



Criminal Identification and Alert System using Image Processing

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Abstract: Humans faces have the lot of unique features to distinguish between each other. Face detection is one of the main computer technologies and it is used in various application like attendance management, ID card to login in Companies etc., This work details a real-time automated unknown or criminal faces detected. This proposed system is a real-world solution to watched day-day activities of a home or stores. The main aim is using

convolutional neural network of detect and recognize the unknown people when entering the places with high accuracy. The automated system detected the faces which are not train people(known). For example, in the house or shop, all the peoples are going out, at that time things are theft by thieves. And later, peoples come into the house/shop and confirm the theft was happened. The owner of the houses/shop are not known because of the lack of automation. To avoid such kind of issues, adding automated technologies in CCTV cameras. The known peoples are trained by using Haar Cascade classifier. If the unknown people are entered, then automatically detect and sent the message to the owner with raise the alert sound at that time. So, owner make the aware and may stop the crimes.

Keywords: Cascade classifier, CNN algorithm, Face recognition, Open-cv

I. INTRODUCTION

Face detection is one of the computer technologies being used in various application and it is an important part of face recognition. The main purpose of face detection is that identifies human face in digital images. Face detection is used to detect a human face from an image which have various attributes in that detected image. Face detection is one of the challenging technologies because faces are inflexible and it changes the size of the image, colour, shape etc. Human face recognition consists of two phases, here we use namely face detection. For an example if the criminal enters in our house the live video if we click the start before going outside or before sleeping it will capture the criminal face and detect the image, first search from the know dataset

because we have trained the known person images and shows the name of the known person, if it's an unknown person it gives an alert sound and send the image automatically through the email. Compare with CCTV cameras face recognition algorithm is best. Because the CCTV can be able to record the footage only. They don't alert the neighbours or security like an alarm system, sometimes it cannot help you to reclaim the stolen things. Face detection become a popular biometric property in recent years because of its importance in security control application. In this world there is a peculiar increase in crime rate because of improper security devices and issues there is various causes of theft, stealing crime, burglary, human trafficking, rape etc. Are left unsolved because of limited security availability in our surrounding areas sometimes in that place there is no identification of the theft who are involved in



the crime process activities. To avoid this situation an automated facial recognition algorithm and alerted system is used. This project proposes the traditional techniques like HAAR cascade for the performance of the proposed system and the important thing is to have a high accuracy for a project of this sensitivity.

II. LITERATURE SURVEY

B Based on Facial Recognition using Convolutional Neural Networks and Implementation on Smart Glasses [1], face recognition is one among the important authentication especially in security. An image is stored in database already of the topic is manipulated using image processing techniques during this task. This system used for face recognition of their high accuracy as compared with other techniques. Detection rate of method is 90% using 3099 features. Face recognition is employed in convolutional Neural Network (CNN). it's a multi-layer network specific task using classification. it's 95% accuracy using 2500 variant images can serve in security authentication process. Based on the A review of optimization method in face recognition: Comparison deep learning and non-deep learning methods [2] research paper, Face recognition was used as a personal identification with limited scope in term of preventing, fraudsters, criminals and terrorist many methods are developed to supply the only accuracy. Deep learning approach is trend during this field of stunning results and fast computation. This paper focus only recognizing the importance of technology. This paper is compared to deep learning and non-deep learning methods are discussed and analyse advantages and drawbacks. The critical analysis experiment with Yale dataset and non-deep learning in 90.6% for low-high complexity results. Optimization method is employed for combining with CNN and SVM. Criminal tendency detection from facial images and the gender bias effect [3] of this article, has been updated Abstract Explosive performance and memory space growth in computing machines in conjunction and specialization of deep learning models have fully boosted the role of images in semantic pattern recognition. they explore a level of image understanding from facial images via deep learning. Two models are convolutional

