# FACE RECOGNITION TECHNIQUES: A BRIEF REVIEW

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***Abstract :***  Initially face recognition is one of the form of computer application, but recently face recognition is mostly use in another form of mobile applications and other forms of technology. The identification of face from image or video source could be a study of pc vision grasp as face detection or recognition. Face detection and recognition becomes in style in recent years by the development of computing power. In this study we are going to gift Eigenfaces algorithms performance side, Fisherfaces, and native Binary Pattern Histograms in numerous development platforms: Arm and Intel processors. In past days, facial recognition is used as a biometrics. It is typically used for security purposes and can be compared to other biometrics such as fingerprint or eye iris recognition systems. This paper focuses on the various face recognition techniques use in the past and how they help to prevent unknown attack.

***IndexTerms*** **- Detection, Eigenfaces, fisherfaces, LBP,ELBP**

## I. INTRODUCTION

The identification of a face from a video or image supply may be a study of laptop vision understand as face detection or recognition. Face detection and recognition becomes customary in recent years by the event of computing power. It's wide selection of applications including: statistics, content-based image retrieval systems, photography and video processing. Computing and visual sensing technologies in today's world has reach to a state that inexpensive, reliable and accurate solutions can be feasible. Many embedded systems supplied with CMOS camera can be used in face detection systems, and because of the heavy computing process, a developed versions of this systems can be used in face recognition. One of major application of face recognition system is biometric devices and many studies are going on, a different type of application can be used in segmenting a movie among with its cast. This application can be used in jumping any scene of your favorite actor/actress.

Television or media player are equip with enhanced embedded systems, which can perform face recognition off-line or on-line. When the job is recognition of a face in a movie, the process becomes more complicated, since the images you have to process are generally not in an ideal condition like in biometric devices. The person you have to detect and recognize can be in various conditions. These conditions can be low illumination, contrast and scene conditions.

This study we will present performance aspect of different algorithms in different development platforms.

The simple face tracking system can be developed  by dividing the problem into three separate subproblems:

1. Detection
2. Identification
3. Track the face

The problem can be implemented by using various functions

**Step1: Detection**

For tracking a face it will also need to first detect it. This function (vision .CascadeObjectDetector) is used in matlab by default to detect the face in a video. This object detector uses the Viola-Jones detection algorithm and a trained classification model for detection. By default, the detector is also used to detect faces, but it can be configured for other object types.

**Step2: Identification**

For tracking a face, first it is detect in the video and also, the next step is to identify a unique feature. For example, it can use the shape, texture, or color. It will choose a feature which is unique for the object.

**Flow chart of proposed system**
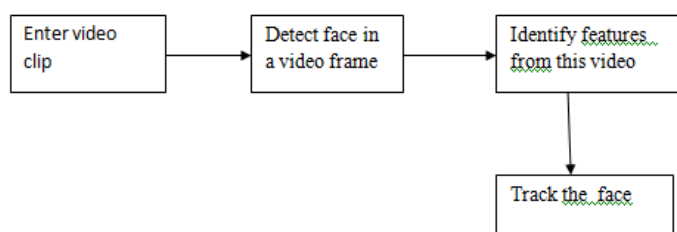
**Step3: Track The face**

With selection of Skin tone feature track the face. In this step, vision.Histogram Based Tracker for tracking. Viola jones use this vision.HistogramBasedTracker for tracking. The histogram based tracker uses the CAMShift algorithm, which provides the capability to track an object using a histogram of pixel values

## II. LITERATURE SURVEY

There are many methods used in face recognition. Each has different features under different conditions like illumination, expression and pose change. Among them, for our purpose which is face detection in video stream, we focused on three major methods and we looked their performance under different development environment to find a good matching and low computing costs.

We use three methods which is Eigenfaces, Fisherfaces, and Local Binary Pattern Histograms (LBPH). These methods also compare with each other. Both Eigenfaces and Fisherfaces methods are one of the well-known techniques for face recognition. They are known to be very sensitive to pixel level variations such as illumination, facial expression and pose variations. LBP is a relatively new method primarily developed for texture analysis. Compared to Eigenfaces and Fisherfaces methods, we found that LBPH is significantly more robust under illumination and pose variations.

### 2.1 Eigenfaces

Eigenfaces is based on Principal Component Analysis (PCA). PCA is used to reduce the dimension of an image matrix. For example if face images are represented in g-dimensional space, PCA uses a linear transform and aims to get an h-dimensional subspace, which answers maximum variance in the g-dimensional space and where h is too small. Mean centered images are calculated by subtracting the normalized training images from the calculated mean image.

There is a negative aspect of this method, that it tries to maximize inter and intra class scattering. Inter class scattering is good for classification while intra class scattering is not. In face recognition, if there is variance of illumination, this increases intra class scattering very high, even classes seems stained, and causes low classification.

### 2. 2 Fisherfaces

Linear Discriminant Analysis (LDA) or Fisherfaces aims to increase inter class differences, not data representation. The Fisherfaces method is an enhancement of the Eigenfaces method that it uses Fisher's Linear Discriminant Analysis (FLDA or LDA) for the dimensionality reduction.

