

# HOME ACCIDENTAL & INTRUSION MANAGEMENT SYSTEM (HAIMS)

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**Abstract:** There are different accidental problems that may occur at home like LPG leakage, fire breakout, short-circuit, which may leads to disastrous problem. There may be chance of unknown or unauthorized person which may try to enter into the house for bad intension. Generally at home we install MCB for protection from shock but it only works for short circuit and shocks but can't protect appliances from getting damage due to sudden peaks of high voltage .This high voltage may cause major damage to appliance as well as may lead to fire and loss of life.

This paper deals with present situation and risk mentioned above and provides better and safer solutions. This may reduce fear and make life tension free and relax. Our system monitors the environment by collecting data about concentration of LPG and smoke components present in air and when the concentration gets above set threshold it trips MCB, open window and also provide notification to owner via SMS and Web notification. System also keeps track of AC voltage and as soon as it goes above 250V it just trips MCB for appliance safety. System captures and performs analysis of outside activities and responds as per condition.

**Keywords:** *Android, Automated Home Security, Image analysis, Microcontroller, Sensor, Web services*

## I. INTRODUCTION

There are different accidental problems occurring like LPG leakage, fire breakout. Also if there is no one present at home then there is possibility of any unknown person or thief enter into house. Moreover generally at home we install MCB for protection from shock but it only works for short circuit and shock but do not protect appliances from getting damage from high voltage. This high voltage may cause major damage and also may lead to fire, for protection from this MCB need to trip before any disaster occurs.

This project provides an adaptive model for home security and provides solutions for all present situations and risk. Also

this project will also provide web support and mobile phone support and save the costs of accidental damage with minimal human intervention. Moreover project uses very less power consumption.

This project deals with personalized recommender systems based on hybrid approach to deal with present home security problems and develop better and safer solutions and making life tension free.

## II. TECHNICAL REVIEW

In recent year, there are different implementations going on for home automation system for residential home, hotels to make life easier and safer to live.

There are different researchers who are working on wireless technology and mobile for security purpose. System remotely

controls appliances, intrusion-detection, security system and auto-configuration such that system automatically adjusts the environment [1]. Also remotely detect harmful gases with and arduino [2]. N. Sriskanthan[7] explained the model for home automation using Bluetooth via PC but failed. Unfortunately the system lacks to support mobile technology. Sending notification/SMS via GSM [8] has been used. Also researchers has contributed for processing on raspberry pi for different home automation [10]. Different android application have been introduced for uploading of data from arduino connected through internet on application[9]. Authentication Test is a new type of analysis and design method of security protocols based on Strand space model, and it can be used for most types of the security protocols. After analysis the security, the proposed protocol can meet the RFID security demand: information confidentiality, data integrity and identity authentication[12]

### III. SYSTEM DESCRIPTION

The main components of system are microcontroller Raspberry pi, Arduino uno for processing and handling different actions, GSM module for sending SMS. There are different modules working with system are as shown below fig a. Following are modules in Home Automation and Intrusion Management System:

1. Flame and Temperature detection module
2. Gases detection
3. Motion and camera module
4. Face recognition module
5. RFID authentication module
6. Notification module

#### 1. Flame and Temperature detection

It provides digital output as HIGH or LOW. This sensor has very high response time of 0.05 sec. It is infrared based sensor. Fire emits large amount of infrared radiation .This sensor takes this infrared radiation as input and when this value is very high then it generates HIGH signal depicting FIRE. Whenever there is HIGH signal it automatically

triggers power cutting system and sends push notification to user on website, mobile app as well as SMS. If in same case temperature of room is above 60C then it sends SOS message to Fire Station.

#### 2. Gases detection:

It provides Analog output as ppm values. This sensor has very high response time of 1sec. It is chemical based electronic sensor. If there is LPG leakage or increase in harmful gases then concentration of gases increases in environment. Whenever there is high concentration of gases it automatically opens the window, triggers power cutting system and sends push notification to user on website, mobile app as well as SMS via GSM.