neural network (CNN) and standard feed forward neural network (SNN). It is very important because criminal facial images won't to train the machine are mostly male. This is the results of the massive gap between the number of mugshots for arrested males and female, to the general public and won't to train the machine. Based on Automated face detection system using viola jones algorithm for criminal detection [4] article, is predicted on criminal detection framework that would help policemen to acknowledge the face of a criminal or a suspect is proposed. A client-server video-based face recognition framework is employed here. The face detection stage uses Viola Jones algorithm supported by Open Computer Vision. The face recognition stage is predicated on Local Binary Pattern Histogram (LBPH) is recently proposed algorithm for face feature extraction which is implemented using python. In this method LBP image is segmented into local regions and histogram of every is extracted and are concatenated to make a face descriptor. It mainly consists of three parts there are face representation, face feature extraction and features classification. Face recognition represents the thanks to model a face and determines the successive algorithms of detection and recognition. The most useful and unique features of the face photo are extracted within feature extraction phase. In the classification the face image is compared with the pictures from the database. The proposed face detection and recognition is implemented using Android studio and Open Computer Vision library, and tested using Electronic devices like Pcs, Android Mobile. The research of Automated Criminal Identification System using Face Detection and Recognition [5] paper based as the world has seen exponential advancement over the last decade, there's an abnormal increase within the rate and also the amount r of criminals is increasing at an alarming rate, this leads toward an excellent concern about the safety issues. Some causes of theft, stealing crimes, burglary, kidnapping, human trafficking etc. they left unsolved because the availability of police personnel is limited, many times there is no identification of the person who was involved in criminal activities. To avoid this example an automatic face recognition system for criminal identification is proposed using Haar feature-based cascade classifier. This paper presents a real-time face recognition using an automatic surveillance



camera. This system is going to be detect and recognize face automatically in real-time.

III PROPOSED SYSTEM

This paper has been used to identify the criminal in real-time recognition. The proposed system includes

- Training the real – time image which are captured by the live camera
- Face detection using cascade classifier
- Compare the images with known images
- Raising the alert sound
- When unknown face is recognized, automatically sent the email to the owner with recognized images.
- Improving the high accuracy of the face recognition.

The system has known image databases which is taken from the project. It will automatically generate the known images and save it into the known folder with the person's name. If the person left from the house then click the start and automatically monitoring the house by using surveillance camera. The video is converted into the frames. The known person images features are stored in the form of encoding which is stored in the data by using pickle package. If some person face is detecting, then compare with the known person image features by using Haar - Cascade classifier. If the features are not matched, then fast generating the email to the owner of the house and rising the alert sound at the place. So, the owner may aware about the situation and stop the crimes. The accuracy of the recognising the images is high when compared to other articles.

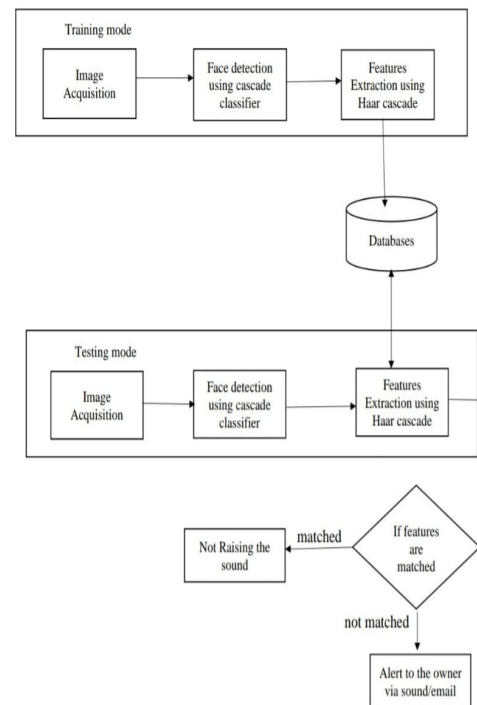


Fig. 1. Flow diagram

III. IMPLEMENTATION

A. Import the required modules

To perform some performance in automation, need to import modules. Modules is nothing but the collection of function in the files. In this project, need modules are os, pandas, cv2, time are the basic need for face detection. Os modules is used for the take the images path from the files/folders. cv2 is used to read the images and detect and recognized the object from the images. For the face recognition, need to import pickle for storing the encoding of the face features with names of the person, face recognition modules is used to recognize the face whether the person is known or unknown. Tkinter is one of the python GUI libraries. It is very help for the user to use the project. Numpy is used to store the list of images in the files. Enter the name and submit it automatically create the file by using os module. SMTP module is used to generate the mail to the owner. Winsound module is used to raising the alert sound when the unknown face is detected.

