

A Survey - Intrusion Detection Using Raspberry PI With Cloud and IOT Approach

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Abstract

Probably the most valuable resource of a city is its residents and their belongings. Smart intrusion detection system is the contemporary urban concept which is absolutely necessary for residents of a system to have a quality life. Over the past decade, the use of the home intrusion techniques along with the concerning security has been improved due to various ways of crimes and intrusion. Using IOT, Image processing and Mobile Computing, this paper proposes security system for homes and residential areas. In this system, we are concentrating on providing immediate notification to the users along with Image Processing techniques for intruder detection.

This review paper is written with the goal of implementing smart home intrusion detection systems for residents of the country by collecting all the admissible research. The main aim of this paper is to understand and study the current research topics, challenges and future scopes from a technical point of view.

Keywords- Intrusion, Notification, Image Processing, Face recognition.

I. INTRODUCTION

The Surveillance means to monitor something. Security in residential complexes is restricted to limited geographical locations due to the traditional devices and process used for securing any apartment or complexes. High Definition Surveillance Camera along with the raspberry pi is set up in the areas which need to be examined. This system is similar to some other systems with some disadvantages which is tried to be solved in this particular system. It also includes some additional feature like data backup, push alert messages and email through cloud instead of SMS schemes which requires additional hardware like GSM. The internet of Things (IOT) is the internetworking of physical devices, buildings and other items connected with electronics, software, sensors, actuators and network connectivity that enable these objects to receive and exchange data. It is expected that by 2020, 20 billion devices will be interconnected with each other through internet. It is also user-friendly system as user can access the system from remotely as well as locally as per the situation and their will. Two different controlling android applications are provided for accessing and controlling raspberry pi through command line or GUI-based.

In the present world where we live there are already many devices, which are connected to each other through internet and help in day to day aspects, for example wearable fitness bands, sensors which help in automation fields, RFIDs in ID cards used in Universities and Industries to gain and lock permissions. However, imagine this after some years where so many of devices will be connected to each other including vehicles, phones, computers etc. Internet of Things (IOT) is a going development of the Internet by which everyday things objects have communication capabilities which help them to send and receive data or messages. It is expected to connect systems, devices, sensors to each other which can communicate without help of machine-to-machine Communication.

IOT refers to an enormous variety of devices such as sensors that assist fire fighters in rescue and search operations, heartbeat and blood pressure measuring devices, biochips that are implanted in farm animals. The internet of things now is being used in the fields of automobiles, agriculture, security surveillance and health care. The IOT expects to use low cost computing devices where there is low energy consumptions and less impact to the environment.

II. CURRENT RESEARCH

It has been observed that many Intrusion Detection systems are being deployed with limitations like a few might have a feature which is missing in the other. Till now a system which overcomes all the limitations of an intrusion detection instrument has not been implemented. Some of the aspects should be understood or kept in mind to develop such a system:

A. Image Processing

Image processing is a method which involves conversion of an analog image into digital form and perform some operations on it, in order to get an enhanced image or to gain some useful information from it. It is a type of signal in which input is image, like video frame or photograph and its output may be image or characteristics associated with that image. Basically, Image Processing system includes considering images as two-dimensional signals while applying set signal processing methods to them.

Image processing usually includes the following three steps.

1. Importing the image with scanner or by photography.
2. Analyzing and converting the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
3. Output is the last stage in which result can be altered image or report that is based on image analysis.

The reason of image processing is divided into 5 groups. They are:

1. Visualization-Examine the objects that are not visible to human eye.
2. Image sharpening and restoration - To create a better and clear image.
3. Image retrieval - find the image of interest.
4. Measurement of pattern - Measures or calculate various objects in an image.
5. Image Recognition - Define the objects in an image.

B. Face Recognition Using Infrared Camera

An IR image of the human face represents its unique heat-signature and it can be used for recognition. The significance of this image gives advantages over visible light images and can be used to modify algorithms of human face recognition in several traits. IR images are obviously constant under extreme lighting conditions (including complete darkness). IR face images are not majorly affected by changes of pose or expressions and give a simple method for detection of facial features. There are several factors of face recognition in IR images. First, we compare the effect of changing climatic conditions over IR and visible light images through a case study. Finally, we propose a methodology for automatic face recognition in IR images, through which we use a preprocessing algorithm for detecting facial expressions or other elements and show the efficiency of commonly used face recognition methods in the visible light domain.