### 2.3 Local Binary Patterns

Local Binary Patterns (LBP) was first presented by Ojala et al. use in texture description. The basic method, labels each pixel with decimal values called LBPs or LBP codes, to describe the local structure around of pixel.
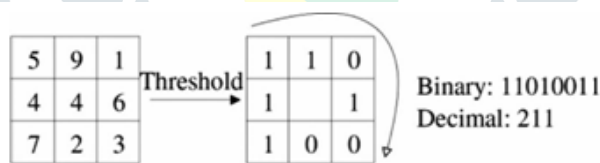


Fig. 1 LBP OPERATOR

There is a drawback of LBP which uses 8-neighborhood (3x3) that cannot cover large-scale structures. To take into account texture of different size structures, the method is generalized. In [5] Ojala et al. revised the method to be flexible for any radius and any number of sampling points and named the new method as Extended LBP(ELBP). Figure 2 shows different examples of ELBP operator, and P represents the number of neighbors and R represents the radius of a circle on which neighbors are located.
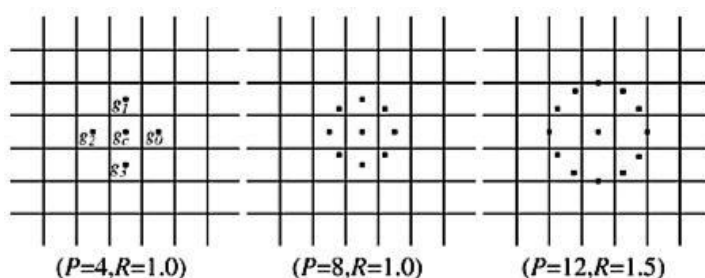


FIG. 2 ELBP OPERATOR EXAMPLE

The histograms of LBP are used for face recognition since LBP histograms contain information about the distribution of local micro patterns. Because the face image is too big for LBP calculation, dividing the image into small regions is proposed in [6]. Some parts of face (like eyes, mouth) contain more information for face recognition. Yang et al. proposes to train and allocate different weights for face parts, by their information covering and then concatenating them end to end to build up global description of face. This helps to collect local pattern information with spatial details of the whole image.

To decide if two face images are belong to same person, the images' histograms are compared. Chi square statistic similarity measure is used for comparison of histograms

## III COMPARATIVE STUDY

Face detection and recognition techniques mostly works on extracting the information from available images and processing that information to use that output for validation procedure. Due to this approach the requirement of quality image acquisition is expected which may increase the cost of procedure. Comparison of various biometric technology table below:

| Biometric technology | Accuracy | Cost | Devices required | Social acceptability |
|---|---|---|---|---|
| Iris recognition | High | High | Camera | Medium Low |
| Retina scan | High | High | Camera | Low |
| Facial recognition | Medium low | Medium | Camera | High |
| Voice recognition | Medium | Medium | Microphone Telephone | High |
| Hand geometry | Medium low | Medium | Scanner | High |
| Fingerprint | High | Low medium | Scanner | Medium |
| Signature recognition | Low | Medium | Optical pen Touch panel | High |

The above table compares some of the biometric systems used lately, from the point of view of accuracy, cost, devices required and social acceptability.

## IV PLATFORMS

Algorithms is implemented on different platforms, to show how the algorithms benefit from the hardware and see performance variance. The result will guide anyone, who wants to build an embedded face recognition system.

Two different platforms are used. First platform is Intel based running at 2.7 GHz processor with 4 GB ram, labeled as Intel Second platform is arm based running at 1 GHz processor 512 MB ram, labeled as Arm.

## V APPLICATIONS

### 5.1      Facial Recognition & Identity Resolution



FIG.5 APPLICATIONS

Military, Intelligence and Homeland Security, Advanced 3D Facial Recognition and Identity Verification. Mobile and Video Identity Resolution and Surveillance Applications
Centralized and Secure Facial Identity Management Solution

## 5.2 Payments

Online shopping and contactless cards are just two examples that demonstrate the seamlessness of postmodern purchases. In 2016, MasterCard launched a new selfie pay app called MasterCard Identity Check. Customers open the app to confirm a payment using their camera, and that's that. Facial recognition is already used in store and at ATMs, but the next step is to do the same for online payments. Chinese ecommerce firm Alibaba and affiliate payment software Alipay are planning to apply the software to purchases made over the Internet.

## 5.3 Criminal identification

If FaceTech can be used to keep unauthorised people out of facilities, surely it can be used to help put them firmly inside them. This is exactly what the US Federal Bureau of Investigation is attempting to do by using a machine learning algorithm to identify suspects from their driver's licences. The FBI currently have a database which includes half of the national population's faces. This is as useful as it is creepy, giving law enforcers another way of tracking criminals across the country. AI equipped cameras have also been trialled in the UK to identify those smuggling contraband into prisons.

## 5.4 Security

Face recognition could one day replace password logins on our favorite apps – imagine logging in to twitter with your face.



Fig 6. Image processing in security

Facial recognition makes access to information more limited and restricted to those who own it. Facial recognition has made verification relatively easier, with nothing much to equip and a lot of information to access within minutes. The Face recognition solution has been as a major component in the field of security.

## VI CONCLUSION

The approach was used to construct a face detection system which is approximately 15 faster than any previous approach. Preliminary experiments, which will be described elsewhere, show that highly efficient detectors for other objects, such as pedestrians, can also be constructed in this way. Various methods in face recognition is compared with each other in different hardware environments. Their recognition success and performance are measured. Various biometric techniques are used but most of the places finger print authentication is used for attendance and for security purposes.

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