B. Load predefined trained classifier

Detect the faces from the images or videos, first need to trained with predefined faces. The predefined faces are store in the xml file. The purpose of the face detection and recognition use the Haar-Cascade which is provided by the Open cv. Download the xml file and load the file into the program by using the Harr- Cascade classifier.

In python, Cascade classifier function,

```
cv2.CascadeClassifier(harcascade_frontalface.xml)
```

Haar-Cascade classifier is the machine learning technique [6]. It is used to detect the objects. The haar-cascade classifier file in the form of xml. It has the lot of faces, eyes, animals face detection, etc., extraction features techniques are consisting.

C. Color Conversion from RGB to GRAY

The images are taken by the camera are processes. The images are in the combination of Red, Green, Blue (RGB) need to converted the Grayscale images. The grayscale images are in the shades of gray color only. In RGB, need to complicated the process images and harder process. But the Gray scale images are easy to process and entirely sufficient for many tasks [7]. The RGB color images are stored in the form BGR (Blue, Green, Red) color and it converted into the Gray scale images. The color conversion function in python,

```
cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
```

D. Face detection from the frame

After converting the images from RGB to Gray, next step is detecting the faces from the frame. Face is detected by using Haar-cascade classifier. Finding the faces from the images is complicated without any using the algorithm. For the face detection, use the viola jones algorithm, face extraction uses the cascade classifier and the techniques is Haar-cascade classifier.

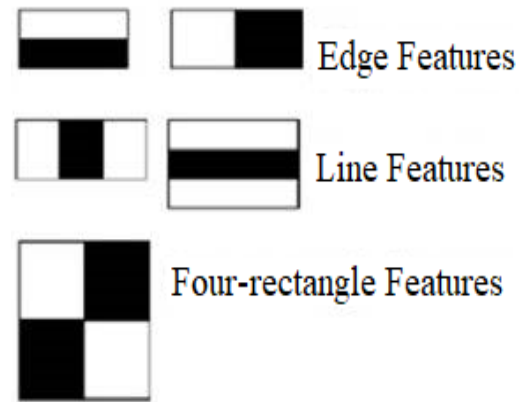


Fig. 2. Haar Features

For the human identification, adding the rectangular box to find the detection faces. In the python, use the rectangle function.

```
cv2.rectangle(frame, (x, y), (x + w, y + h), (255, 0, 4)
```

E. Preparing and perform the training dataset

After the face detection, then check the person is known or unknown. Have to train the images from the existing datasets. For creating the datasets, enter the name in input box and the take images buttons which is created by tkinter module. Press key 's' for saving the images, it automatically created the dataset along the names in the known folder. The system takes only the face so it automatically crops the faces images and remove the background. Then train the known images by using the encoding of the person images. The face recognition module provides the encoding function, which is used to generate the encoding of the particular images. Encoding is 128 measurements of the faces are generated by neural network and trained which is identified by person name. These are stored in the dictionary datatypes.

F. Testing

The dataset of the images is trained. For testing the face recognition, the live video is start and monitor the place. If the face is detected and recognize the features, compare with the trained features and



whether the person is known or unknown. If the person is known then it loops the process but the person is unknown then it unknown images are saved to unknown folder and automatically sent the alert mail with the attachment. It raising the alert sound in the place.

V RESULTS AND DISCUSSION

A Results Explanation

The flow diagram of the results is show in Fig. 3. The front page of the project contains the entry box for inserting the name and add name to it dataset. Then start take images from the camera for the adding known person with the name in datasets. Then click train button, it automatically trains the known dataset images and generated encoding of the images. After train the images, start live button for testing the project the person is recognized or not. If the person is unknown, it raising the alert sound and generating the mail to the owner of the place.

