

# CamRadar – Facial Recognition System

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**Abstract**— Face recognition has become one of the key aspects of computer vision. There are no less than two purposes behind this pattern; the first is the business and law authorization applications, and the second is the accessibility of achievable advances following quite a while of research. Because of the simple idea of the issue, PC researchers, neuroscientists and clinicians all offer an unmistakable fascination in this field.

**Keywords:** Face Recognition, Image Processing

## I. INTRODUCTION TO FACIAL RECOGNITION METHODS

Face recognition is an important task in image processing and computer vision. This system is concerned with determining the identity of a human being observed in an image through any set of inputs such as camera. Humans can recognize any object in the real world easily without any efforts; on contrary machines by it cannot recognize objects. Object recognition is one of the fundamental tasks in computer vision and now facial recognition is advancing the technology. It is the process of finding or identifying humans (for example face) in digital images or videos. Object recognition methods frequently use extracted features and learning algorithms to recognize the present input set of face.

The face is crucial for human identity. Face is the feature which best distinguishes and identifies a person. Face recognition is an interesting, vital and challenging problem and impacts important applications in many areas such as identification for law enforcement, authentication for banking and security system access, and personal identification among others. Face recognition is an easy task for humans because our brain does that job for us effortlessly but it's entirely different task for a computer because we have to train the machine or model to be able to recognise the facial minute details with need a lot of skills. Face recognition is all about extracting those meaningful features and minute differences from an image, putting them into a useful representation format 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 idea or process can be divided in three major steps where the first step is to find a database of faces with multiple images for each individual for training purpose and more the number of images the better the computer gets. 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.

Face detection is the first step are the many applications; one of them is face detection and recognition.

To the recognize a face, we first detect the face in the frame and then we compare it with a set of known individuals present in a database to verify the identity of each person. Face recognition method can be classified as

two main approaches: In Feature-based approaches skin texture feature we first process the input image to remove the noise, and then we extract distinctive facial features such as the eyes, mouth, nose, edges, etc., and then geometric relationships among those the facial points, facial expression thus reducing the input facial image to a vector of geometric features.

The face detection and recognition techniques are then employed to match faces using this database. Most of the previous works was based on this technique and method.

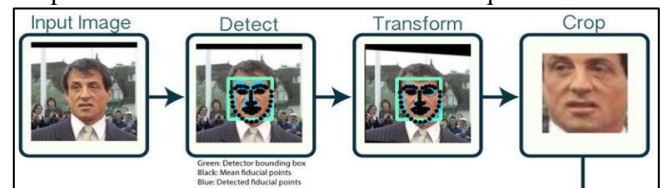


Fig. 1: Facial Image Analysis

## II. PROPOSED SYSTEM

Quite less knowledge is known about human recognition till date on how do we analyse and dissect an image and how does the brain decode it and how are inner features (mouth, eyes, nose, ears) or outer features (head shape, hairline) used for a successful face recognition?

When an object or human is spotted by camera, which needs to be processed, it detects that particular face/object using the inbuilt feature of OpenCV called as Haar function. For simplicity, the face recognition system presented in this project is using grey scale images.

To build the face recognition system, we first need to perform face detection, extract facial details from each face by training a face recognition model and then finally recognize faces in both images and video streams by the help of OpenCV. The face detection algorithm looks for specific Haar features and not pixels on screen of a human face. When one of these feature is found, the algorithm allows the face candidate to pass to the next stage of detection. A face candidate is a rectangular section of the original image scanned which is called as a sub-window. Generally, these sub windows have a fixed determined size. The algorithm scans the entire image with this sub-window and denotes each respective section a face candidate.

The whole process can be divided in three major steps where the first step is to find a strong database with a collection of images for each 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.

## III. LITERATURE REVIEW

A. *Criminal Identification System Using Face Detection and Recognition by Piyush Kakkar (IT Department,*

*Maharaja Agrasan Institute, Delhi* (ISO 3297:2007 Certified Vol. 7, Issue 3, March 2018):

This paper report helped us to get a basic overview of how a face detection and recognition system works for the criminal identification and how useful the system is in the real time where the security approach is not up to the mark.

With the advancement in security technology, cameras especially CCTV have been installed in many public and private areas to provide surveillance activities. The footage of the CCTV can be used to identify suspects on scene. So, this made us move forward to design an automated facial recognition system using the known HAAR CASCADE CLASSIFIER of the OpenCV.

