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An Integrated Vision Based Home Security System

G.Gayathri
P.G. Scholar (M. Tech),
Department of ECE,
Modugula Kalavathamma Institute of Technology for Women, Rajampet, Kadapa District.

R.Aruna
Assistant Professor,
Department of ECE,
Modugula Kalavathamma Institute of Technology for Women, Rajampet, Kadapa District.

ABSTRACT:

Throughout history, humans have sought to protect their life, property and possessions. In early societies, guards, watchdogs, traps and even noisemakers provided security. Fire was used to baffle wild animals and keep them at bay. As centuries passed and human accomplishments became more noteworthy, some rather engaging and sophisticated devices were developed to insure man's security. But until the discovery and harnessing of electricity, no device or protection scheme could be expected to provide any real degree of assurance or consistent peace of mind. Now when everything is available to us why not design something that provide us complete security .The very basic of this started with the simple alarm system and today it include capturing image , notifying suspicious activities etc. Commercially available Security systems are too expensive to be used by common population. Here I present a security system that provides all the facilities needed for security like activation of an alarm, capturing an image of intruder, along with sms and email notification at a very low cost the proposed system proves the security over intruder, dangerous gas leakage, and also provides controlling of electrical loads.

KEYWORDS: Security threats and vulnerabilities.

1.INTRODUCTION:

Security is the degree of protection against danger, loss, and criminals. It must take into account the actions of people attempting to cause destruction. There are different types of security mainly IT realm (Application security, Computing security, Data security) , Physical realm (Airport security, Port security/Supply chain security, Home security, Physical security) , Political (Homeland security, Human security, National security) ,Monetary (Financial security). The need for Security systems have rapidly grown from being specialized for high-risk areas (like banks, companies, governmental institutions), to be available and demanded rapidly by the average public.

Some of the common characteristics of a home security system as follows 24 hour monitoring, Ease of use, Difficulty to hack, Reliability, Heat, motion sensors, Ability to control doors, gates, etc , System that monitors burglary, fire and medical emergencies, Efficient, fast and precise notification system. All people value security. They like to feel safe. We note that people, both at home and at the office, spend a large factor of their budget for security. Statistics show that in 2000 every 50 out of 1000 households in America was robbed (www.ojp.usdoj.gov). This was mainly by means of illegal entry by force, such as breaking a window or slashing a screen or by entering through an unlocked door or an open window. Therefore, we have seen a trend in the increasing need for home security systems. There are various wireless and wired alarm systems. Typically a home alarm kit will include a control panel, alarm/siren, window and door sensors, plus at least one motion detector. Depending on the type of home alarm system, the price can range from just under a $100 to hundreds of dollars. In recent years, technology of such systems has allowed for lower prices. In addition, some home alarm systems can incorporate home automation, smoke detectors, freeze alerts, and glass break detectors. Small businesses have rapidly grown and expanded and the need of reliable, cheap and effective security system is becoming a must, not only for the business owners, but also at homes. Well, here the problem arises, despite their commercial success, most if not all commercially available devices target large corporations and companies, neglecting the need for this system to the home residents and small business owners .This doesn't mean that it is not available for them, but it is way pricy for normal consumers. Here we are trying to present a security system that provides a security system basically for homes and at a very low price. Now a day there is a lot of burglary happening across the city, the reason behind that is police can't make out the exact location of burglary for example if burglary is happening inside any area in the city, police will get information after the incident had happened, and then they can't find out the way the thieves had went.

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Now so many alarm system and security systems are emerging in our markets using high-tech techniques, but still these systems have some of the limitations.

2.RELATED WORK:

As discussed above, there are various home security systems designed and also working properly as per the need of the requirements of the owner. The earliest home security systems date back to the early 1900's. These systems were generally expensive and very hard to monitor. In the past 100 years as technology has changed, home security systems have also changed. Early home security systems were very expensive and surprisingly ineffective. They were very similar to car alarms.

If the security system was tripped it caused a loud siren to sound, but in order to monitor these systems you had to be within hearing distance. As time passed and more and more consumers purchased these local alarm systems false alarms increased at such a rate that many times when an alarm would sound it would be neglected. Intruders quickly learned how to defeat these systems making the home security system essentially useless.

Previously, simple alarms systems are there which were placed at doors, windows, lockers, automobiles etc and gets activated on any type of intrusions. [3]. Research in security systems has gained momentum in recent years. There was high increase in need of security and as per the new requirements of the customers, high tech security systems that include alarms, sensors on Passive Infrared (PIR) based technology, electronic access control systems, or Video Surveillance System (VSS) cameras, security systems using email notification, sms using GSM technology etc. are being designed. A number of publications focus on the security and privacyimplications in various applications .