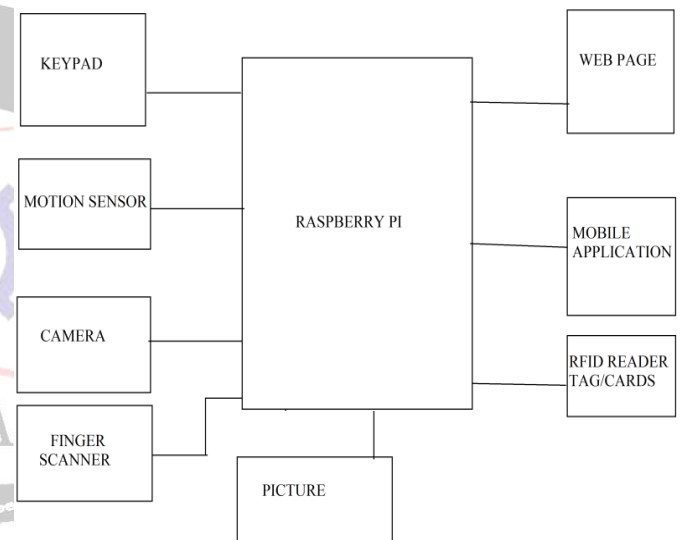


Fig a. Overall Architecture (Raspberry pi)

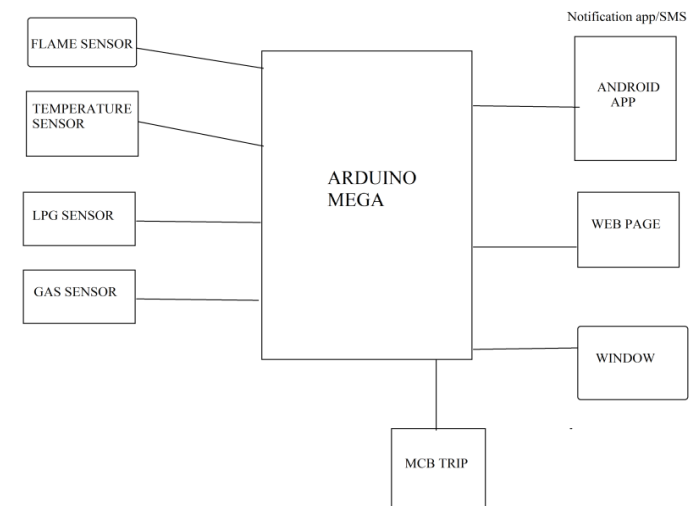


Fig b. Overall Architecture (Arduino)

### 3. *Motion and camera module*

Motion sensor provides digital output as HIGH or LOW for detection in motion. This sensor has very high response time of 1sec is passive sensor (PIR). Human body releases heat energy in form of Infrared Radiation. This motion sensor compares the IR radiation to change in output voltage; it compares this resultant voltage and triggers the detection in motion[13]. Whenever there is HIGH signal it give notification to raspberry pi to take pictures via camera.

#### 3.1 *Camera*

Camera can be used to take video, as well as stills photographs. When camera receives signal from raspberry pi it will capture pictures and upload online for user to see; it will also save the pictures in raspberry pi. It will capture picture whenever door opens or closes.

Also there will be a 3\*4 matrix keypad where we can punch any secrete key into matrix keypad. This keypad has 12 buttons, arranged in a telephone-line 3\*4 grid. Finger scanner that will accept finger print from person for security purpose if matched will be authenticated.

### 4. *Face recognition module*

The images are stored in raspberry pi by user for face recognition samples. These samples are used by algorithm to compare recently taken photo by raspberry pi camera. This algorithm use coordinate map ratio technique. If % of match is above 60% then face is recognised and data is logged online.

### 5. *RFID authentication module*

It uses 2 stage authentication It uses 2 encryption algorithm 2 different keys each of 1536 bits are used for authentication and validation It has 15 blocks of 64 bytes with each block require 2 authentication keys to read its data.

### 6. *Notification module*

GSM can communicate with controllers via AT commands. When AT commands are called by arduino, SMS is send via GSM APP notification. Low power consumption 1.5 mA.

Android application will show notification and also user to view current activities in home.

#### 6.1 *Web site*

Web site will allow user to register and upload images of family for security purpose. Web site will display and allow to download all log files. User may take actions though website; all data will be logged at server on daily basis.

#### 6.2 *Power backup*

Power Backup will be provided through UPS in case of power failure. By providing power backup system will never stop.

