



CRIMINAL IDENTIFICATION SYSTEM USING HAAR-CASCADE ALGORITHM

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Abstract: The technique of figuring out a crook is gradual and hard. So the solution to this problem is the use of face recognition system. The objective of the project is to understand the face recognition system and develop a “criminal identification system”, for that the requirement is python, understanding of haar cascade algorithm, knowledge about input/output of the IR sensor and the database so that it can contribute the valuable inputs while creating the “System”.

Index Terms - Face recognition, criminal identification, machine learning, Haar Cascade algorithm, Raspberry Pi.

I. INTRODUCTION

In all countries detecting crime and identifying the criminal is the main responsibility of police and law enforcement agencies. A lot of developed and developing nations are maximizing the use of advanced technology for the identification, as well as for the other purposes. After discovering that the crime has been committed next step will be to find the suspects and then identifying the criminal by severe interrogations, checking their criminal records (if any). Many foreign countries make use of the latest and evolving technologies in identifying the criminals. Identification can be done by making use of different features like fingerprints, DNA, eyes and faces.

The face is the most crucial feature for identifying humans. Face is the main feature which best differentiates and introduces someone. So face recognition can be used for the identification. In India, as we see law enforcement agencies still do not make use of such developed technologies. So the idea of building a criminal identification system which uses the face recognition technique to identify the criminals and this system will be very much reliable in countries like India where population is very large, it will provide a near accurate result.

This (A criminal detection) system uses a database given by the officials which contains images of the criminals then it compares the face or picture proven with the aid of us with the pictures inside the database to discover a match if there exists one. For every facial picture, recognition can be done using the Haar cascade algorithm which is an object detection algorithm. This makes use of line or facet detection functions.

This paper is structured in the following way. The following segment deals with the literature review, the third section deals with the methodology, the fourth section explains implementation process, the fifth section is results and discussion, and finally conclusion and future work.

II. LITERATURE REVIEW

Reference [2] in truth, the identity of a criminal in Malaysia became performed by using figuring out the thumbprints however, this form of identification is mandatory as these days most criminals are cautious now not to leave their thumbs on the scene. With the development in protection technologies, CCTV have been hooked up in public and private places to offer surveillance offerings. CCTV pictures might be used to identify the suspects at the scene. However, because of the restricted software developed to automatically discover similarities among video in video and recorded photographs of criminals, the law mandates the identity of thumbprints. As the sector has seen widespread upgrades over the beyond decade mentioned in [3], there has been a dramatic increase in crime quotes and an alarming increase in crime, leading to critical safety worries. Diverse reasons of theft, theft crime, burglary, kidnapping, human trafficking etc. they have not but been resolved because the supply of police is confined, regularly it is not clean who changed into worried in criminal sports.

The method of figuring out and identifying a crook is slow and difficult as stated in [1]. Criminals, nowadays are smarter via now not leaving any form of biological evidence or the emergence of fingerprints at the scene. A brief and clean answer is to use advanced face reputation structures. With the advancement of protection technology, CCTV cameras are established in many buildings and robots for surveillance purposes. Video taken from the digital camera can be used to pick out suspects, criminals, fugitives, missing human beings etc. [5] due to the high crime charge, criminal identification takes a lot of time despite the fact that the man or woman is a persistent individual. Figuring out and tracing missing or trafficked folks the time it takes to identify and maintain them can be large earlier than that individual disappears again. To overcome this, we suggest an exceedingly reliable gadget to hit upon those human beings using face reputation strategies to see them everywhere in real time using CCTV or another video-provided device for fast action. We installation the complete gadget within the cloud so that snap shots of those humans can

be uploaded to teach the face reputation version and may be utilized by many regulation enforcement groups. Pics may be uploaded from a nearby pc related to the cloud and the website may be updated by way of including uploaded pictures. [4] Many challenges are there for face reputation. Gadget tightness can be averted by means of human beings changing their facial features through sporting colored touch lenses, elevating moustaches, robust facial expressions, etc. moral subject is associated with the technique of recording, analyzing, and facial expressions. . Many people are not in favor of monitoring systems that take huge numbers of human beings who have no longer authorized this action.

III. METHODOLOGY

To achieve the results required to establish the objective, some methods are used. The following subsections will explain the methods used in this project.

3.1. Creating Criminal Database

The first main task is to create a local database which consist of the images of the criminal. This pictorial data will be required to identify or match the identity captured in the image. This data set is created by either the user or by the officials with the help of a program. Program will generate a 20 samples of the images and will store in given address.

