A Case Study on Analysis of Face Recognition Techniques

Lalitha.P[*], Dr.R.Neduncheliant[**]

[*] Saveetha School of Engineering Dept. Computer Science &Engineering Thandalam.
[**] Professor, Saveetha School of Engineering Computer Science &Engineering Thandalam

Abstract- This paper aims to propose a methodology for face recognition using artificial neural networks in dynamic background. The dynamic background is chosen for comparing the important information sequences, characteristic. This paper analysis four different techniques using artificial neural networks for face recognition.

I. INTRODUCTION

Face recognition is a computer vision that has an ability to capture the face from the database automatically. Face recognition is one of biometric methods, to identify given face image using main features of face. This paper reviews most conventional face detection and face recognition approaches, leaving advanced issues, such as video face recognition or expression invariance, for the future work. The goal is to provide a firm statistical basis for drawing conclusions about the relative performance of different algorithms and to better explain why algorithms behave as they do. This helps further understanding of traditional methods such as Eigen faces.

II. FACE RECOGNITION SYSTEMS

In general, automatic face recognition systems are comprised of three steps namely

- Face Detection
- Extraction
- Recognition

Face Detection:

Detection may include face edge detection, segmentation and localization, namely obtaining a pre-processed intensity face image from an input scene, either simple or cluttered, locating its position and segmenting the image out of the background.

Feature extraction:

Denote the acquirement of the image features from the image such as visual features, statistical pixel features, transform coefficient features, and algebraic features, with emphasis on the algebraic features, which represent the intrinsic attributes of an image.

Face recognition:

Represent to perform the classification to the above image features in terms of a certain criterion. Segmentation among three steps is considered to trivial, easy and simple for many applications such as mug shots, driver's licenses, personal ID card, and passport pictures.

2.1. APPROACHES

Face recognition can be seen as a way for systems to begin to understand human face and thus building a bridge between machines and human

Depending on the type of input data the approaches for interpreting a face could be done in different ways. Depending on the quality of input and algorithm's approach.

The approaches can be made in many ways as shown in the figure:

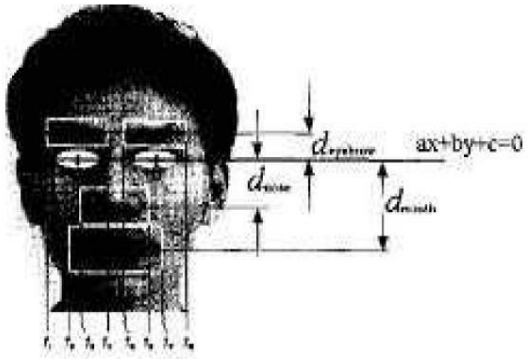


Fig1.Geometric model

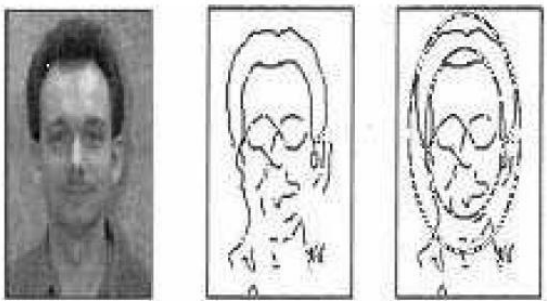
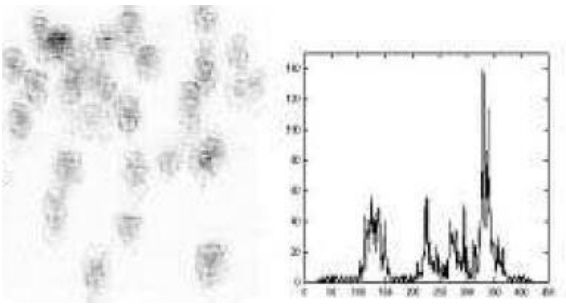


Fig1.1: Color-Based or Texture-Based Method

The approach is coarse-to-fine in both the exploration of poses and the representation of objects. Features are spatial arrangements of edge fragments, induced from training faces at a reference pose, and computation is minimized via a generalized Hough transform; there is no

on-line optimization and no segmentation apart from visual selection itself.

Color and texture are two important modalities in many images processing tasks, ranging from remote sensing to medical imaging, robot vision, face recognition, etc.



MOTION BASED MODEL

Motion analysis could extract the low-lever features such as body part segmentation, joint detection and identification and recover 3D structure from 2D projections in an image sequence. This motion information, which was comprised of position and velocity of moving eyes, speaking tone and expressions, etc., incorporated with intensity value, could be employed to easily locate the face.

Other Methods:

This model is used to characterize the geometric pattern of facial components. The center and the radius of the eyeballs of a person's eyes was detected using the face detected, the structural information extracted and the contour and region information

Some of the literature differentiates 4 different approaches in recognizing a face.

- Principle component analysis
- linear discernment analysis
- Hidden Markova method
- Eigen faces

2.3. Principle Component Analysis Approach

Principal Component Analysis (PCA) is an unsupervised method of dimensionality reduction and classification. Using Principal Component Analysis, patterns are detected in the data and on the basis of these patterns similarities and dissimilarities in the data are identified. PCA helps in detecting such type of patterns in the data which cannot be represented and analyzed graphically. If the patterns in the data are identified, then it is possible to reduce the dimensions of data without losing much information.

