Mayday – Automated Home Security System using IOT

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Abstract: The rise in theft, break-ins, accidents which caused due to negligence at home. Now-a-days both parents are working, leaving their kids and elderly people at home, as all make mistake kids and elderly people too tend to make some mistake which may cause accidents. It is at great concern to develop a Security and Safety System which can detect these threats and try to notify the owner so that he can prevent it well in time. The Main aim of our project is to provide Security and Safety to the user by notifying the user if any hazardous activity is taking place in the presence or absence of the user. The hazardous activities may include opening of Door, Gas Leakage in kitchen, fire in the house (due to any reason like short-circuit, negligence, etc.). It can also help to avoid wastage of electricity. It will notify the user when someone opens the door, Recognize the face of person and send the data to the owner in form of alert. If the visitor is an intruder, owner can take necessary steps to stop the person. It will also notify about accidents in home like fire, gas or smoke. Face recognition will be used to segregate between authorized user and intruder.

Keywords Security, Safety, Face Detection, Automation, IOT, Home Security Automation

1 Introduction

The safety and security is an attractive research topic due to its wide application areas in day to day life of human. In this era of automation, the surveillance system need to be fully automated and free of human intervention in order to maintain transparent and error free system [1]. Now-a-days, both parents go to work leaving kids or elderly people at home. Kids and elderly people tend to forget things such as leaving the house unlocked and leaving electrical appliances on which results in wastage of electricity and sometimes that may even result in accidents.

Every 3 minutes, a burglary, robbery or a break-in is taking place in India. In 2018, 70% of all thefts in India are home thefts while only 30% are digital thefts. In India, from 2001 to 2014 there were over 3 lac deaths due to fire, In 2015 2200 deaths and 2016 11000 deaths respectively. Top 3 reasons for fires are I). Negligence in Cooking. ii.) Heating Equipment's. iii.) Faulty Wiring.

Most of the time people tend to forget things such as keeping the door open, leaving the electrical appliances on, household appliances on which may lead to different hazardous activities such as fire, robbery, gas leakage, which may cause damage to the property and can be dangerous to one's own health. Few reasons like cylinders in kitchen are not properly monitored due to which gas leakage can take place in whole kitchen which may lead to harm.

Therefore, a system is required to maintain and avoid these hazardous activities which may cause harm to one's own life. So, a system is designed which will monitor all such activities and notify the user accordingly so that they can take proper preventions and measures. This is achieved by implementing various modules in system such as the very first module Intruder Detection System which will detect any suspicious person/activity and if the system finds any suspicious person trying to break in then simply the system will block the entry and it will be brought to notice of owner. The next module in the system is about detecting gas leakage/fire alert and this module is achieved by using MQ2 sensor which will detect the hazardous gas and its concentration. If it is near to threshold value accordingly alert will be given to the owner. The last module is to notify user if he/she leaves any electrical appliances on and leaves the home, so this can be notified to the owner immediately in order to prevent from any accident that can take place.In next section, we have reviewed various work done on our topic. In methodology section, we have mentioned the process of execution. In upcoming sections we have mentioned results and conclusion.

2 Literature survey

Home Security system [1] was designed that detects the opening of Door and sends a notification on Smartphone, Owner can control the alarm from his smartphone. This will help in giving information about visitor to the home owner which will increase security.

IoT-based smart home security system [2] was created, for alerts and door access control via a smart phone. The system allows for remote door access and voice alerting by smartphone, as well as receiving a taken image of a person at the door as an email alert.

The goal of the Gas Detection and Monitoring System [3] is to develop a system that can detect and monitor a variety of gases in the environment, as well as their ppm concentrations. When the gas concentration exceeds a specified threshold, it sounds an alarm and sends a text message to a mobile phone via the GSM module. If the user is unable to react in time and the gas concentration rises to a harmful level, the valve will be turned off instantly to prevent further damage.

According to review done by Mrs. S. S. Sankpal [4] on different technologies used in Security System most of the system are automated to avoid any errors or negligence caused by humans.