3.2. Face detection using Haar cascade Algorithm

Detection classifier that comes under cascade classifier is Haar Cascade classifier. Cascade classifier is trained on the data that contains both positive and negative samples. To illustrate, thousands of images which has picture of objects in it and images with no objects in it will be the training data.

a) How it detects a face? Whether it's there in image or not?

Haar Feature selection: It has been observed that there are several common properties we see in the most common human faces. The dark areas near the eyes compared to the upper chicks, the bright areas of the nose compared to the eyes, some specific areas of the eyes, the mouth and nose are characteristic features common to all faces.

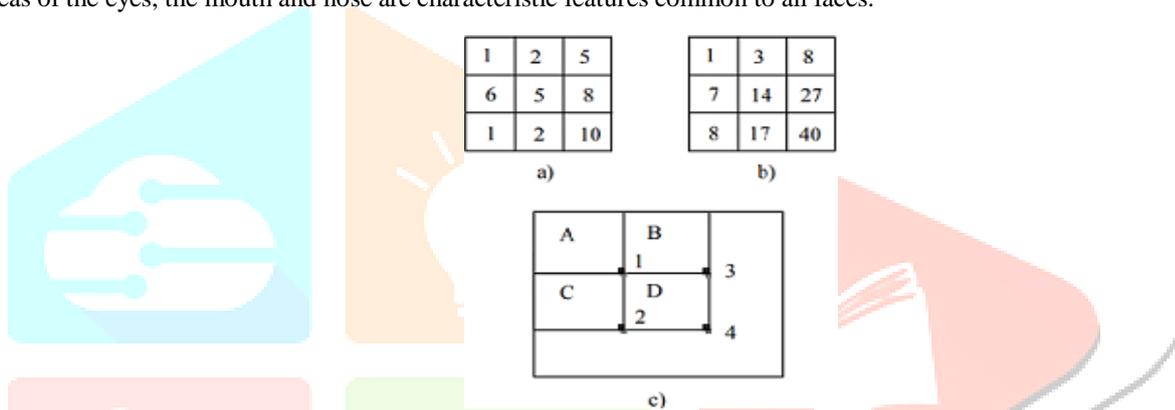


fig. 1. haar filters

b) Create integral image:

Haar features computational time is large, so the integral image was used, to reduce the computation time, which changes based on the size and type of the feature.

fig. 2. (c) pixel calculation of area-D with integral image

c) Adaboost Training: This algorithm - combines multiple weak classifier to form a strong complex classifier.

d) Cascading classifier:

After Adaboost algorithm, the strong classifier will give $N*N$ window and it will check whether the window has positive image or not if it has then that window will be examined, if not it will be expelled. See the flowchart below

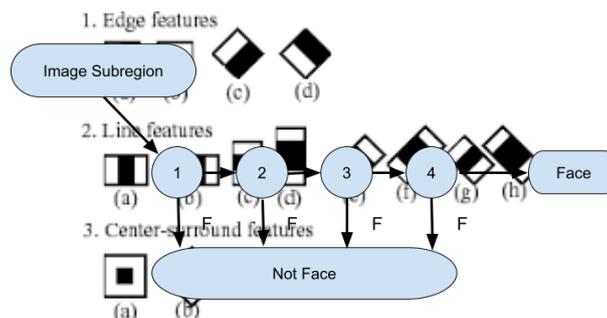


fig. 3.attentional cascade, the face should go through all steps in the cascade to recognize

3.3 Alert system

Once the face is identified and if it matches with the criminal data set then an alert mail will be triggered and will be sent to the respective officer.

IV. IMPLEMENTATION OF CIS

1. Generation of a file for the storage of criminal records

A python program is built which will capture the image and it will store the captured image at the given location of the file in the operating system.

Firstly, the path of the file is generated using `os.path.join (image-dir, name)`. If there is no such file exists then it will create a new file with the given name. Haar cascade frontal face detection algorithm is used to capture the image of face accurately from a live feed. Secondly, web camera or pi camera will be started and it will take the given number of samples (images) and store it in the file.

2. Recognition and identification of criminal face

An IR sensor and a pi camera is integrated with the raspberry pi board. The above discussed program will be loaded in the Raspberry pi board. When a person comes in front of IR sensor, the camera will be triggered and then it will capture the image of the person and it will send it to the haar classifier which will identify the facial area. Then the selected area will be passed on to the model, which is trained over the already stored criminal data set. And this model will predict whether the captured face is matching with any of the faces that are stored in the data set or not.

