Criminal Face Recognition using Raspberry Pi

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Abstract— This paper presents a real time face recognition using an automated surveillance camera. The present paper discusses about the detection of criminals with the help of the various devices and software. OpenCV (open source computer vision) is the major software that is being used in our present work. For detecting faces we are using various algorithms like Haar cascade, linear SVM, deep neural network etc. The main method that we have proposed in our work is, if any person comes in front of the camera, first it will look for potential matches that we have already stored in our system. If the module finds a match, then it continues to record until any person comes. If the face is recognized, then the criminal's face will be captured and a snap shot will be sent to the admin's email. The device is developed using Raspberry Pi b+ with 1.4 GHz quad core processor, raspberry pi camera module.

Keywords: Raspberry Pi, Surveillance Camera, Haar Cascade, OpenCV

I. INTRODUCTION

The face is crucial for human identity. It is the feature which best distinguishes a person. Face recognition may be a remarkable and challenging problem and impacts important applications in many areas like identification for enforcement, authentication for banking and security system access, and personal identification among others. Face recognition is an easy task for humans but it's entirely different task for a computer. A very little is understood about human recognition to this on How can we analyze a picture and the way does the brain encode it and Are inner features (eyes, nose, mouth) or outer features (head shape, hairline) used for a successful face recognition? Neurophysiologist David Hubel and Torsten Wiesel has shown that our brain has specialized nerve cells responding to specific local features of a scene, such as lines, edges, angles or movement. Since we don't see the globe as scattered pieces, our visual area must somehow combine the various sources of data into useful patterns.

Automatic face recognition is all about extracting those meaningful features from an image, putting them into a useful representation and performing some classifications on them. Face recognition based on the geometric features of a face is probably the most instinctive approach for Human identification. The whole process is often divided in three major steps where the primary step is to seek out a decent database of faces with multiple images for every individual. The next step is to detect faces in the database images and use them to train the face recognizer and the final step is to test the face recognizer to recognize faces it was trained for.

Nowadays, face detection is used in many places especially the websites hosting images like Picassa, Photobucket and Facebook. The automatically tagging feature adds a new approach for sharing pictures among the people that are within the picture and also gives the thought to people about who the person is in the image. In our project, we've studied and implemented a simple but very effective face detection algorithm which takes human complexion under consideration. Our aim, which we believe we've reached, was to develop a system which will be employed by police or investigation department to acknowledge criminal from their faces. The method of face recognition used is fast, robust, reasonably simple and accurate with a relatively simple and easy to understand algorithms and technique.

II. RELATED WORK

Closed-circuit tv (CCTV): CCTVs have proven to be hugely popular for security functions because of their low cost performance and smooth functioning. Surveillance could be very useful for regulation enforcement to analyse and save you crook sports, for recognizing and monitoring threats. Also, surveillance systems have continually been playing a vital role in managing the burglary instances. These CCTV structures generally tend to monitor any activity continuously. These consequences in excessive power consumption and large memory usage. Moreover, it doesn't give alert on any suspicious activities detected.

Radio Frequency Identification (RFID): It uses radio waves to routinely identify individual or gadgets. There are many techniques for identification, however the trendiest is to store a unique serial number that identifies a human or object on a microchip that is attached to an antenna. The blended antenna and microchip are called RFID transponder or RFID tag and it works in combination with an RFID reader. The reader antenna is used to transmit radio frequency (RF) power. Depending on the tag type, the energy is harvested by the tag antenna and used to power up the internal circuitry of the tag. The tag will then modulate the electromagnetic waves generated by the reader so as to transmit its data back to the reader. The reader receives the modulated waves and converts them into digital data.

III. PROPOSED SYSTEM

Criminal Identification Using Raspberry Pi is especially about maintaining a secure environment. OpenCV (open source computer vision) is the major software that is being used in this project. For detecting faces, system using various algorithms like Haar cascade, linear SVM, deep neural network, etc. The main method that is proposed in this work is, if any person comes in front of the pi camera, first it will look for potential matches that we have already stored in this system. If the module finds a match, then it captures the person and sends an alert to the Headquarter.
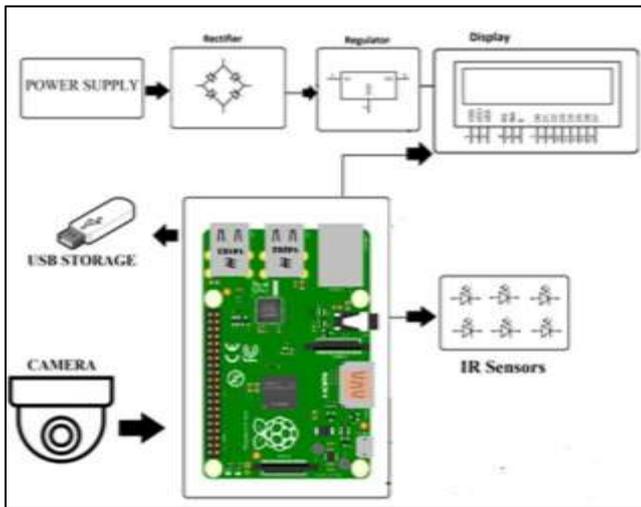
421

