A Proposed System for Security Surveillance to Detect Human Intrusion

Gaayan Verma, Madhurima Hooda, Saru Dhir

Abstract**:** ***Nowadays, Security is one of the, if not the biggest priority in places such as public speaking venues, restricted areas and all important places of any country. Moreover, military conflicts & terrorism has increased recently. Monitoring these areas is substantial, but currently, monitoring is dependent upon technology and manpower. Since there is always the potential of having a human error that may be caused due to several reasons, to counter this issue, this research paper proposed an application to reduce human error. The primary feature of this application is a surveillance system that detects the face of a human, identifies the personality and display their information to possibly prevent human intrusion..***

Keywords: Human intrusion, surveillance system, security surveillance and real time security surveillance, face detection, machine learning

I. INTRODUCTION

Originally, Security surveillance is considered to monitor an area by cameras which is usually connected to a storage and watched by security guards (humans). For personal uses like in homes, the cameras are connected to recording device which records all the activities. In case of any intrusion, an alarm is raised or a notification on the mobile phone is sent. Unfortunately, it has not solved the problem of preventing human intrusion. An existing system designed projected a design of a remote embedded intelligent security monitoring system based on the background modeling algorithm [1] which can detect and determine if intrusion is occurring or not in real-time. In this system, user can log in to an application and then check the specific camera which detected the intrusion. This gave the user to have a better understanding of the situation and a sense of safety as compared to the traditional closed-circuit television (CCTV) camera systems [12].

Even though many implementations of Security surveillance for human intrusion [9,16,17,18,19] are available but these lacks in trustworthiness to the user. Another proposed system applies deep learning which is gaining popularity.

In this system, Time data mining of short part from a live feed is collected by surveillance camera by processing arcs or lines on the object of interest [2], Deep learning and Support Vector Machine (SVM) to make the Security system accurate and reliable. Deep learning countenances computational models that contains several processing layers to learn exemplifications of data with various stages of abstraction [11.13]. Neural Network models are extensively cast-off for automatic cataloguing [14]. Support vector machines also known as SVMs are supervised learning models which are used to counter classification or regression challenges [10]. A big drawback of deep learning was that it requires heavy computational cost, which was a challenge. Some researchers proposed an algorithm that require low computation power and is fast enough so it can process low-resolution frames and it can distinguish between occurrence of distinct events such as overcrowding and can operate in low-resolution video without using any classification technique [3]. This was especially useful for ATMs (Automatic Teller Machines) as these machines have low hardware capability and are usually targeted by intruders.

The proposed system not only works on further increasing the security but it helps the user to identify and fetch full information about the intruder. This is principally worthwhile in public events. The threat can be suppressed at the time of entry itself, also in hospitals, this approach would be very useful for the safety of patients.

II. PROPOSED ALGORITHM

A. Flowchart

This proposed system is a Security Surveillance System Graphical User Interface which is developed on open-cv and utilizes number of python libraries. CascadeClassifier in Open-cv is used to capture the video. Classifiers are trained by using number of similar type of objects called positive objects that are reduced to similar size to recognize faces [4] and places a rectangle on the face.

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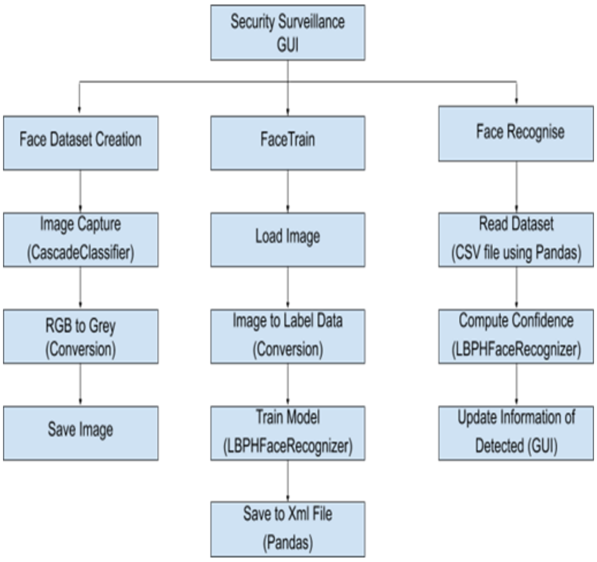