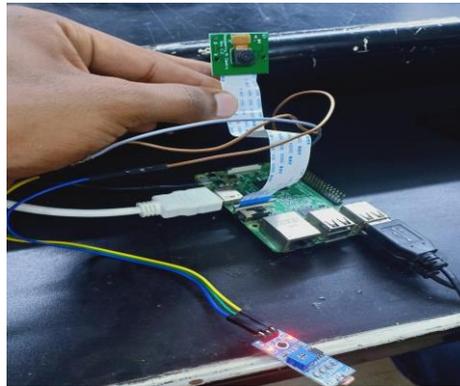


fig. 4. integration of IR and Pi-cam on RPi

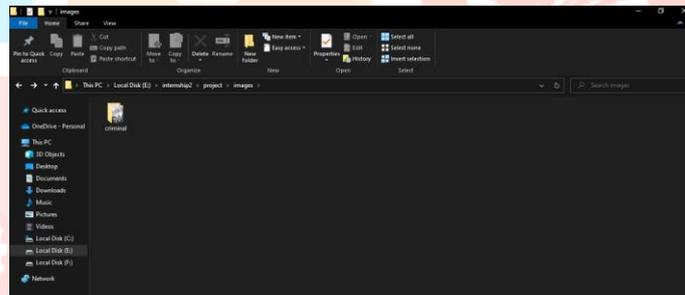


fig. 5. data is locally stored in the files

3. Alert mail

After successfully identifying criminal, email will be triggered and it will be sent to the admin or authority for the further actions. Email contains the gray image of the identified criminal.

V. RESULTS AND DISCUSSION

This section pointing to the principle final results of Criminal identification system. This study pursuits to design, develop and check the Face recognition for crook identity, this system is performing well and it is providing very accurate results, which shows that it has successfully hit the targets. And it can also be further developed to improve the results.

Random images of crooks were stored in the local files and tested the model. The following figure 6 shows the result.

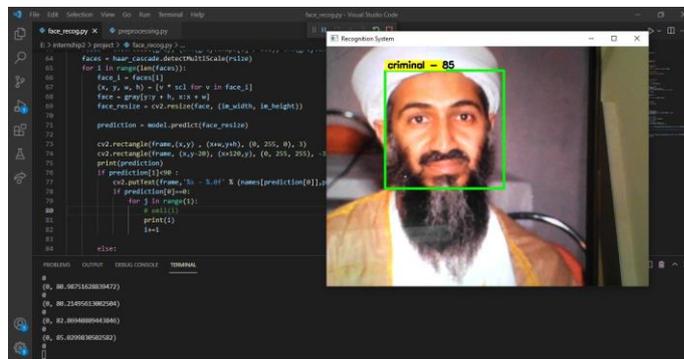


fig. 6. o output of the criminal identification system

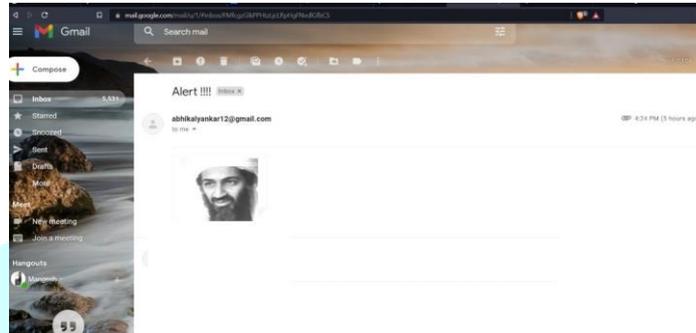


fig. 7. i image of email that is sent

Once the person is identified as a criminal then the mail will be sent as an alert to the officials. See the image above figure 7.

VI. CONCLUSIONS AND EXTENSIONS

Criminal identification system makes use of the implementation of a face recognition and Detection techniques. This paper presents an innovative idea on building a criminal identification system. This system is able to identify the faces of the criminals from photo or from a live video stream and is using Haar-frontal face cascade classifier in Open CV to find the face. Machine learning is used in this approach, cascade function is trained on different set of pictures. Then this trained model is used to detect face in other images accurately. LBPH module is also used in system for recognition and this recognizer will help to identify faces in strong lightning background as well.

This system could be developed further in the future with the development of face recognition algorithm by improving its correctness and performance. As we know this method is one of the methods for the identification, in future to improve the accuracy of the system it can be integrated with more features for example pulse sensor, emotion detector to identify the criminal, also we can integrate his heart rate and expressions to increase the accuracy. This system after improving and after adding new features can also be used in public by replacing CCTV cameras.

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