

# Face Detection Identification

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**Abstract: Face Detection Identification** or we can refer it as **Face Recognition** is the process of recognizing the person with the help of classifiers and recognizers and identifying the person in real-time. The face recognition application has captured its roots on to the specific fields starting from security access and jumping on to healthcare, general identification, database systems. OpenCV, a library function to solve computer vision problems, is accountable for providing us with a class Cascade Classifier and loads the training file of the classifier onto our systems. In this paper we have emphasized on the LBPH recognizer for face verification. The classifier detects the face and recognizer provides us with the image along with the label associated with the person. This paper contains the basics of Face recognition, different techniques for types of classifiers, face recognition are given.

**Keywords:** face recognition, Eigen-Face, Fisher-Face, Local binary patterns histograms (LBPH) Face Recognizer, Cascade classifiers, OpenCV.

## I.INTRODUCTION

The process of identifying a person in any real time images or videos is known as face

recognition. We as humans identify and acknowledge any friend or any family member on the basis of their facial characteristics. Specific areas [1] of law, criminal investigation, biometrics for security purposes all use the face recognition application.

Further Face Recognition has gained the limelight as it has a higher identification or recognition rate.

Recognizers vary on the light factor, the best recognizer being the LBPH (Local Binary Pattern Histogram) recognizer. The main steps of face recognizer are verifying and recognizing the face.

Identifying the face or face verification compares the face image with the input image. Face identification compares the face image to all the images stored in the database.



Fig1: Face Detection

## II. LITERATURE SURVEY

The main objective of Face Recognition is to identify the input image and provide a label output associated with it on the basis of training. In the process of Face Recognizing we have to use the face detection classifiers[4]. Classifiers, as the name suggests, is known to classify the input image accurately. It decides as to whether the image is a positive image (face image) or negative image (non-face image) and the classifier is trained on hundreds to thousands of face images so it is able to work on it efficiently. We have two pretrained face detection classifiers provided by OpenCV: Haar Classifier, LBP Classifier. Face recognition, determines the face and gives the label output. The model is trained for recognizing the face. There are three built in face recognizers provided by OpenCV: Eigen-Face[1], Fisher-Face, Local Binary Patterns Histograms (LBPH). With the help of Classifiers loaded onto our files by OpenCV we call detectMultiScale function through which we would be able to detect the face. This detected face is captured and stored onto the specified path of the database. The captured image goes through the process of training along with the label associated with each face so that it gets well acquainted with the features of the captured image. Then the input image is checked as to whether it matches with the captured image. A confidence value is set, to measure the accuracy of the input image matching with the captured image.

## III. TECHNIQUES AVAILABLE FOR FACE RECOGNITION:

### A. CASCADE CLASSIFIER

Classifiers, as the name suggests, is known to classify the input image accurately. It decides as to whether the image is a positive image (face image) or negative image (nonface image) and the classifier is trained

on hundreds to thousands of face images so it is able to work on it efficiently. OpenCV provides a class known as Cascade Classifier. This class is very useful for us as it loads the training files of the classifiers you choose either Haar or LBP classifier. The function detectMultiScale detects a face from an image object. It finds faces and when we iterate through the list of face images obtained and a rectangle is drawn on them by using the OpenCV's rectangle function.

### 1. HAAR CLASSIFIER

To measure the single and relevant Haar feature of the face image, we place each window of the Haar Classifier on the image. The feature is basically a value which we obtain by removing total pixels under the lighter part from the total pixels under the darker part of the image. Now, for calculating a lot of features, all feasible sizes of each window are positioned at all probable locations in the image.

### 2. LBP CLASSIFIER

The image which is being trained is split into blocks. In each block, a 3x3 window checks for the central pixel which is the main area to be focused upon. A comparison is made between the central pixel and the pixels surrounding it and a binary value is generated and it is converted to decimal format. The decimal value is the value of the central pixel, and we obtain this value from each block. We plot a histogram for every block value in the image.

Finally, these histograms for each block is summed up and we obtain all the features of the image we want.

