

Smart Home Security System

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Abstract: *A smart home security system normally connects controlled devices and sensors to a central hub. The user interface used for control of the system uses wall-mounted terminals, desktop computers, a mobile phone application and in some cases Web interface that may also be accessible off-site using Internet. These systems typically include a number of sensors and cameras placed throughout the home, as well as a central control panel which allows user to access and control the system remotely. The system helps saving a fortune along with many people's lives*

Keywords: home security system

I. INTRODUCTION

The 21st century is the era of science and modern technology. While keeping with the rapid change of time, the technology of the Home has been modernized a lot. Now a days maximum home appliances are not manual but automated. The concept of Home Automation was first introduced in 1889 with water heater. The uses of Home Automation increase day by day after that. Now-a-days Home Automation is widely popular and made a good position in market and it gives a greater field to work and research for the engineers. It has been predicted that within 2022 the overall market value of Home Automation will become more than 10 billion US \$. Using the concept of Internet of Things, it becomes really flexible and user interactive. Various types of wireless network technology such as an internet, WIFI, GSM makes the Home Automation system more effective. Using these technology home appliances are easy to control from away through the mobile application or browser. In order to build a smart and intelligence home is now easily possible by combining IoT and Home automation system. In this project we design Home Automation project based on IoT using the Raspberry pi and Ethernet shield to control various electronics appliances and make a security alarm. The central hub is connected to internet using Ethernet cable or wifi and the mobile device or pc is connected to internet by wifi.

II. PROBLEM STATEMENT

The main problem arises from the need for constant user intervention to make changes to the devices in order to get the desired output from the devices that control the environment or any service in their houses. The user might find these tasks tedious and hence we need to eliminate this. Reducing the rate of false alarm in home security system to make it more efficient and reliable is also important. The cost of the system is also a factor it is not used in middle class, so making it affordable is necessary. People with disability should also be able to use the system easily. The system has to adapt with different houses and the design have to be resistant to tampering to ensure that they are not easily the current image and the stored one.

III. LITERATURE SURVEY

In the Internet of Things platform based home security system, the main focus is on protecting our loved ones and our valuable items at home. Currently a large number of IoT based home security systems are available in market. According to the literature and market survey, the most basic parameters of Internet of Things enabled home security system are 24x7 monitoring of our home even from remote places, real-time, affordable and precise notification system suggested by various researchers.

Following are some of the contributors of various research done in IoT domain.

- Pushkar Chowdhury (2013) describes IoT based remote access control system for authorized person at door using raspberry Pi. Internet connection, raspberry pi, camera and PIR sensor are the most common components that are used in the above references system. Passive Infrared Sensor is used for detection of motion at the door and camera is used to capture the image according to motion. The system gives the remote access for authorized person at the door step. Comparatively very less work is done here on the human face recognition and object detection algorithm.
- Shaik Anwar (2016) explains the IoT based door motion accessibility and voice based alerting system through the smart phone for home security system.
- Tanaya and Kishore (2016) explains the up-gradation of home security system with face recognition technique using the haar algorithm in open CV Python for the detection of authorized person or object detection.
- Shreyas Ghodke(2017) explains in their paper how the IoT network based system send the captured image of any person coming close to the door for home security to the owner.
- Ruby Dinakar (2018) proposed IoT based automated home security system using Raspberry Pi which gives intruder detection alarm system and notification to the authorised system.
- R.Rani (2018) explains the IoT based home security using Raspberry Pi which give SMS alert to owner through WAY2SMS and image of the unauthorized person via email

The focus of the above studies is not to conduct a dedicated systematic literature study on smart home safety and security systems. However, our paper presents a comprehensive and systematic literature study with a very well-defined research to investigate various aspects of smart home safety and security systems, such as applications, architectures, algorithm, enabling technologies, challenges with possible solutions, and possible research gaps. Thus, it also extends the details of other works on this topic by addressing many important research questions that are not addressed in the literature. Potentially, this study provides a much detailed survey on the development and use of smart home safety and security systems.