## IV. DESIGN COMPONENTS

The Home Automation and Intrusion Management System (HAIMS) is combination of both hardware components & software components which are classified as follows:

### A. *SOFTWARE COMPONENTS*

- I. Android studio: For development of mobile application
- II. SQL Server 2012 : Secured Data Bas
- III. Arduino IDE: Arduino programming for microcontroller
- IV. Raspberry OS: Platform to run Raspberry Pi 3 and support data processing
- V. Python Compiler: For running and execution of python programs
- VI. Visual Studio 2015: Website creation on asp net with C# coding..

### B. *HARDWARE COMPONENTS*

#### **Raspberry pi 3:**

It is credit size single board computer (microprocessor) used for complex processing like image processing. It usually has LINUX operating system. Fig c.



Fig c. Raspberry pi 3

**GSM SIM 900A module**

This is an ultra-compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption Fig e.



Fig e. GSM 900A module

**Arduino UNO**

Arduino UNO basically is a microcontroller .This system provides sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ("shields") and other circuit's Fig d.



Fig d. Arduino UNO

Other hardware components used are:

- I. Raspberry pi Camera
- II. Wi-Fi module
- III. ARDUINO: Microcontroller
- IV. Smoke Sensor MQ-2:

MQ2 is basically detects LPG, butane, alcohol, hydrogen, propane, methane, and smoke.it can be implemented in home and industry to detect gas leakage[14].

- V. LPG Sensor MQ-5:

It is suitable for detecting H2, LPG, CH4, CO, Alcohol

- VI. Motion sensor:

It is used to detect the motion HIGH when detects motion

- VII. Temperature Sensor DTH122:

Voltage output is provided by this temperature sensor which is linearly proportional to the Celsius temperature[15].

- VIII. Flame Sensor LM 393

- IX. Alarm (buzzer)
- X. Tripping Circuit

Sensors used for the HAIMS network are as follows with description are as follows (Table 1).

**Table 1.Sensor Information**

Sr no	Sensor name	Sensor type	Description
1.	Smoke sensor(MQ-2)	Analog / Digital	Detects harmful gases
2.	LPG Sensor(MQ-6)	Analog / Digital	Detects lpg gases
3.	Temperature Sensor (DTH22)	Digital	Detects rise in temperature
4.	Flame Sensor(lm 393)	Digital	Detects IR rays
5.	Motion Sensor(HC-SR501 8051)	Digital	Detects motion

## V. ALGORITHM

The idea is to represent this images into a low-dimensional space for face recognition when person press door bell.

Steps in algorithm for training data set.

- 1) Collect the negative face dataset who won't be allowed to enter into the house.
- 2) Collect the positive face dataset who would be allowed to enter into the house.
- 3) Let us consider a dataset of N images of size K\*K of negative faces and M images of positive faces of size K\*K such that  $N \gg M$ .
- 4) Set of positive faces will have 10 images of same person at different expressions for best results.
- 5) Now unfold each image (greyscale) of size k\*k into k<sup>2</sup>-dimensional vector
- 6) Arrange this images into matrix where each column represents individual images so output image will be K<sup>2</sup>\*N, this will be done separately for both positive and negative set of images.
- 7) Now we will calculate the mean image and remove it from each image vector and let resultant dimensional vector be A of size K<sup>2</sup>\*N but we will save the information of mean image for future use.

Now we will calculate  $C = (A^T) * A$ , this creates low-dimensional space of N\*N size. This will be used as trained dataset.

### A) Face Recognition Using Eigen faces

Given an unknown face captured by camera, the location of face is detected and cropped and resized to K\*K, let's call this image as I, then we will use following steps:

Step 1: normalize the image by subtracting mean image

$$\Phi = I - \text{mean}$$

Step 2: project  $\Phi$  on the eigen space to find matching face vector from trained dataset created

$$\Phi = \sum_{i=1}^K w_i u_i \quad (w_i = u_i^T \Phi)$$

Step 3: represent  $\Phi$  as combination of known eigen face vectors say it as  $\Omega$

Step 4: Find minimum distance  $E_r$  with similar eigen face vectors

$$E_r = \min |\Omega - \Omega|$$

Step 5: If  $E_r < \text{threshold}$ , then I is recognized as face from the training set.