### B. RECOGNIZERS

#### 1. EIGEN FACES

Eigen Faces is a Face Recognizer that gathers face images. The face images are

trained along with the label associated with each face. In Eigen Faces, only particular features of the face is considered and the irrelevant features are not considered. It gains insights from all of the training images of every individual simultaneously. Eigen Faces Recognizer[2] considers the relevant characteristics of the face and these characteristics or features are known as the principal components and the Principal Components[3] splits the face into feature vectors and searches for those vectors responsible for variability of face images. The feature vectors are known as the Eigenvectors. The face can be approximated with the help of eigenvectors having highest eigenvalue. Eigen-Face extracts the principal components or the relevant features of the input image, then it compares these features with the captured images. The best match is found and the label associated with the face is provided in output. This recognizer has gained popularity because of its simplicity. Time and Storage are also efficiently utilized in Eigen Face Recognizer.

## 2. FISHER FACES

Fischer Face[4] is also one of the popular algorithms for face recognition. Light plays a dramatic role in Eigen-Face. It is considered as a relevant feature and since Eigen-Face gains insights for all the images simultaneously, it may account for discarding the features of other person and obtaining the features of only one particular person. Fisher-Face is basically a complete improvement over Eigen-Face. It extracts useful and relevant features from each person's faces separately rather than extracting them from all the faces put together so it does not discard the features of other people and the light factor reduces the influence of one person's features over the other person's features to a great extent

but still the light conditions is an important factor even in Fischer Face Algorithm.

## 3. LBPH (LOCAL BINARY PATTERN HISTOGRAM)

Light factor accounts for discarding of relevant features of faces, which is basically an issue for the other face recognizers namely Eigen-Face and Fisher-Face Recognizer. In reality, light can play its role anywhere it wants to so to address this problem, the LBPH recognizer[4] is used. The LBPH algorithm works on the fact that the image is split into blocks and it takes a window with measurement 3x3. We compare the pixel present at centre to the pixels which surrounds it in the 3x3 window frame. Values are obtained by comparing the pixels, if the value of the pixel surrounding the central pixel is more than the value of central pixel itself, then we equate value 1 to it else value 0 is provided. After the assignment of values, we obtain a list of binary number format which is local to the specific area of the image. This local binary pattern is converted to decimal format using the binary to decimal conversion. We plot a graph, which contains the histogram for all the decimal values we have obtained. LBPH extracts the histograms for every image that is present in the dataset, so we obtain one histogram per face image. So, it accounts for the fact that the number of images in the dataset is equal to number of histograms after training. These histograms are stored for the purpose of recognition so when an input image is matched, then the histogram of the input image is compared and matched

with the histograms of the training images present in the dataset. In correspondence to the images, the algorithm also keeps in check the face image of the person associated with its own histogram.

#### IV. IMPLEMENTATION

Face detection by using the OpenCV function of Cascade Classifier. Detectmultiscale for detecting faces and drawing rectangle around the image object. Using LBPH Face Recognizer to recognize the input image. A new input image is provided to the face recognizer for the purpose of Recognition. In LBPH, the recognizer plots a histogram for this input image. A comparison ensues after obtaining the histogram for the new input image. The comparison is between the histogram of the input image and the histogram of the training images present in the dataset. A best match is found and the label associated with it is displayed as output.

#### V. SCOPE

Right now, facial recognition seems impressive. It's quick, precise and deliver excellent results in no time. In this way, businesses can integrate it with their security systems and get the advantages of using it. Face Recognition plays a vital role in applications based on smart card, general identity verification, access to smart phones and criminal case investigation.

#### CONCLUSION

This paper covers the application of face recognition. We can have different algorithms out of which LBPH is considered the best for enhanced face recognition which yields better performance as it also deals with light illumination conditions but still we can use any of the algorithm as per the requirement.

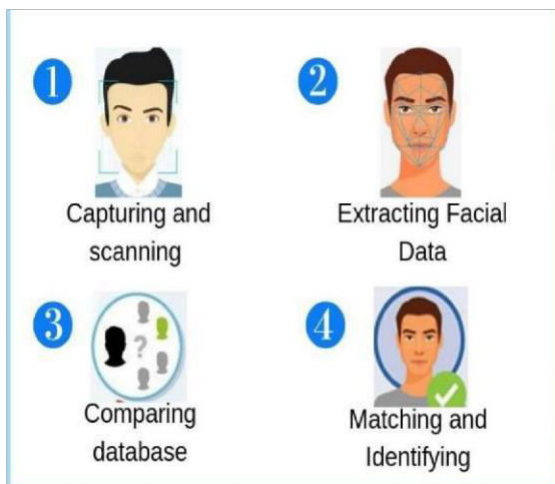


Fig 2: Explanation of working of face detection identification i.e. Face Recognition

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