Fig 1 is a low-cost GSM/GPRS based wireless Home Security System [5]. This system has three kinds of wireless security sensors, which are mainly the door security nodes, nodes for infrared security and nodes for fire alarm. These all sensors will help to alert whenever security is compromised. GSM will digitize and compress the data and then it will send down to a channel. It consists of two microprocessors, the first one is connected to the GSM/GPRS module and also to the wireless transceiver module. It is also connected to the lcd screen and also to the led's and the buzzer. The second microprocessor is connected to the keyboard where the user will enter the password. And the whole module is connected to the power supply. House, Residential Complex and Small Offices are the major applications of this system.

In fig 2 secure door system [6], it uses human tracking method with the help of laser range finder. This laser range finder is also called laser telemeter. The objects which are at distance can be determined with the help of laser beam. It consists of automatic door, the laser range finder, the computer, an identification device and also the camera alarm dual door. The laser range finder is connected to computer with the help of USB. When the trespasser enters the region of interest, the camera captures the human moment and also counts the number of people in the region of interest.

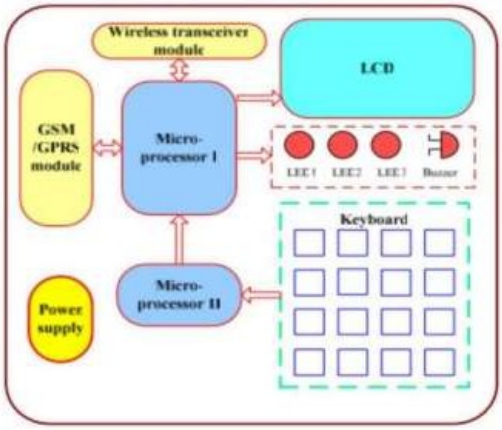

Fig 1: GSM/GPRS based wireless Home Security System[5]

If the person is not authenticated then the camera will capture the face of the trespasser and also the alarm will ring. If the person is authenticated then the door will open and he will be allowed to enter. This system is basically designed to provide high level security and help find any trespasser/intruder who wants to enter in authenticated region. This system was designed in a cost-efficient manner

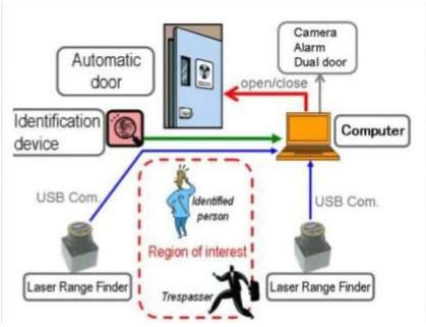

Fig 2: Human Tracking Method with Laser Range Finder[6]

The Raspberry-Pi home security system [7] is a system which consists of different sensors together called a sensor unit, Camera and the servo motors which together represents Camera Unit. Then it also consists of MCU which has Raspberry-Pi3 connected to webserver which is then connected to pc and smart device. The sensor unit consists of Ultrasonic sensor01, Ultrasonic sensor02, IR sensor. This ultrasonic sensor measures the distance of an object with the help of ultrasonic sound ways. IR sensor is Infrared sensor which sense some aspects of surrounding.

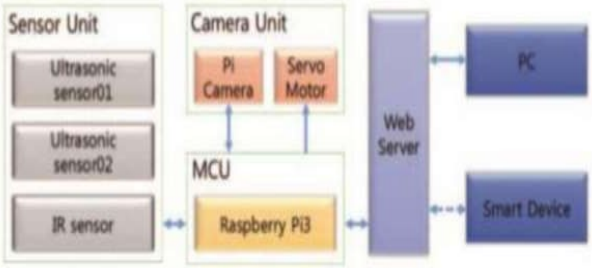

Fig 3: Raspberry-pi based home security system[7]

3 Methodology

As a person opens the door, camera starts to capture and using face recognition the individual would be categorized as a member of the house or an intruder an alert notifying the same will be sent to the user. In case of fire, gas leakage or smoke user will be notified at the early phases with all the alerts light status and room temperature will be sent. Whenever user leaves the house, he can check the light status and room temperature, if mistakenly user has left lights on or the AC's on, he can simply go in and turn it off. Images of all members would be stored in database for face recognition.