The distance  $E_r$  is called distance within the face space.

Images Generated by above algorithm.



Mean image

Positive image

Negative image

## VI. CONCLUSION

This project deals with personalized recommender systems based on hybrid approach to deal with present home security problems and develop better system that would be able to deal with major problems automatically. This system is scalable as it can be implemented at other place like restaurants, cafes, colleges, schools and offices etc. with similar conditions and risk with very little modification. Security problem were solved by using different security mechanisms which could be easily be implemented in existing environment with little modification. Health problem are also solved by reducing some amount of stress and by monitoring environment for proper care. Combine solution to major problem reducing cost to buy different system and monitor separately as all the data collected by system will be uploaded on website where user can view and also take action from anywhere. Also this system consumes minimal power.

## REFERENCES

- [1] Prof (Dr) Khanna Samrat Vivekanand Omprakash ” WIRELESS HOME SECURITY SYSTEM WITH MOBILE” on wireless communication and phones.
- [2] A Mobile Gas Detector with an Arduino Microcontroller Arkadiusz ŚPIEWAK, Wojciech SALABUN Department of Artificial Intelligence Methods and Applied Mathematics, Faculty of Computer Science and Information Technology, West Pomeranian University of Technology, Szczecin, ul Żołnierska 49, 71-210 Szczecin, Poland.
- [3] Smart Home Safety and Security System Automated with Alerts through GSM Mobile Phone Asst Prof S B Dhekale1, Asso Prof M M Sardeshmukh2 AISSMS's College of Engineering Pune (Maharashtra, India) 1, Sinhgad Academy of Engineering, Pune2 (Maharashtra, India)
- [4] Barrie Jenkins, Peter Mullinger 2011 Industrial and Process Furnaces: Principles, Design and Operation, Butterworth-Heinemann/ICHEM series, p 329 Butterworth-Heinemann ISBN 0080558062
- [5] Jump up S P Bag 1995 Fire Services in India: History, Detection, Protection, Management, Environment, Training and Loss Prevention, p 49 Mittal Publications ISBN 8170995981
- [6] Shih-Pang Tseng, Bo-Rong Li, Jun-Long Pan, and Chia-International Journal of Computer Applications (0975 – 8887) National Seminar on Recent Trends in Data Mining (RTDM 2016) 10 Ju Lin,”An Application of Internet of Things with Motion Sensing on Smart House“, 978-1-4799-6284- 6/14 ©2014 IEEE
- [7] N. Sriskanthan and Tan Karand. “Bluetooth Based Home Automation System”. Journal of Microprocessors and Microsystems, Vol.26, pp.281-289, 2002
- [8] 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
- [9] Kim Baraka, Marc Ghobril, Sami Malek, Rouwaida Kanj, Ayman Kayssi “Low cost Arduino/Android-based Energy-Efficient Home Automation System with Smart Task Scheduling”, 2013 Fifth International Conference on Computational Intelligence, Communication Systems and Networks.
- [10] Jan Gebhardt, Michael Massoth, Stefan Weber and Torsten Wiens, “Ubiquitous Smart Home Controlling Raspberry Embedded System”, UBICOMM: The Eighth International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies, 2014.
- [11] Andrea Zanella, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, and Michele Zorzi, “Internet of Things for Smart Cities”, IEEE INTERNET OF THINGS JOURNAL, VOL 1, NO 1, FEBRUARY 2014.
- [12] Authentication Test-Based the RFID Authentication Protocol with Security Analysis 1 Minghui Wang, 2 Junhua Pan 1 School of information engineering, YanCheng Institute of Technology, No. 9, Xiwang Avenue, Yancheng, 224051, China 2 Library, YanCheng Institute of Technology, No.9 Xiwang Avenue, Yancheng, 224051, China.
- [13] GroveGasSensor(MQ2)[Online] Available: [http://www.seeedstudio.com/wiki/Grove\\_\\_Gas\\_Sensor%28MQ2%29](http://www.seeedstudio.com/wiki/Grove__Gas_Sensor%28MQ2%29)
- [14] DHT11 basic temperature-humidity ensor, Adafruit [Online] Available: <http://www.adafruit.com/product/386>.