International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 05 | May 2021 www.irjet.net p-ISSN: 2395-0072

AUTOMATED CRIMINAL IDENTIFICATION AND NOTIFICATION SYSTEM

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Abstract - *As the world has seen exponential development over the last decade, there is an atypical increase in the crime rate and also the number of criminals is increasing at an alarming rate, this leads toward a great concern about the security issues. The individualistic characters of the human face can be extracted by face recognition. Face recognition is a simple and agile bio-metric technology. Face detection and recognition is the technology which is used to identify a person from a video or image. With the advancement in technology, the extracting features of the human face are become simpler. This paper presents a real time face recognition using a automated surveillance camera. In this system, we can detect and recognize the faces of the criminals in a video stream obtained from a camera in real-time. Criminal records generally consists personal details and the photograph of the criminal. So, we can use these photograph along with his details. The video captured from the surveillance camera are converted into frames. When a face is detected in a frame, it is pre-processed and then it goes through feature extraction. The features of the processed real-time image are compared with the features of images which are stored in the criminal database. If a match is found, an alert message along with the location of the criminal would be sent to the authority.*

Key Words: Face feature extraction, Face Detection, Face Recognition, Haar, Open CV.

1. INTRODUCTION

Biometrics is a technology that uses the unique patterns of physical or behavioral traits of human for authentication or identification. There are many services and applications that require high security and smooth customer experience. Biometric technology is supplanting traditional authentication methods. One of the advanced methods of biometric is facial recognition. For identifying a person face is the vital part of the human body. The face is important for human identity. It is the feature which best classifies a person. Facial recognition is a challenging problem that finds application for authentication in banking services, security systems, searching, and personal identification. Face recognition which is a combination of machine learning and the biometric techniques which holds the qualities of not only high precision but also the reliability. A human can easily recognize the face of human, for the computer it requires an entirely different process. A face recognition system is expected to identify faces present in images and videos automatically. It can operate in either or both of two modes: (1) face verification (2) face identification. Face identification is defined in three steps (1) Face detection (2) features extraction (3) Face recognition. Camera configuration is very important to track moving persons and recognize them precisely. Automatic face recognition is all about extracting the meaningful features from an image, putting them into a useful representation and perform some classifications. Face detection and recognition can be used to develop a system that can be used by police or investigation department to recognize criminal from their faces.The research in facial recognition is motivated by vast real-time applications that can make the traditional identification system smooth and easy. Facial recognition CCTV systems can improve performance in public security missions. Face recognition CCTV can be used by police to track and identify past criminals suspected of enacting an additional infraction. The simple and easy approach to identification has made facial recognition as the key biometric technology. The benefit of facial recognition over other biometric technologies is that it is natural, nonintrusive and easy to use.

1.1 Facial Recognition

A facial recognition system is a technology capable of matching a human face from an image or a video frame against a database of faces. The facial recognition can be done using two methods one is Geometric that is feature based and other Photometric that is view based.

A. Geometric:

This technique uses the geometrical relationship between the facial landmarks. It finds the three-dimensional configuration of the features on the face. This method identifies the features of the face like eyes, nose, mouth and eyebrows. It studies the location of these features. The faces are uniquely recognized by determining geometrical distance and angles between the features. The process of the geometric method to facial recognition is as follows. It marks

the points at the prominent parts of the face as on eyes, nose and boundary of the lips. Further, only these points are measured, geometrical distance is calculated between these points to uniquely identify the face.

B. Photometric stereo:

Photometric stereo is a method to quickly estimate the three-dimensional geometry of a face using several images with an identical viewpoint but varied illumination directions. This method uses numerous photo/image of a person taken under different lighting conditions and taken from a different angle. Then recover the shape of the face by a gradient map. This image is made up of an array of the surface normal. In photometric stereo method, multiple images of the same face are considered to gradient map, to determine the single image.

Out of these two approaches, the implementation of a geometric-based approach to identify and detect face is discussed in this paper. Both of these are capable in terms of recognizing faces. When dealing with only software, the geometric method is the best choice for Open CV.

2. PROPOSED METHODOLOGY

The criminal face identification is implemented by extracting the face from video or image and matching the features of face with the image in database to identify the criminal. If a match is found, an alert message along with the location of the criminal would be sent to the authority.