Ahmad Masri has used an inexpensive Ethernet chip calledthe WIZ5100 to create a simple and flexible Ethernet based security system which senses human movement using PIR sensor and immediately sending email notification to the owner. A web based home security system is also exists where all home appliances can be remotely controlled by the owner via internet .This can be an innovative security system that works properly even in absence of the owner.

2.1SECURITY THREATS AND VULNERABILITIES:

Necessity is the mother of invention, i.e. as human get use to present technology, the expectations to get more better arises and day by day there is an advent in the technology. Let us take the example of the security systems available in the market. There is variety of them with different costs to fulfill the needs of the human. The security threats can be of any form like Domestic thefts (in houses, private buildings), thefts in small business areas like shops, offices, etc, thefts in banks, government offices or any automobile thefts. The loss can be ordinary or sometimes very rigorous. These danger and risk possibilities with the belongings and valuable things are everywhere that baffles their owners at each point of time. Everyone has to take some of the safety measures like fencing the area with anti thefts equipments like spikes on walls, security guards at the doors, electrifying the exits, etc. But all these are common technologies and burglars or criminals can easily deactivate them as they are now fully aware of the weakness of these systems. These systems are just to prevent the mis hapenings but if in case any kind of threat happens barring all the setups then the present technology is useless. For this our proposed work can be taken into consideration that will sense the intruder and buzzes the alarms as the normal security systems and also further provide information like image of the intruder, sms notification that can be used as the evidences of the incident and for the identification of the intruder. Now the valuables are safe even in the absence of the owners.

3.PROPOSED SYSTEM :

A model of smart home is prepared as shown in Figure bellow to test the prototype of developed system. It consists of various sensors like IR, temperature sensor, gas sensors, light sensor etc. Home appliances like motor also connected to make the home energy efficient.The proposed system is controlled by an ARM7 microcontroller. It collects information from the sensors, makes a decision and sends SMS to a corresponding number by using a GSM modem. If it finds any interruption in its sensors (for example IR sensor) then microcontroller will send a SMS to the home owner and send a command to PC to get image from webcam and an email. In the same way if the temperature is increased above certain point or gas sensor sensors is ON, a SMS will be sent to the home owner giving the indication of fire.

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ARCHITECTURE OF PROPOSED SYSTEM:

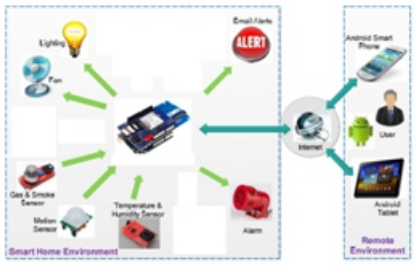

Fig. 1 Schematic image of a model home security system

BLOCK DIAGRAM OF PROPOSED SYSTEM:

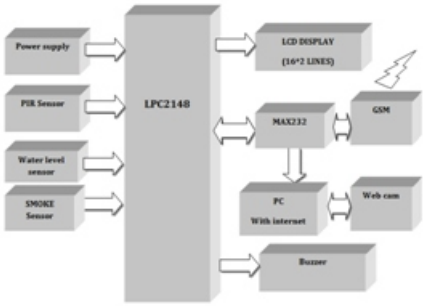

Figure 2

4.HARDWARE DESCRIPTION:

Hardware Design Hardware of the system contains sensors, ARM7 microcontroller, GSM module, Buzzer,webcam in system programmer and relays to control the appliances. The system design is shown in Figure 2.The core of our proposed security framework consists of the following components as shown in fig. 2.

1.Human Motion Detector
2.Smoke detection system
3. Image capturing Subsystem
4.Emailing Subsystem
5.Sms Sending Subsystem

HUMAN MOTION DETECTOR:

This is the main module of our work that will sense the human movement through the designed hardware which is installed at the exit points, i.e., doors, windows, etc. The components like microcontroller, IC's, PIR sensor, transformer, leds, resistors, capacitors, etc are connected to each other on a PCB forming a well designed circuit. This setup is connected to a computer with DB9 connector and USB connector.

IMAGE CAPTURING SUBSYSTEM:

This module is designed in C sharp language. Its prime function is to receive the signal from the microcontroller and then capture the image by switching on the web camera attached to the computer. We are performing these functions by using two C sharp files. First file is to receive signal and the other one is to start camera and take picture.

Receiving signal from Controller:

This code interfaces our controller with the computer. In this program we are initializing the connection using COM port serial connection. The microcontroller senses any human interruption and sends signal to the serial port. We then read data from this serial connection and perform desired operation.

Capturing Image:

After receiving the signal form the controller now the job is to process the data and capture the image. The WEBCAM used is initialized and it continuously captures the frame. Now the job is to grab the frame when ever any signal is received, when any signal is received the code call the function Takeshot this function grabs one of the continuous frames and convert it into a still image .

