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Face Recognition Technology

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Abstract: Face recognition is a fast growing and interesting area in real time application. It presenting a challenging problem in the image analysis and computer vision. In this paper, an overview of some of the well-known methods in each of the categories is provided and some of the benefits and drawbacks of the schemes mentioned therein are examined. This paper also mentions some of the most recent algorithm develop for this purpose and attempts to give an idea of the state of the art of face recognition technology.

Keywords: Face Recognition, Logic pattern, Person identification, Application.

I. INTRODUCTION

Face recognition is based upon the capability of human perception system and is a routine task for humans, while develop a similar computational model of face. It is biometric based technique or biometric, this technique is used in recent years ,instead of authenticating people and granting then access to physical domain

The earliest work on face recognition can be traced back at least to 1950, in psychology and to 1960 in engineering literature.

A. Problem Definition

The main problem in face recognition technique is formulated as follow: Given face as input and take out the number of pictures of individual. How can we determine and analyse the identity of the person individually?.

When the identity of the any person is verified then how the output is to be taken?

So the resultant output like opening the locker room, opening the gate or other things will be taken into consideration.

II. REASONS BEHIND THE USE OF FACE RECOGNITION TECHNOLOGY

These are the reasons behind the use of Face recognition technology :

- A. It is an advance technology which cannot easily hacked.
- B. It is one of the fast biometric technology that has only one purpose - to identify human faces.
- C. It analyses the characteristics of a person's face images.
- D. It is a method that provides no delay and leaves subjects entirely unaware of the process.
- E. Various landmarks of facial features are measured by facial recognition tech of these features include length of cheekbones shape, distance between the eyes and depth of the eyes socket, the jaw line, and the nose width. The measurement gathered by system are then put in a database and compared to other detected faces.
- F. The use of this software allows your CCTV security algorithms trigger an alert when it identifies particular individuals from a hit list. It can't be replaced. it is a technology equally for finding **based on pin, password, token keys**. shoplifters, scam artists, or potential terrorists as well as for recognizing VIP customers in stores.
- G. This technology approach raises more and more awareness, questions about whether it violates the privacy. Is it safe to live in the world of facial recognition technology's future?
- H. All these queries will be on hold till implementation of the project if the project outputs are good as per the expectation then we will answer all the questions to the world

III. FACE RECOGNITION TECHNOLOGY EXPLAINED USING EIGEN FACES

Face recognition implementation can be done by the many methods:

Eigen faces was firstly introduced by Pentlands, and Turk in 1991. It is considered the first working facial recognition technology which is based on PCA. PCA (Principal Component Analysis). It is a statistical approach used for reducing the number of variables in Face recognition. In PCA, every image in the training set is represented as a linear combination of weighted eigenvectors called Eigen faces. In a general view, this algorithm extracts the relevant information of an images and encodes it is efficiently as possible. A collection of mages of a same person face is evaluated in order to obtain the variation. Face is typically a multidimensional structure and needs good computational analysis for recognition. Many face features make development of facial recognition systems difficulty. This problem is solved by the methods called Principal Component Analysis or so called Eigen face approach. This approach transforms faces into a small set of essential characteristics, Eigen faces, which are the main components of the initial set of

learning images (training set). Recognition is done by projecting new images in the Eigen face space with the position of known individuals.

Each image from the set contribute to an Eigen vector, these vectors characteristics the variations between the images. When we represent these Eigen vectors, it is Eigen faces. Eigen faces has greater value then we can minimize the Eigen faces to make it more efficient. The basic thing we considered not the comparison but also other significant figures explained before. The algorithm can reduce the next simple steps.

- A. Take database of the face images, calculate the Eigen faces and determine the faces space with all them. It will necessary for further recognition.
- B. When the new image found, calculate the set of weights.
- C. Find the image is a face; to do so, we have to see of it is close enough to the face space.
- D. Finally determine the image corresponds to a known face of the database or not.

In term of dimensionality reduction,

- 1) *Pros*: Reflect our institutions about the data. It allows estimating probabilities in high dimensional data. There is no need to assume independence etc. Size of the data is dramatic reduced. It has faster processing and data storage is less.
- 2) *Cons*: It is too expensive for many applications and disastrous for tasks with fine grained classes. There may be better ways to deal with clearness.