2.1 System Flow

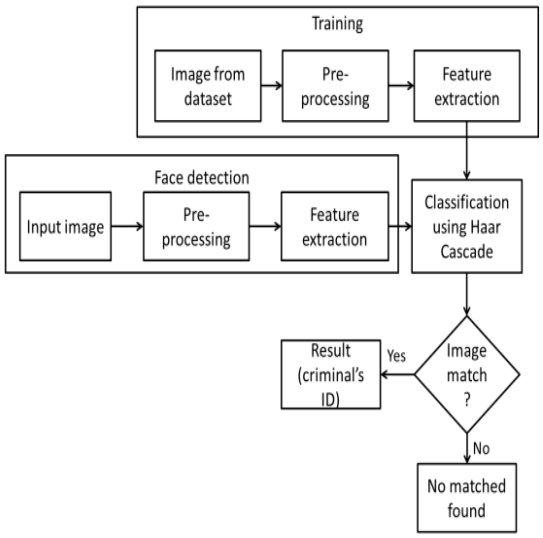

Fig -1: Face Recognition Process

The diagram as given in figure 1 describes the face recognition process.

(a) Registering new criminal: This is the first step of implementing criminal identification where criminal has to be registered to the database. The details of criminal involve id, name, crime details and the photograph of criminal. This face can be used for identifying the criminal captured through the surveillance camera.

(b) Face detection: The video captured from the surveillance camera are converted into frames. In this frames the model checks the presence or absence of face in the image. Once face is detected its location is localized and only the face image is extracted.

(c) Preprocessing Images: The aim of pre-processing is an improvement of the image data that suppresses undesirable distortions or enhances some image features significant for further processing. In this step the features that are to be extracted are processed, for improving the rate of recognizing the face.

(d) Feature extraction: When a face is detected in a frame, it is pre-processed and then it goes through feature extraction. The performance of the entire system depends on this step. Different facial features are extracted using the Haar cascade classifier.

(e) Classification: The features of the processed real-time image are compared with the features of images which are stored in the criminal database. Classification is performed using Haar Cascade Classifier.

(f) Notification: If a match is found between the real time image and database image of a criminal, an alert message along with the location and real time image of the criminal would be sent to the authority. From this details the police can further track the criminal.

2.2 Open CV

Open CV is the vast open-source library for the computer vision, machine learning, and image processing and plays a major role in real-time operation which is very important in today's systems. Through Open CV, one can process images and videos to identify objects, faces, or even handwriting of a human.

Open Source Computer Vision Library is a library of programming functions aimed at real-time computer vision. Classifier provides the differences between positive and negative image where the positive image is for face and the negative image is for non-face image. Open CV trains the classifier on any chosen face as set in the program and provides pre-trained and ready for implementing face detection classifier.

3. ALGORITHM

Haar Cascade is a machine learning object detection algorithm used to identify objects in an image or real time video. This algorithm requires a lot of positive and negative images (where positive images means those images where the object to be detected is present, negative means those where it is not present) so that it extracts the face images and convert them to a grayscale image. There are different feature like an edge feature, line feature, four rectangle feature that is landmarked in the face. Haar cascade algorithm has four stages:

(a) Haar Feature Selection

(b) Creating Integral Images

(c) Adaboost training

(d) Cascading classifier

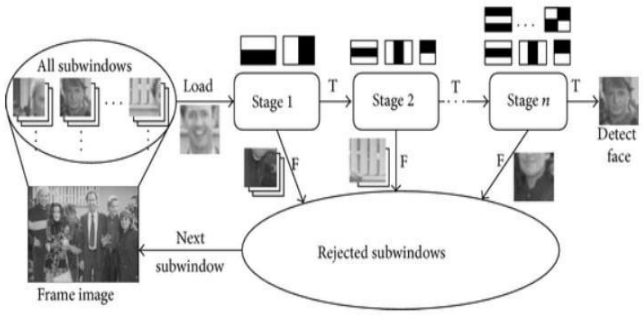

Fig -2: Haar Cascade

After the training data in the form of images is fed into the system, the classifier begins by extracting the Haar features from each of the image. They are just like the convolutional kernel. Each feature is a single value which is obtained by subtracting the sum of pixels under the white rectangle from the sum of pixels under the black rectangle. Calculating the pixel difference for all the features will be a rigorous process so we use the Integral Image concept where we calculate four corner values. For selecting the best feature out of the entire chunk, a machine learning algorithm called Adaboost is used. We select the features with minimum error rate, which means they are the features that best classifies the face and non-face images. The process is continued until required accuracy or error rate is achieved or required number of features are found. The cascade classifier consists of stages where each stage consists of a strong classifier. The classifier at each stage determines whether or not the sub-window is a face and determines where to discard sub-window or continue to next stage.