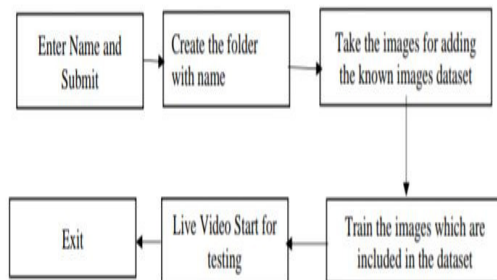


Fig. 3. Result flow diagram

In the Figure 8.2 shows, If click the take image button after the entering name, It automatically generating the dataset of the particular person and enter 's' key for saving the images in the folder

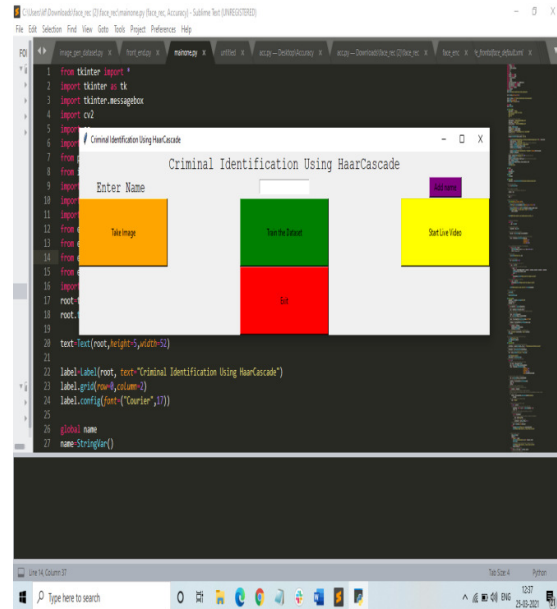


Fig. 4. User Interface of the project

In the Fig. 5 and Fig. 6, the dataset of the particular person is created and stored into the known database folder. It automatically store and generated the dataset by using os lib.

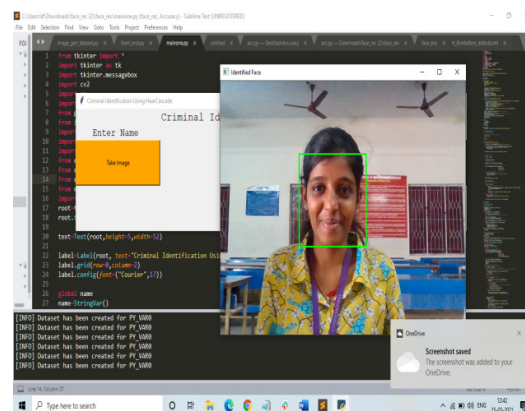


Fig. 5. Generating dataset

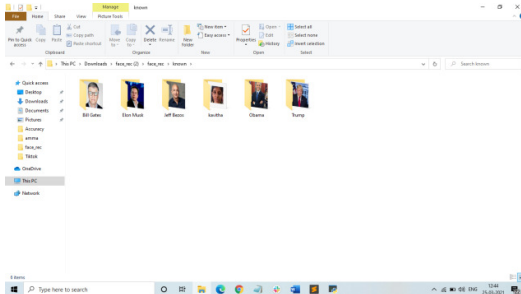


Fig. 6. Known person dataset

In the figure 7, It shows the result of known person name and their encodings. In face recognition, the algorithm notes certain amount of feature on the face like the color, size and eyebrows gaps, etc. All these put together is called face encodings. This is used to identify the particular faces.

face_recognition.face_encodings(imgaes)

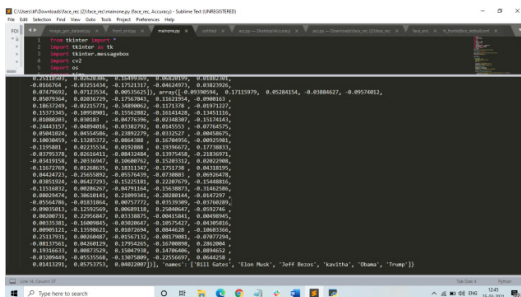


Fig. 7. Encoding of the train images

The faces are trained by the dataset. After trained, test the process by live video. By clicking start live video button, automatically open the camera and noted the person whether it is known or unknown. If the face is unknown, then automatically detected and get alert sound. If the face is known, then it shows the person's name on the rectangular box are shown in figure 8 and 9.