From this referred report we got to understand that the system works only on basis of few main steps:

- Import the required modules: This step tells to invoke the library and modules that will be required for the faced identification and detection.
- Load the Face Detection Cascade: This step tells to detect the image in face using the Haar Cascade Classifier by calculation the region of interest in each image.
- Create a Face Recognition Object: This step tells to create a face recognition object that consists of the functions like Train, Predict, to recognize a face. Usage of the LBPH recognizer because Real life isn't perfect.
- Prepare the training set and perform the training: After the faces are captured using the region of interest we train them using the trainer.
- Testing: Then the final step is to test the whole system that is whether the face is being recognized or not.

This is how we create the whole system for facial recognition and improve the security in the absence of police if any incident takes place which makes easy to find the criminal that conducted the crime.

*B. "Face Detection" (a project proposal) by Department of Computer Science and Information Technology of Prime College(Tribhuvan University)(26 MAY 2017)*

This is another report that we referred for creating our system. From this we got to know that the facial detection and recognition works on the Haar Cascade feature along with LBPH recognizer only.

But we also got some knowledge about the problem that we may face during our creation of the system. This helped us to make a better and accurate system. Some of the reasons:

- Physical changes
- Acquisition geometry changes:
- Imaging change

Taking all these aspects into account, we can analyse the unique features that differentiates one individual from another.

We also learned how feasible the system should be for perfection. We got to know the software and hardware requirements from this report. We also preferred to use Webcam for our video surveillance and using the appropriate version for the Python and OpenCV library.

*C. Face Recognition using Machine Learning by Arun Alvappillai and Peter Neal Barrina (UCSD):*

From this report we got to know how to improve the accuracy of the facial recognition system so we worked on it too. It says that more the number of images of a particular person or a criminal you store in database the more accurately the face will be detected and recognized. So we decided to make a database of each criminal with about 200-250 images and then further train all these images so that we can get accurate database.

It also gave us an idea of creating the SQL database and make a Web Portal. The Web Portal should contain the administrator or some other agent login from where he could see the recently detected criminals, he can also add new criminals or remove those who get caught and even see the crime rate. The agents can also a statistical view of data. The SQL database would contain the reference of the ID for each criminal.

#### IV. OBJECTIVE

Face Recognition System is been available for accessing control over systems such as entrance, gates, both commercial and residential doors etc. The overall system helps in keeping the entrance system completely secure and safe by restricting entry to unauthorized people.

In day – to – day news we get to know Various crimes in different parts of nation. The major problem is corruption in our country which helps such criminals to escape from imprisonment. Government is unknown for such cases, which indirectly approaches such crimes to increase.

Our system overcomes such traditional problems of bribe and corruption. The software is inbuilt in CCTVs all around nation. and when a criminal is spotted roaming freely, there's when the software detects the criminal by comparing present person with the person from criminal records of Government.

Real Time Problem: A person was rewarded 1 crore INR because he was sentenced for 3 years even though he was not a criminal. The reason was the actual criminal was his identical brother(twin). This system will eliminate such misunderstanding.

#### V. LIMITATION

Lighting: The lighting conditions may differ during the course of the day. Also, the weather conditions have a great impact on the lighting in an image.

In-door and outdoor images for same object can have varying lighting condition. Shadows in the image can disturb the image light and visuals. Whatever the lighting may be the system must be able to recognize the object in any of the image.

Positioning: Position in the image of the object can be changed. The system must handle in images uniformly if template matching is used in it.

Mirroring: Camradar must be able to recognize the mirrored image of any object in the image.

Occlusion: When object in an image is not completely and clearly visible then it is referred as occlusion.

Multiple targets are close together leads to misclassification.

Small human targets are often not recognized as temporally stable objects.

## VI. CONCLUSION

Most vital use of the face detection and recognition project is to catch criminals which could be at mall or some other public places where criminal have a chance to escape but with this being at the entrance of every department or such public section, we can easily locate the responsible person for the purpose caused. It can also be used in other situations such as finding a lost person or kid by matching their faces. This project is of great use to the crime investigators at such high demanding public areas. The project consists of both hardware and software components making it a complete all-round project.

## ACKNOWLEDGMENTS

We would like to express our sincere thanks to our HOD Mrs Vaishali Rane, our guide Mr Kalpesh Kubal and all the staff in the faculty of Computer Science Department for their valuable assistance

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