To implement Security and Safety of the user by notifying the user if any hazardous activity is taking place in the presence or absence of the user. The hazardous activities may include opening of Door, Gas Leakage in Kitchen, Fire in the house (due to any reason like short circuit, negligence, etc.). This will be achieved using sensors and other modules. It can also help to avoid wastage of electricity. It will notify the user when someone opens the door, recognize the face of person and send the data to the owner in form of alert in our application.

Visitor or User can be verified in fig 4 by password based authentication or with the help of Face Recognition. Based on these two above categories, a result will be generated depending upon which we can see that whether the user is an authorized user or an unauthorized user or an intruder. An alert message will be sent to the owner notifying that the visitor or Intruder is trying to open the door.

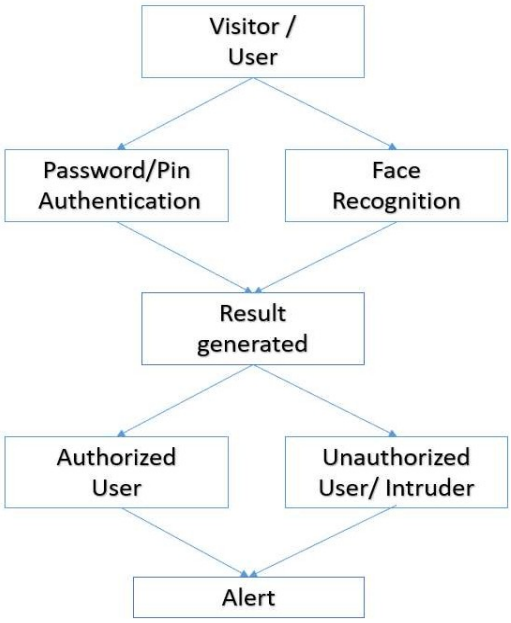

Fig 4: Authenticating the visitor

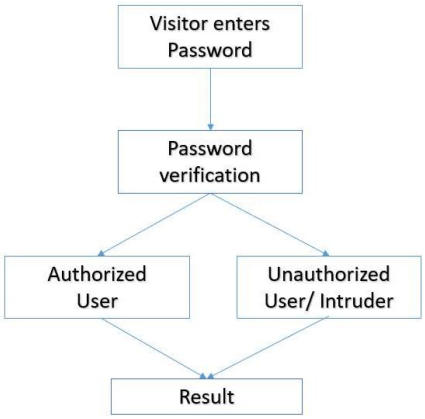

Fig 5: Password Based Authentication

When visitor arrives on the door he can enter his password. The system will verify the password and depending upon the password the user will be categorized.

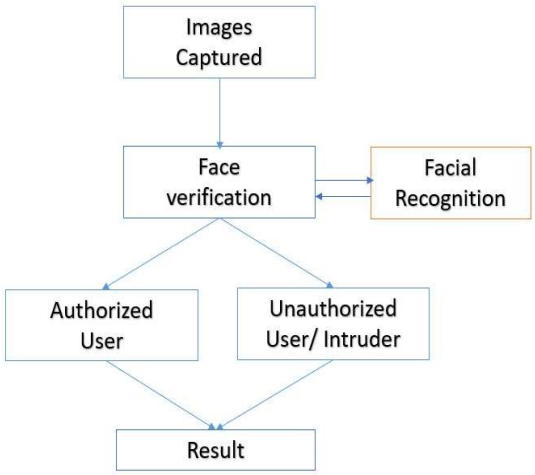

Fig 6: Face Recognition based Authentication

When visitor arrives at the door, the images of the visitor get captured. As soon as the images get captured, face verification is done with the help of facial recognition model against the images stored in dataset. As a result, depending upon this, the visitor is categorized as an authorized or an unauthorized user/intruder.

Face recognition model is created using computer vision and deep learning with haar cascade classifier[11] and local binary pattern classifier. Other model developed using deep learning models and convolution neural network (CNN) is most accurate with images. The CNN is widely used for image classification. The CNN in further depth can be used to get more accurate models.[12] The network architecture of model consists of convolutional layer followed by batch normalization and ReLU.