EMAILING SUBSYSTEM:

Java provides an efficient and reliable method for sending mail, using various SMTP Servers available to us. Here we are using Gmail's SMTP Server. Gmail offers are a portable SMTP server to send mail from any network for any email address.

SMS SENDING SUBSYSTEM:

This module is used to send SMS to the owner's mobile number when ever any intrusion is detected.

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To perform this operation we are using a GSM modem, using Bluetooth we are connecting this modem with the serial port of computer, we then use the AT commands to send SMS. To perform this operation various AT commands are used for initializing and setting the mode of GSM modem. Required AT commands to do this job are
AT: This is the basic AT (Attention) command used to initialize the modem to receive further AT commands. After this command only we can configure our modem to send SMS.\

AT+CMGF: This command is used to set to text mode, this mode is used to send text message from the modem.

AT+CNMI: This command is used to store the SMS-DELIVERS and the SMS-STATUS-REPORTs are displayed.

AT+CMGS: This command sends SMS to the mobile. This command is like the submit button or the send button as we use in mobile phones to send SMS.

5.IMPLEMENTATION:

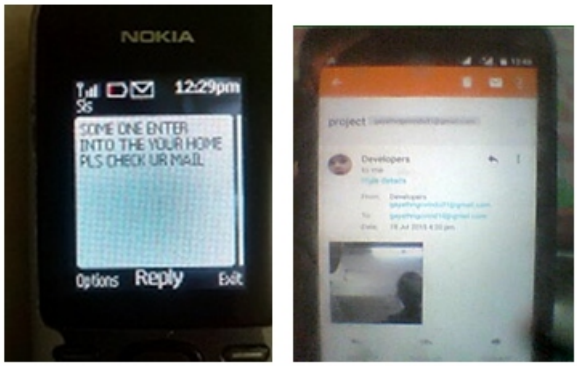
Object oriented methodology is used in our work to provide flexibility and independence in working of each module. Our programs must be well synchronized so that they can work properly with the hardware part. The system is like a contraption any mismatch in sequence may lead to complete failure. So each and every part of the system must be implemented properly and should finish their process in specified time. The whole implementation of the system starts from the detection of the human movement and finally we get the result as the image of the intruder in the email and SMS on the user mobile. A main java class is designed in which the classes designed for the modules is called by creating respective objects in this main class. The system can be divided into certain steps and these steps must be executed in this order only.

STEPS:

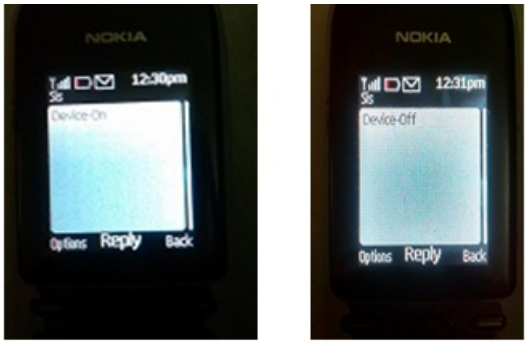
1. Firstly hardware part after getting the power supply, switches on the PIR sensor to detect any intrusion. Detection doesn't mean mere playing of buzzer, it must also send signal to the computer to perform further operation. Whenever any such intrusion is detected a signal is sent to the serial port of the computer. We are setting a delay of about a minute so that all functions performed on the software part will execute properly. After detection signal is sent to COM port, the signal sent here is 'A'. This character is further used by the software program to perform further operations.
2. Now the job is to read the received signal i.e. 'A' from the COM port. A server program run continuously and waits for signal from the hardware. Once get the signal the system capture the image.
3. After capturing the image our job is to match the image with the stored images. We are performing this operation using C sharp. Firstly no. of images that has to be stored in the image set is defined. C sharp code Incase the image is not identified we will run the codes for sending SMS and sending Mail with the captured image.

6.RESULT
RESULT:

The smart home system proposed in this paper was fully developed and tested to demonstrate its feasibility and effectiveness. The screenshots of the smart home app developed has been presented in Figure bellow.



Here we also used this system to control the devices by giving the missed call it will give response by giving the sms alert whether the device is on or off.



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7.CONCLUSION AND FUTURE SCOPE:

Our work presents a possible solution to the real-time problem of protecting are valuables in our absence.Here a successful system is designed that senses the presence of any unknown person and notifies this to the owner of house in his absence through mail and SMS. More over we are fulfilling the most important motto of making a low cost security system and we are successful in making one. Human requirements never achieve a saturation point; every one needs something more than what they have. Same is case here we can add many things to our proposed system. Some of these future improvements that can be achieved are

1. We can provide storage for storing the video of the intruder so that we can refer it at latter stages and find the intruder.

2. We can also provide facility that the owner can receive a call along with an SMS, as call is much more efficient then SMS.

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