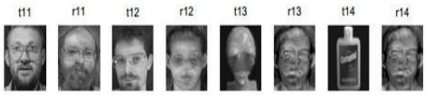


Figure 5: Unknown face and Non-face images - t11 and t12 are unknown faces. t13 and t14 are non-faces. r** means the reconstructed image

2.2 Linear Decrement Analysis Approach

Linear Discriminate is a "classical" technique in pattern recognition, where it is used to find a linear combination of features which characterize or separate two or more classes of objects or events. The resulting combination may be used as a linear classifier or, more commonly, for dimensionality reduction before it can be classified. The prime difference between LDA and PCA is that PCA does more of feature classification and LDA does data classification. In PCA, the shape and location of the original data sets changes when transformed different ATT& Indian Face Database (IFD)

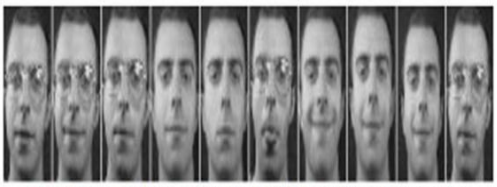


Fig. 1. One of ATT face database with ten different expressions.

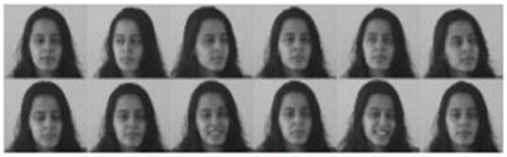


Fig. 2. Images corresponding to one individual.

Limitations:

 The time taken for execution, train and test the image of LDA is more than PCA for IFD dataset.
 In terms of accuracy the LDA shows a higher recognition rate.
 This is because of the use of discrete classes to group the images and perform a covariance minimization within the same class.
 The use of this distinct class information increases then feature space used for classification.

2.4. Eigen faces

Eigen faces Approach is a principal component analysis method, in which a small set of characteristic pictures, are used to describe the variation between face images. Eigen faces Approach is superior to feature based recognizers in its simplicity, speed, invariance to noise and individual facial features. Recognition is performed by projecting a new image into the subspace spanned by the Eigen faces and then classifying the face by comparing its position in face space with the positions of known individuals. Goal is to find out the eigenvectors (Eigen faces) of the covariance matrix of the distribution, spanned by a training set of face images. Later, every face image is represented by a linear combination of these eigenvectors. Evaluation of these eigenvectors is quite difficult for typical image sizes but approximation can be done.

Limitations:

Background (deemphasize the outside of the face)
 Lighting conditions (performance degrades with light changes)
 Scale (performance decreases quickly with changes to the head size)
 Multistage Eigen spaces
 scale input image to multiple sizes)

2.5. Hidden Markov Method

The first features used in face recognition performed with HMM were pixel intensities with a P2D-HMM and were up to 94.5% on the ORL database. The most widely used features for HMM in face recognition are 2D-DCT coefficients. These DCT coefficients combine excellent decor relation properties with energy compaction. Another example of features used with EHMM for face recognition is KLT features with recognition rates of up to 98% on ORL database. The main advantage of using KLT features instead of pixel intensities is their capacity to reduce redundant information in an image. The disadvantage is their dependence of the database of training images from which they are derived.

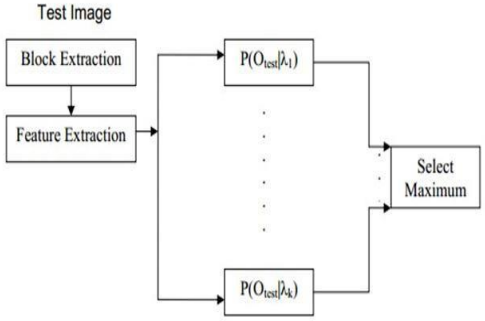


Fig2: training schema of face recognition

Advantages of HMM:

Face images with registration errors occur all of the methods except the HMM one degrade severely in performance.

The HMM algorithm is more tolerant to eye perturbation and gives much better results than the other methods when this phenomenon occurs. Face recognition using a DCT-HMM approach has an accuracy of 99.5%.

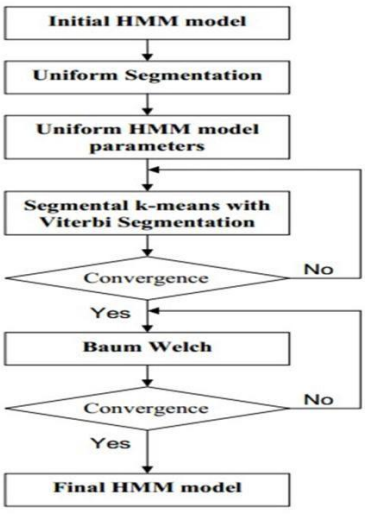


Fig: 2.1-Dimensional HMM model

III. Conclusion

Face recognition method is used for security purposes. Thus we have developed a system which provides high level of security in confidential areas.

References

[1] Simone Colin, William A.P Smith and Edwin Hancock.-sIEEE International conference on digital image computing techniques and facial application.

[2] Helms, E. low ,B- face detection: Survey computer vision and image Detection.

[3] Chin-Liang Su Lursinsap- face recognition by orientation and pattern matching, IEEE Proceedings of ICPR'96.

[4] S.Arivazhagan, L.Ganesan – face recognition using multi resolution transform International conference on computational intelligence.

Authors

First Author – Lalitha.P, Saveetha School of Engineering Dept. Computer Science &Engineering Thandalam.
Second Author – Dr.R.Nedunchelian Professor, Saveetha School of Engineering Computer Science &Engineering Thandalam