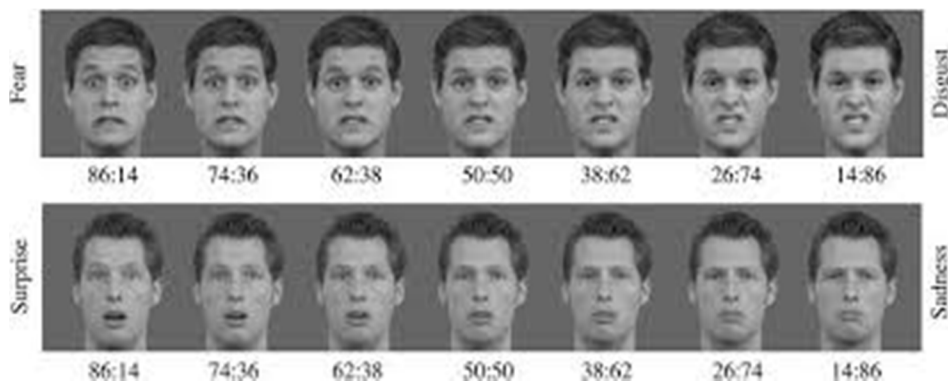


Fig1.Set of face images



Fig2.Average of the set image

A new face recognition method based on PCA, LDA and neural network were proposed in method consists of four steps:

- a) Preprocessing
- b) Dimension reduction using PCA
- c) feature extraction using LDA and
- d) classification using neural network. Combination of PCA and LDA are used for improving the capability of LDA when a few samples of images are available and neural classifier is used to reduce number misclassification caused by non-linearly separable classes. The proposed method is then tested on Yale face database.

Experiment results on this database demonstrates the effectiveness of the proposed method for face recognition with less misclassification in comparison with previous methods.

IV. APPLICATION

Face recognition is used to perform two tasks, Verification another is Identification.

In verification face of unknown individual along with a claim of identity, ascertain whether the individual is who he/she claims to be and in Identification, image of unknown individual identify by comparing images of known individuals.

There are various application areas in which face recognition can be exploited for these two purposes, a few are outlined below.

- A. Security (airports/seaports, ATM machines and border checkpoints; computer/network security; email authentication on multimedia).
- B. Surveillance (a large number of CCTV cameras are used to monitor the activities).
- C. General identity verification (electronic commerce, identifying new born, national identity)
- D. Smart Card application (maintaining a database of facial images, the face- print can be stored in smart card).
- E. Multimedia environments with adaptive human computer interfaces (part of ubiquitous or context aware systems, behaviour monitoring at childcare, recognized a customer and assessing the needs).

V. COMPARISON OF DIFFERENT FACE DATABASES

Number of face algorithms has been described in the previous sections. We give a comparison of face databases which were used to test the performance of these face recognition algorithms. The description and limitation of each database is given. .

While existing publicly-available face databases contain face images with a wide variety of poses, illumination angles, gestures, face occlusions, and illuminate colours, these images have not been adequately annotated, thus limiting their usefulness for evaluating the relative performances of face detection algorithm. For example, many images in existing databases are not annotated with the exact pose angles.

VI. PROBLEM FACING

Face recognition is a special and hard case of object recognition. The difficulty stems from the fact that in their most common form (the frontal view) face appears to be roughly alike and the difference between them are little bit subtle. Frontal face image forms a very dense cluster in image space which makes it virtually impossible for traditional pattern recognition technique to accurately discriminate among all of them with high degree of success. Intrinsic factors are due perfectly to the physical nature of the face and are independent of the observer. These factors can be further divided into two classes: intrapersonal and interpersonal class. The main advantage offered by the featured-based techs is that since the extraction of the feature points precede the analysis done for matching the image to that of a known individuals, such methods are relatively robust to position variations in the input image. Method-based schemes can be made invariant to size, orientation and/or lighting. Other benefits of this scheme includes the compactness of representation of the face images and high speed matching of Images. The major disadvantages of these approaches are the difficulties of automatic feature detection and the fact that the implementer of any of these techniques has to make decisions about which features are important. After all, if the feature set lacks discrimination ability, no amount of subsequent processing can compensate for that intrinsic deficiency .

VII. MERITS AND DEMERITS OF FACE RECOGNITION TECHNOLOGY

The merit offered by the featured-based techniques is that since the extraction of the feature points precedes the analysis done for matching the pictures or images to that of a known person, these methods are relatively robust to position variations in a input image . Feature-based schemes can be made invariant to size, orientation and lighting. Other benefits include the compactness of representation of the face images and high speed matching.

The demerit of these approaches is the difficulty of automatic feature detection (as discussed above) and the fact that the implementer of any of these techniques has to make arbitrary decisions about which features are important . After all, if the feature set lacks discrimination ability and all, no amount of subsequent processing can be compensated for that intrinsic deficiency.

VIII. CONCLUSION

Face recognition is a tough task in the field of image analysis that has received a great deal of attention over the last few years. We used many software's and its application in this problem. It receive more attention because of its many applications in various new domains. Research has been conducted continuously in this area for the past four or five decades or so, and though huge progress has been made, encouraging results have been obtained and current face recognition systems have reached a certain degree of maturity level, when operating under the constrained conditions; however, they are far from achieving the ideal conditions of being able to perform in all the situations that are encountered by applications utilizing these techniques in practical life.



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