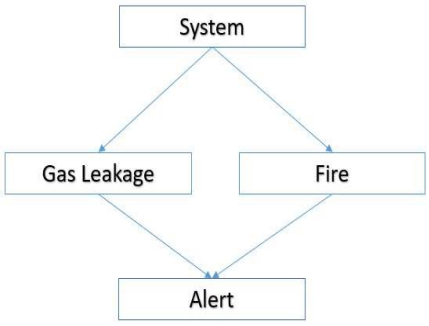

Fig 7: Gas Leakage & Fire detection

With the help of gas leakage and fire detection module system will generate the alert and notify the member's or owner well in time so that proper caution will be taken. In case of gas leakage, when there is gas leakage below the threshold a warning is sent to the user. As soon as the leakage of the gas goes above the threshold then alert is sent to the owner.

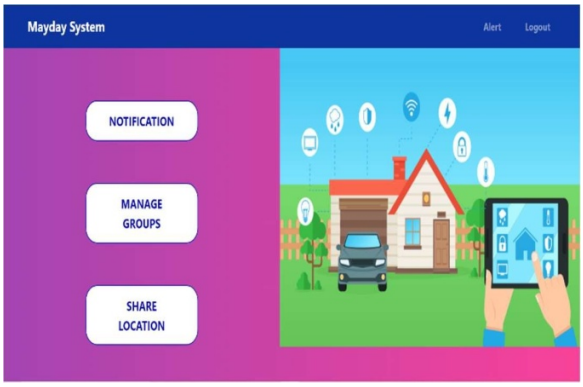

Fig 8: Home-Page of the website

The above figure shows us the webpage of the MayDay system. In this, we can see the notification, manage groups and share location buttons. On clicking the notification button, the user can see all the notification received by the system. On clicking the manage group button, the user can view or manage different groups in which he/she is part of. And on clicking the share location button the user can share the location to other members of the group.

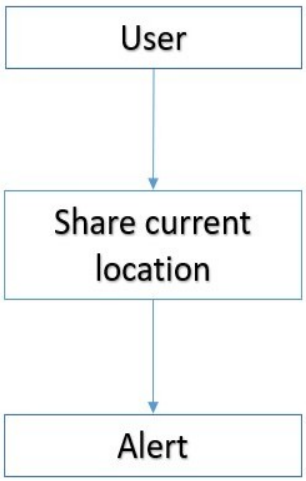

Fig 9: Share Location

Whenever the user clicks on the share location button, the location of the user along with the username gets shared to all the groups he/she is present in. The other group members receive an alert which contains the current location where the user is stranded.

In the fig 10 we can see that, we can add members to our group. On writing the username and clicking the add member button, the user can add any member to the group. Also, we can see who all are the participants of the group, and can also view the member's profile.

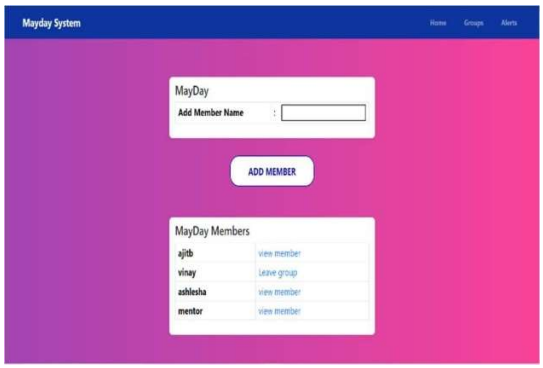

Fig 10: Manage Group

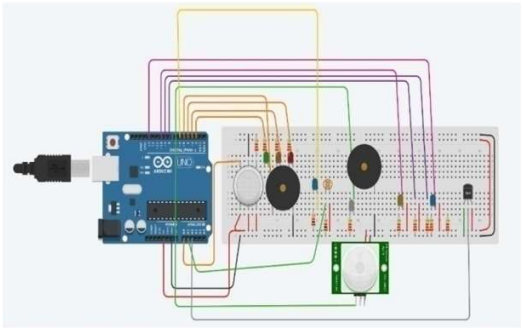

Fig 12: Sensor Module

4 Result

The Proposed Method solves the problem of Security and Safety of the user in a Residential Complex, working environment and minimize the problem occur due to intruder and other accidents caused due to negligence.