IV. METHODOLOGY

Motion detection is what we used to identify if there is somebody at home or not. We know that there are curtains which can move, and maybe pets, but a pet is (almost) always smaller than a human so we can create an algorithm which can only detect humans and big changes on the webcam feed frames. An interesting approach would be with Deep Learning but because I did not have a big dataset I can rely only on the Classic Image Processing methods

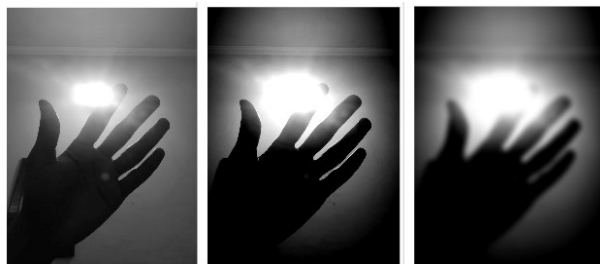
When the detection starts, it stores the first image that the camera captures. Then we convert it to a grayscale picture, apply Histogram Equalization and Gaussian Blur. Then the camera always captures new images and we create a difference image between the current image and the stored one. Of course we apply the same gaussian blur and grayscale conversion to the new images too.

Here see the steps with example:

Histogram equalization – This is useful if the image is too dark or too bright

Gaussian blur – I use it for noise reduction

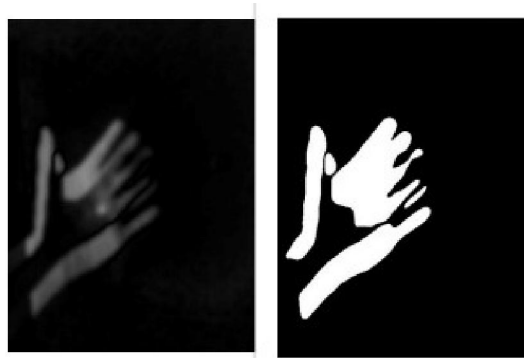
Grayscale – It is easier and faster to work with 2D arrays and not 3D arrays



Greyscale->histogram->blurred



Processed Image



Binary Image

On the distinct images we can find the contours and we can have the choice to choose the largest one. With a high probability that it will be our unwanted human being. For that we can calculate the contour area and we can set a threshold value for detection. So below that value it won't be counted as a detection. Above that value we can snap a picture and upload it to our Firebase project and notify ourselves because we just caught an intruder.

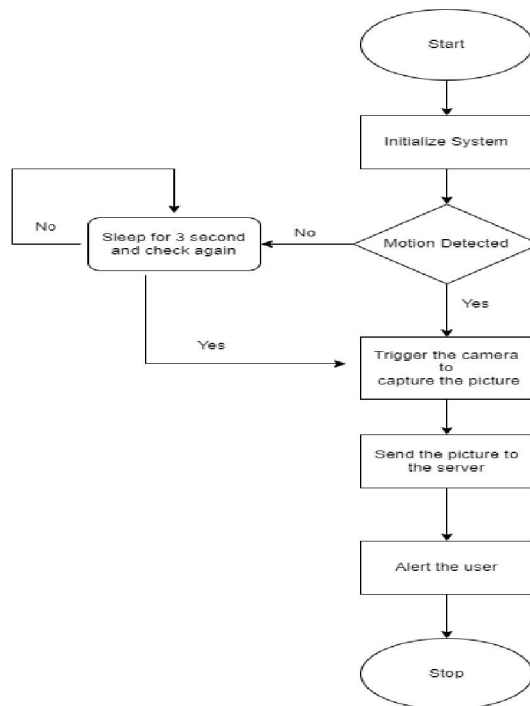
After something is detected we just store that particular frame, so we will have a new background image and we can detect future changes.