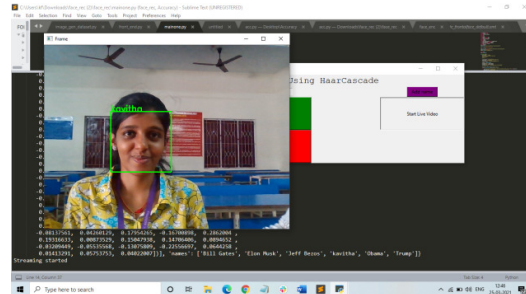


Fig. 8. Known face detection

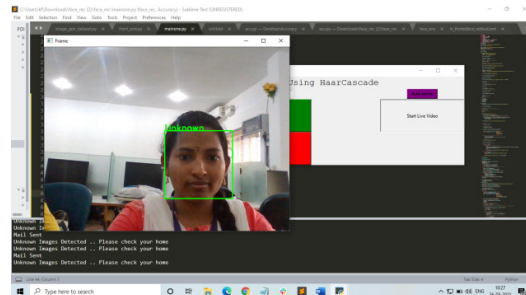


Fig. 9. Unknown Face detection

If the face is unknown, It shows messages during the live video stream and also get the mail to user/owner by using smtp library. These are shown in figure 10

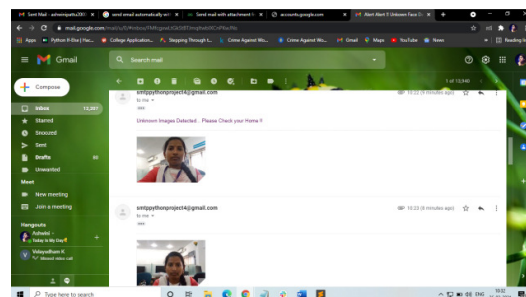


Fig. 10. Email-Alert to the Owner

B. Calculating Accuracy

In the face recognition, the accuracy can be defined as the percentage of correctly classified instance.



The evaluation parameters for any classification are based on only four outcomes.

$$\text{Accuracy} = (\text{TP} + \text{TN}) / (\text{TP} + \text{FP} + \text{TN} + \text{FN})$$

Where TP = number of true positives in images

FN = number of false negatives in images

FP = number of false positives in images

TN = number of true negatives in images

The terms positive and negative refer to the classifier's prediction, and the term true and false refer to whether that prediction matches to the external knowledge.

The standard performance measures,

- Sensitivity = $\text{TP} / (\text{TP} + \text{FN})$
- Specificity = $\text{TN} / (\text{TN} + \text{FP})$
- Precision = $\text{TP} / (\text{TP} + \text{FP})$

In this project, the accuracy is 99% correctly classified instance.

VI CONCLUSION

In this project, we are able to detect and recognize faces of the criminals in an live image/ video stream obtained from a camera in real time. Haar feature-based cascade classifiers in OpenCV methods for face detection and face recognition. It is a machine learning based method where a cascade function is trained from tons of positive and negative images from the user input. It is then went to detect objects in other images. Also, we have used Local Binary Viola jones algorithm for face recognition. Several advantages of this algorithm are: Efficient feature selection that is sophisticated and an invariant detector that locates scales. We can scale the features rather than scaling the image itself. Since it's a general scheme of detection, it can also be trained for detecting another object. The accuracy of the face recognition is extremely high. The proposed system can successfully recognize quite one face. The accuracy of the face recognition is extremely high. The proposed system can successfully recognize quite one face which is beneficial for quickly searching suspected persons because the

computation time is extremely low useful for quickly searching suspected persons because the computation time is extremely low.

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