above figure, we see Arduino IDE connected PIR sensor for detection any motion when line of sight cut and also Temperature sensor for detecting change in room temperature based on present value. In addition the Arduino IDE is connected to GSM module for sending alert message using AT command to user's mobile phone. The complete circuit makes the home security system. Lastly the Arduino is connected via USB to computer to burn the code necessary for it to function onto Atmega Microcontroller.

So towards demonstrating our system, we ask someone to pass by PIR sensor which cuts the line of sight and accordingly message displayed on the user's mobile phone as alert message. In addition due to the presence of the intruder, there has been change in room temperature from normalcy and same is sent as another alert message via GSM to owner's mobile. These are shown as alert message for owner to take appropriate action which is shown in Fig. 7

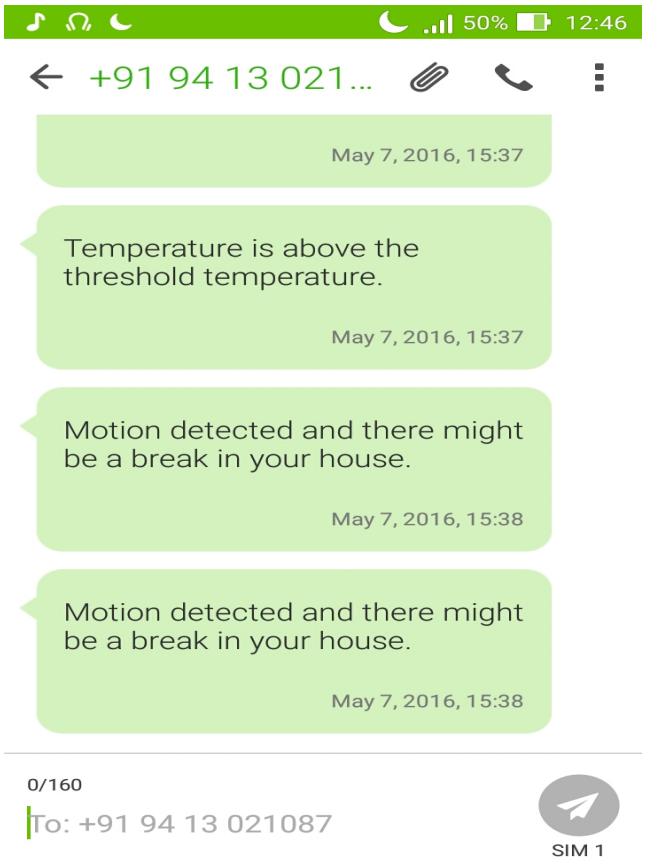

Fig.7 Alert Message

V. Conclusion & Future Work

Home Security has become a major concern these days towards securing our homes and belonging. Lots of theft and vandalizing happening around us even with best security personnel employed. So towards this lot of research been carried out by employing Webcamera, IR sensors, Ultrasonic Sensors with LCD display for alerting the personnel towards security threat. But none of these systems are economical and feasible for every common man. So we here have developed Home based Security system small prototype by employing PIR and Temperature sensor interface with Arduino Uno towards alerting the home owner via GSM for action and alert. These been carried out using Arduino IDE and GSM module and shown as screenshots. By using this system, the security services like police and fire brigade of a nearby region are also informed about the intrusion instantly and they can take steps immediately. So this system is safe and cost effective. The research is still not complete as there are more room for improvement towards future work. The research on our developed Home Security system can be further extended by adding feature such as when intruder tries to break into the house, the owner and the nearby police station are informed with the help of a call which will help to take preventive measures and protect the house from theft. Also the system should have automatic control towards Siren and also automatic door getting closed for letting the people nearby alert the presence of intruder to catch him. Also the system need to developed with more functionalities and employed in real household scenario towards comparative analysis with existing system under various conditions. Lastly the system deployed in real house hold scenario be analyzed for accuracy & time taken to complete the procedure.

References

[1]. Bangali, J, Shaligram, A. Design and Implementation of Security Systems for Smart Home based on GSM Technology. International Journal of Smart Home. 2013 November; 7(6),201-208

[2]. Huang, H, Xiao,S, Meng,X, Xiong, Y. A Remote Home Security System Based on Wireless Sensor Network and GSM Technology. Proceedings of Second International Conference on Networks Security, Wireless Communications and Trusted Computing, China, 2010,535-538.

[3]. Singh, A, Yadav, A, Singh, H.P, Dubey, S.K.GSM Based Security System. International Journal of Advanced Technology in Engineering and Science. 2014 April; 2(4),81-84.

[4]. Singh, A, Pal, A, Rai, B. GSM Based Home Automation Safety and Security System Using Android Mobile Phone. International Journal of Engineering Research and Technology, 2015 May;4(5),490-494.

[5]. Potnis, M, Chimnani, A, Chawla, V, Hatekar, A. Home Security System using GSM Modem. International Journal of Engineering Research and Applications, 2015 April; 5(4),143-147

[6]. Arduino Uno R. http://www.electroschematics.com/7958/arduino-uno-pinout/ .Date Accessed: 02/03/2016

[7]. GSM Module. http://www.circuitstoday.com/interfacing-gsm-module-to-8051. Date Accessed: 02/04/2016.