Security Surveillance GUI
Face Dataset Creation
FaceTrain
Face Recognise
Image Capture (CascadeClassifier)
Load Image
Read Dataset (CSV file using Pandas)
RGB to Grey (Conversion)
Image to Label Data (Conversion)
Compute Confidence (LBPHFaceRecognizer)
Save Image
Train Model (LBPHFaceRecognizer)
Update Information of Detected (GUI)
Save to Xml File (Pandas)

Fig. 1. Steps of face recognition of the proposed system

LBPHFaceRecognizer[2] gives a metric value which is known as confidence score. It tells how much the face is matched to faces present in dataset. (LBPH) Local Binary Patterns Histograms algorithm is originated from LBP which is very simple texture operator that marks the pixels of an image, This is done because all by thresholding the neighborhood of each pixel which combines with histograms to increase the accuracy and efficiency.

B. Real Time Security Survelliance

The interface of the projected application is very user-friendly which updates in real-time. It displays the information of the person identified by investigating the dataset and resets it to default as soon as real-time video feed is closed. It consists of three buttons namely:

1. FaceCapture- to start detecting the face. (*shown in figure 3*).

2. FaceTrain- to deal with the training of the model. (*shown in figure 4*).

3. RecogiseFace- to compare the detected face with the faces stored in the dataset.

(*shown in figure 2*).

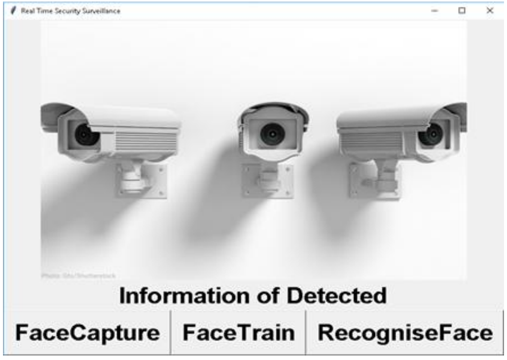


Fig. 2. Flowchart summarizing Graphical user interface of the proposed system.

C. FaceDataset Creation

When the 'Face Dataset' button is pressed the program captures 30 snap shots of all the faces detected in the video feed and saves them in greyscale. The use of grey is to increase the accuracy of the on face recognition [5] by removing the color element form the picture and focusing on the features of the face. The images saved are only the rectangle detected by CascadeClassifier. All the pictures are saved in the 'Dataset' folder which is used by the next function which is known as 'FaceTrain'.

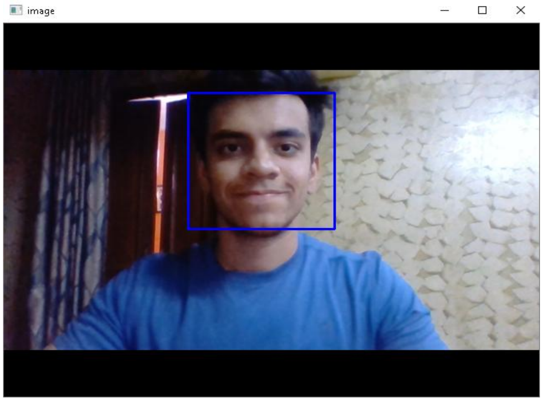
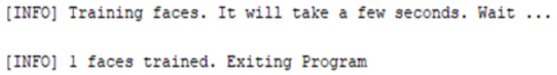


Fig. 3 (a). Face Capture feature of proposed system

D. FaceTrain

As the name says "faceTrain' deals with the training of the model. The main function of the model is to convert the GreyScale image into a numerical format (numpy array). It saves various kinds of information which are converted using CascadeClassifier such as threshold, reduced dimension in the form of a grid (usually 8x8), data which is the actual values of each pixel as a value which is used by the recognizer. All the information is saved in an XML file in the 'trainer' folder.



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[INFO] Training faces. It will take a few seconds. Wait ...