In case of night comes and light conditions change normally it will detect it as a change and store that frame as a movement in the pictures.

To eliminate these kind of false alarms we will refresh the stored image in a certain time. For example we can refresh it in every 3 seconds so slow light condition change will not affect it.

We can change with the contour detection area threshold value, Gaussian blur size and the refresh time to create our reliable system for our use which can eliminate the false alarms and noises and detect the real danger.

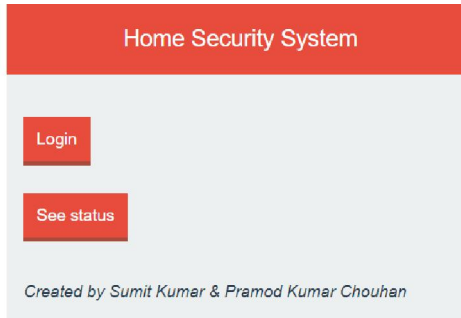
Flowchart



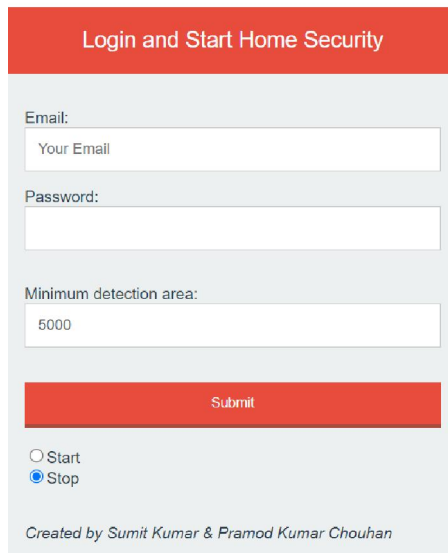
User Interaction

We first need to create your firebase project . After updating the required credentials of firebase and your system ip address in the code,we are ready to go. The login page is a basic html form.

In the login form we first need to authenticate with the firebase. If authentication is successful we first need to set the contour threshold detection area and then we can choose to start or stop the detection.



If you click on login this page will appear



V. RESULT

The user who will access the system first have to create their user id in firebase using email and password. There are no verification for email. The admin can grant and revoke the access of any user at any time. The user have to login using same email and password to start the system.

If you want to access the pictures the camera clicked you can see them through firebase. You first have to login to the firebase with the account you provided credentials with and there you can go to the storage section. There you will get the picture along with the date and time.

Name	Size	Type	Last modified
2023-04-11-00-15-36-211878.jpg	31.17 KB	image/jpeg	Apr 11, 2023
2023-04-11-00-15-37-29978.jpg	63.49 KB	image/jpeg	Apr 11, 2023
2023-04-11-00-15-40-057525.jpg	58.5 KB	image/jpeg	Apr 11, 2023
2023-04-11-00-15-41-088510.jpg	60.88 KB	image/jpeg	Apr 11, 2023
2023-04-11-00-15-43-572984.jpg	66.28 KB	image/jpeg	Apr 11, 2023
2023-04-11-00-15-45-577878.jpg	63.38 KB	image/jpeg	Apr 11, 2023
2023-04-11-00-15-48-099945.jpg	66.99 KB	image/jpeg	Apr 11, 2023
2023-04-11-00-15-50-541889.jpg	66.56 KB	image/jpeg	Apr 11, 2023

VI. CONCLUSION

The Smart Home Security System using Iot has been experimentally proven to work satisfactorily by automating simple appliance and the appliances were successfully controlled remotely by hub using Internet.. It stores the pictures in the cloud database in a timely manner. This will help the user to analyze the condition of various parameters in the home anytime anywhere. With the invention of new technology featuring IoT and AI, home automation has become a reality. These technologies can be used to build a fully functional home automation system and control smart home devices including smart lights, connected thermostats, and appliances. Some notable advantages of the low budget system are its inexpensive cost, relevancy and easy-to customize nature.

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