Fig. 1: System Architecture

In this paper, the images in the database are pre-processed to remove noise and redundancy. Then it undergoes feature extraction where Haar cascade is employed. The video obtained from the surveillance camera is going to be converted into frames. When a face is detected in a frame, it is pre-processed where noise and redundancies are reduced. Then it undergoes feature extraction process where Haar cascade comes into picture.

The processed real time image is compared with the processed images already stored into the database. If match is found, the person is considered as criminal/suspect. If he's criminal/suspect the time for which he was under the surveillance of the camera is noted and email is sent to the admin with the image of the suspect.

IV. ALGORITHM

A. Haar cascade

Face identification is a PC innovation that decides the areas and sizes of human faces in subjective (advanced) pictures. It recognizes facial highlights and disregards whatever else, for example, structures, trees and bodies. Face recognition can be viewed as a progressively broad instance of face confinement. In face confinement, the errand is to discover the areas and sizes of a known number of appearances.

1) Haar features

OpenCV's calculation is at present utilizing the accompanying Haar-like highlights which contributes to the fundamental classifiers:
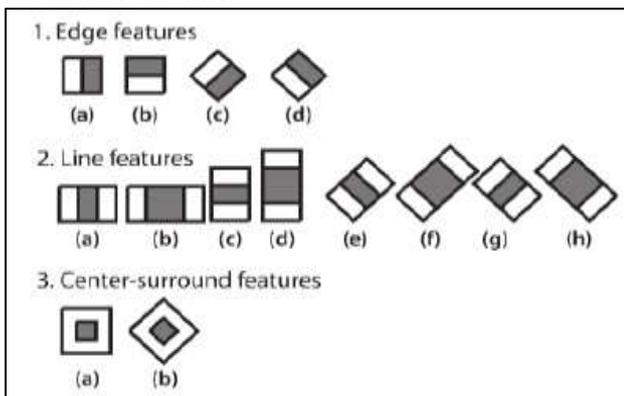

Fig. 2: Haar Cascade

2) Cascade of Classifiers

Rather than applying all the 6000 highlights on a window, amass the highlights into various phases of classifiers and apply one-by-one. (Ordinarily initial couple of stages will contain less number of highlights). On the off chance that a window falls flat the main stage, dispose of it. We don't think about outstanding highlights on it. On the off chance that it passes, apply the second phase of highlights and proceed with the procedure. The window which passes all stages is a face locale.

V. RESULTS

The testing is done using raspberry pi platform with the following specifications:
- Quad core 64-bit processor clocked at 1.4GHz
- 1GB LPDDR2 SRAM
- 42mp Quantum camera module
- Bootable SanDisk Ultra 16GB micro SD Card

A. Steps followed:

Firstly, we need to install the raspberry os onto the sd card
connect all the components to the hardware
login to the raspberry using vnc server
connect the dongle to the raspberry pi

B. Command used for setting up the OpenCV and to run the required python file:

Initially, all the OpenCV modules are separately installed on a virtual environment. So, our first step is to type the command as given below:

After getting into the virtual environment, we need to change the directory to where we have saved our python file. Refer the below figure.
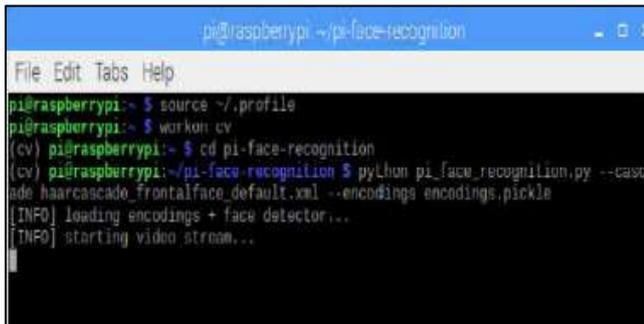

Final step is to run the required python code as shown below.

C. Execution:

In this figure the python script is loaded. After the script is loaded the face will be recognized. If the person's face is unknown, then that persons face will be sent to the admin's email.

VI. CONCLUSION

This paper has introduced the face recognition system based on Haar cascade. Even though the stored set of images of the person into the database differ from the input image, the system is a fruitful method of identifying the faces. In order to find the difference between input image and stored images the system takes out and calculates main features from the input image.

Thus, some changes in the new face image to be recognized can be allowed. The main advantage is that system uses citizenship database which already exists.

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