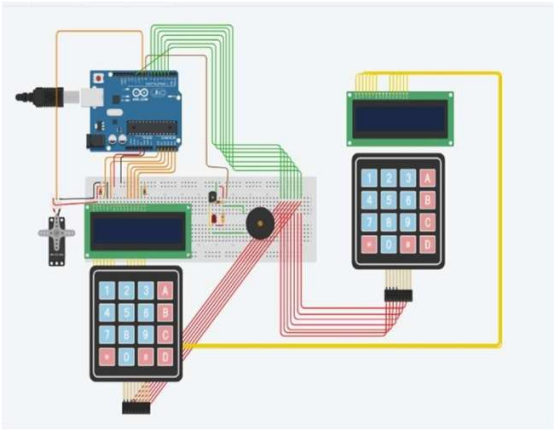

Fig 11: Password Validator Module

In figure 11 we can see that, we have to enter the password in the keypad while entering and exiting through door.

In figure 12 we can see that the different sensors used in this system. These sensors collect the data and system processes the data collected to send the alert to the user. There is the mq2 sensor, PIR sensor, lm35 sensor which collects the data and system generates the alert and sends it, to the user during the time of the crisis.

In figure 13 we can see that, the alerts are being sent by the system whenever there is gas leakage, door unlocking, or there is fire the place. We can also see that; we receive the location send by the user in our group.

MayDay

User	Alert	Lgt	Tmp	Date/Time
SYSTEM	GAS LEAKAGE	on	34	2022-02-26 21:26:27
Gauri	Door Unlocked	on	36	2022-02-26 21:24:42
SYSTEM	GAS LEAKAGE	off	17	2022-02-26 21:24:04
SYSTEM	FIRE	off	39	2022-02-26 21:23:57
vinay	Shared location rait, Mumbai 400059		0	2022-02-02 11:50:35
ajitb	Shared location Thane, Mumbai 400059		0	2022-02-01 22:53:22
SYSTEM	FIRE	on	56	2022-02-01

Fig 13: Alert Page

In fig 13 we can see that the alerts such as the door unlocked, gas leakage, fire and the location of the user are sent to the people along with the status of the lights, temperature and the date along with time. Thus, the user is notified along with the status of these things keeping the user safe and secure from different threats and intruder.

Therefore, the user who uses this system is constantly updated of all the current status of his/her home thus keeping the property safe.

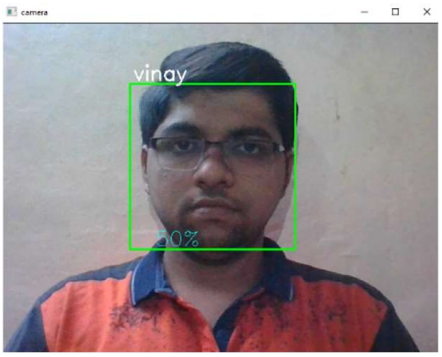

Fig 14: Face Recognition

In the above image, we can see that when a person opens the door, the camera starts to capture the image of the person and checks whether the person is authorized or not, depending upon the accuracy of the facial recognition of the person.Depending upon this the person can be recognized as an intruder or the authorized visitor. Thus, the burglary or the break-ins can be prevented and the house can be safe.

4 Conclusion

The Proposed Method solves the problem of Security and Safety of the user in a Residential Complex, working environment and minimize the problem occur due to intruder and other accidents caused due to negligence. Thus, by developing MayDay System it provides Security and Safety to the user by notifying the user if any hazardous activity is taking place in the presence or absence of the user. As user will be notified during/prior to the action of incident he will have a greater chance to stop/ prevent it. In future the system would be enhanced to make an accurate activity detection and classification model.

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