[INFO] 1 faces trained. Exiting Program
```

E. FaceRecognise

The foundation of this function is LBPHFaceRecognizer which is used to determine how similar is the face in the live video feed to the face stored in the dataset. This is made possible by a 'confidence score', ConfidenceScore is a numeric value having a range of 0-100, It depicts the percentage of similarity the model has computed. The information of the detected face is displayed on the GUI. Also, the updates in real-time logs are also accessible in program feed.

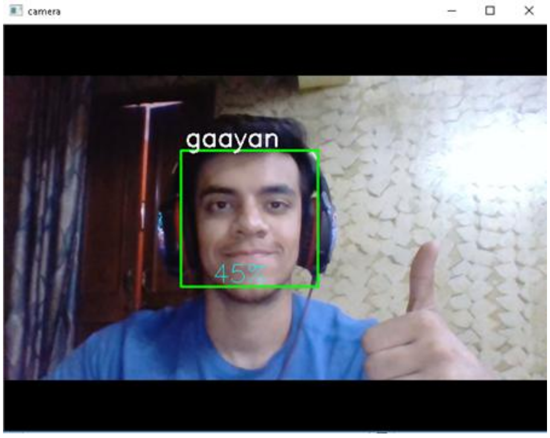

Fig. 3 (b). Face Recognition feature of proposed system

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III. RESULTS AND DISCUSSIONS

This work has high potential as it can be implemented in many areas. For instance, implementation as a login authentication on a billing system resulting in preventing human intrusion providing convenience for the employee. Another example, in public meetings camera sensor modules can be used to identify and allow all the permitted guests to enter the premises and prevent lethal threats. This can also be used in a polling station at the time of voting allowing people who are citizens of the country and preventing false/ multiple votes. So, successfully integrating real-time face recognition [7] into a security system that identifies and displays information of the detected on the GUI has vital applications. If the identification of the person is not present in the dataset, an unknown label is set over the face which helps to determine the unknown threat. This work is very flexible in terms of adding information about the person and training the model. This concept would excel at a workplace where information of each employee is available and a database maintained for the same, also employee won't have to scan cards to enter the facility face scanners can be implemented near the doors which can scan the face, match the face with the database and open the door. This kind of technology is widely used in smartphones which gives users the convenience to crack in to the phone with just looking at the phone. The graph in figure 4 provides a visualization of number of features versus accuracy percentage of the implemented system. Figure 5 shows details of the person identfied. The details are fetched from the dataset.

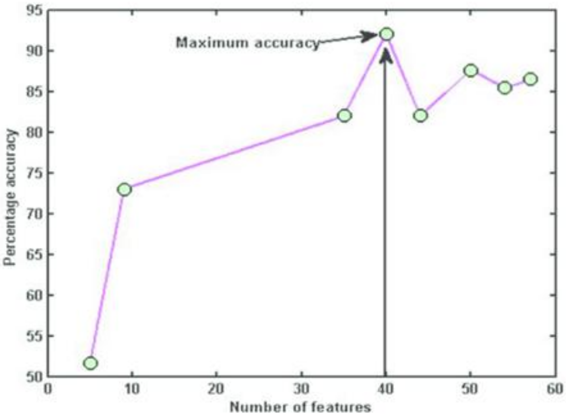
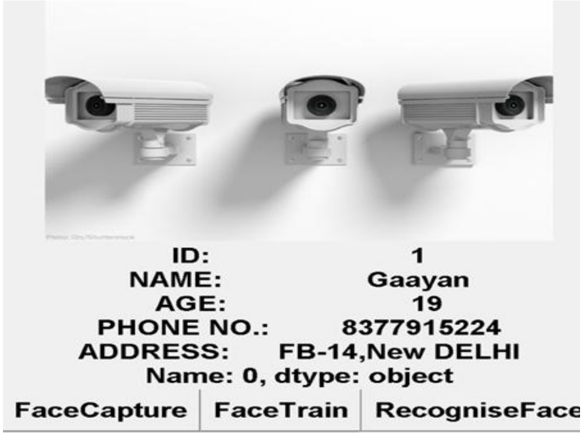


Fig 4: Graph showing number of features vs Percentage accuracy



ID: 1
NAME: Gaayan
AGE: 19
PHONE NO.: 8377915224
ADDRESS: FB-14,New DELHI
Name: 0, dtype: object

Fig 5: GUI displaying information of detected person

IV. CONCLUSION AND FUTURE WORK

There is a lot of potential in the turf of image recognition and its various implementations. Face detection of relatively satisfactory accuracy can be achieved by adding sensors and high-resolution camera modules [8,9]. This concept is very user-friendly and reduces a lot of manpower which goes along with the current trend of automation, there is no chance for human error and it is very easy to add more features into the current system. Image recognition or machine learning [6,15] in general needs a lot of data to give viable results. This would be possible by implementing this project with the cloud which consists of an array of data that can be extracted and used to get better results. Also results with machine learning gets substantially better if it has provided with a huge amount of data.

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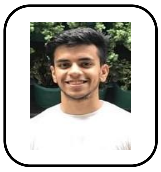

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