C. Live Streaming

Live streaming is the broadcasting of real-time coverage, live video to an user application over the internet or cloud. All you need to be able to live stream is an internet enabled device, like a smart phones or laptops, and a platform to broadcast on. Live streaming defined as online streaming media simultaneously recorded and broadcast in real time to the user.

III. PROPOSED SYSTEM

A. System architecture and implementation

In this system, we are focusing on providing immediate notification to the alert users about the intrusion. Image Processing techniques or methods will be used for intrusion detection. Face detection and recognition by a Dot Projector also be done in this proposed system. Figure shows the block diagram of the proposed system architecture. For detection of an intruder, a Raspberry PI Camera is used to ensure image detection even in the dreary surroundings. Through one channel, the captured image will be crosschecked with the database. The database will be provided along with a few datasets. Further, the image will be stored in the database if the interloper is new and transmit along with the notification. The notification will be sent through the internet or cloud towards user application, which is its primary work. The captured image will be saved in the permanent data base. The Raspberry PI will control appropriate applications.

B. Development of android application

After the internet part would be developed and the methods worked properly, we would develop an android application for making it easier for the internet part. This android application would be developed by using Android Studio. Through this application, the user will get the notification and picture of the intruder as alert. When an unknown intruder is detected, the image would be sent along the notification to user application. After the notification is received, a prompt will come up asking whether you would like to save the image. If yes, the image will be saved in permanent database along with the name specified by the user. If not, the image goes to recycle bin.

C. Hardware Interfaces

- a. Raspberry PI Camera
- b. Raspberry PI
- c. Memory -16GB SD Card
- d. Power Source - DC input can supply power

IV. BLOCK DIAGRAM

Smart intrusion detection system operated through android device by owner can be remotely as well as locally. IOT application for controlling is used, this system will send the push notification or email or text message to android device when an intrusion is detected. It is necessary to develop and implement the low cost surveillance system for remote security monitoring. Authorized user can access to their monitoring system through internet with the use of mobile phone and examine the situation on application. This entire work is developed on raspberry pi using Raspbian as operating system.

Raspberry pi will be placed in area which needs to be examined, spying or surveilling the activities connected with components like PIR sensor, power supply, camera module. The controlling and examining the area can be done from any location or any part of world through android application. The system consists of camera module to capture the image from the area to be examined and then transfer the same to the application. The owner can view the image with secured credentials i.e. log in ID and password. We are using internet to control and monitoring the system and also for sending notification or email on user mobile when an intrusion is detected.

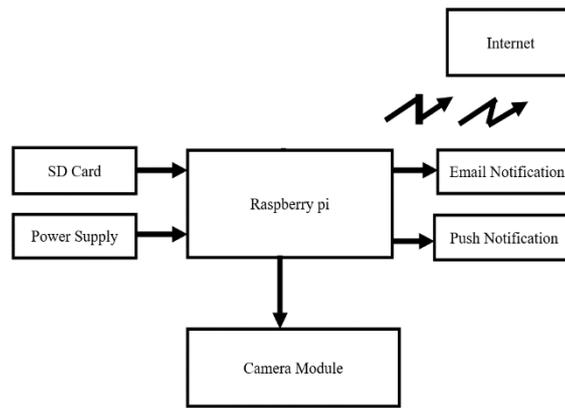


Fig. I Block Diagram

Advantages :-

- Highly reliable.
- High security access.
- Reduce cost.
- Instant report.
- Easy to use.

Future scope

One application should be developed which include notification as well as the controlling power of raspberry pi from the window. User can also use android application to view captured image. Live video streaming can be added as per the will of the user. Power management also have to be there and system should go on sleep mode when it is no longer in operativemode.

The future scope of this system can be extended further by adding additional infrared emitting system to detect the people face if they wore the mask on his/her face. Apart from this we can also interface sensors to the system like Gas sensors, Smoke sensors and Fire sensors to give alerts respectively and to increase the systems efficiency.

V. CONCLUSIONS

The proposed system notifies the user about the in- house scenario along with the live streaming. The security module successfully sends notifications upon detecting intruder using wireless and wired techniques where owner further can take necessary actions thus enhance convenience and comfort, save energy efficiently. As an extension to this paper, we propose a generic IOT framework and use cloud computing infrastructure for connecting and managing remote devices. In addition, we also plan to productize proposed home automation solution so that a greater number of people can use IOT in a smart environment.

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