4. RESULTS

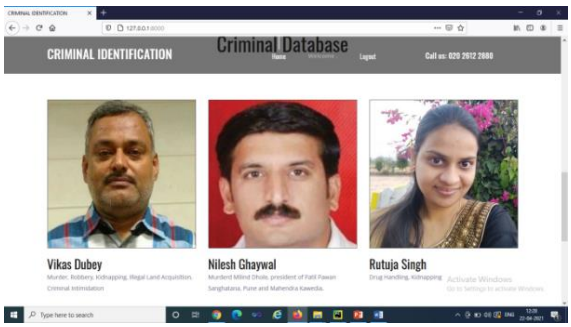

Fig -1: Criminal Database

Fig -2: Criminal Identified with Hat and Spectacles.

Fig -3: Notification on Mobile App

5. CONCLUSIONS

The purpose behind the technology is making criminal identification easier and this project is a step towards achieving that goal. Protective services and authorities often fail to respond to crime incidents efficiently. They mostly follow a reactive approach which relies mostly on witness reports or CCTV footage after the crime takes place. Therefore, in most of the cases, when an event occurs, authorities visit the location of the incident, retrieve the content manually from the camera, and then proceed to identify relevant footage either by watching the full length of the video or by processing it through specialized video analytics algorithms. In the proposed system, we will be able to detect and recognize faces of the criminals in an image and in a video stream obtained from a camera in real time and notify the concerned department. We will use Haar feature-based cascade classifiers in Open CV approach for face detection. So this system will very useful for the police department to identify the criminal through video obtained from camera in real time.

REFERENCES

[1] Omkar Chitnis, Antriksh Borkar, Yatharth Donde, "Criminal Identification and Alert System", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 5, Issue 8, August 2016.

[2] Nurul Azma Abdullaha, Md. Jamri Saidi, Nurul Hidayah Ab Rahmanb, Chuah Chai Wenc and Isredza Rahmi A. Hamid, "Face Recognition for Criminal Identification: An implementation of principal component analysis for face recognition", The 2nd International Conference on Applied Science and Technology 2017 (ICAST'17). 1891, 020002-1–020002-6; https://doi.org/10.1063/1.5005335

[3] Ahmed AbdulQader Al-Bakeri Abdullah Ahmad Basuhail "Notification System Based on Face Detection and Recognition: A Novel Approach" International Journal of Computer Science and Information Security (IJCSIS), Vol. 14, No. 4, April 2016.

[4] B. Kranthikiran, Padmaja Pulicherla "Face Detection and Recognition for use in Campus Surveillance" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-3, January 2020.

[5] Ningthoujam Sunita Devi Prof. K. Hemachandran, "Automatic Face Recognition System using Pattern Recognition Techniques: A Survey", International Journal of Computer Applications (0975 – 8887) Volume 83 – No 5, December 2013 10.

[6] Bernd Heisele Thomas Serne and Tomaso Poggio "A Componentbased Framework for Face Detection and Identification" International Journal of Computer Vision c 2006 Springer Science + Business Media, LLC. Manufactured in the United States. DOI: 10.1007/s11263-006-0006-z.

[7] Ashu Kumar, Amandeep Kaur Munish Kumar "Artificial Intelligence Review" https://doi.org/10.1007/s10462-018-9650-2 Face detection techniques: a review © Springer Nature B.V. 2018.

[8] Omaima N. A. AL-Allaf "Review of Face Detection Systems based Artificial Neural Networks Algorithms", The International Journal of Multimedia amp; Its Applications (IJMA) Vol.6, No.1, February 2014 DOI: 10.5121/ijma.2013.6101 1