IJMDRR
E- ISSN –2395-1885
ISSN -2395-1877

Research Paper
Impact Factor - 2.262
Peer Reviewed Journal

COMPARATIVE STUDY OF FACE RECOGNITION METHODS

R.Rajeswari * R.Rajesh Kumar**
**Asst.Professor in IT Dept, S.B.K.College, APK.*
***Asst.Professor in B.C.A. Dept, S.B.K.College, APK.*

Abstract
Face recognition presents a challenging problem in the field of image analysis and computer vision, and as such has received a great deal of attention over the last few years because of its many applications in various domains such as information security, access management, biometrics, law enforcement etc. In this paper, an overview of some of the well-known methods developed for this purpose and attempts to give an idea of the state of the art of face recognition technology. In this paper we compare various methods of face recognition using feature extraction techniques PCA, LDA and SIFT. We extract the features using PCA, LDA, and SIFT and go for recognition. Finally we get recognition results and compare the all results. And conclude which one is best one in various aspects.

Keywords: Face Recognition, Person Identification, Biometrics.

I. INTRODUCTION

SECURITY is the one of the main concern in today's world. Whether it is the field of telecommunication, information, network, data security, airport or home security, national security or human security, there is various techniques for the security. Biometric is one of the modes of the security. A biometrics is, "Automated methods of recognizing an individual based on their unique physical or behavioral characteristics."[1]. Biometrics consists of two classes:

Physiological and Behavioral. Physiological traits include face, fingerprint, iris, hand and DNA. Signature and voice are the part of Behavioral class.

In the fear of the terrorism the face recognition techniques are used at airport, seaport in the case of national security. But the methods used at these places are conventional biometric methods and thus static as it is mainly based on cross matching the face the traveler with that in the international passport and fingerprints. At present, identification of the suspects with the old technique is not reliable in case of cosmetic or plastic surgery modification of their faces. Although a new technique in which database of biometric information including faces and fingerprints are used to
Identify a person.

Identification and Verification are the two main function of the Recognition system. Verification is Authenticating identity of an individual by comparing a presented characteristic to a pre-enrolled characteristic while Identification is determining the identity of an individual by comparing a presented characteristic to all pre-enrolled in the database. In simple words "Are you who you say you are?" Is Verification and "Who are you?" is Identification.

For the Researchers Face Recognition is among the tries work. It is all because the human face is very robust in nature; in fact, a person's face can change very much during short periods of time (from one day to another) and because of long periods of time (a difference of months or years). One problem of face recognition is the fact that different faces could seem very similar; therefore, a discrimination task is needed. On the other hand, when we analyze the same face, many characteristics may have changed. These changes might be because of changes in the different parameters. The parameters are: illumination, variability in facial expressions, the presence of accessories (glasses, beards, etc); poses, age, finally background [2],[3],[4].We can divide face recognition techniques into two big groups, the applications that required face identification and the ones that need face verification. The difference is that the first one uses a face to match with other one on a database; on the other hand, the verification technique tries to verify a human face from a given sample of that face [5] .

Feature extraction methods can be distinguished into three types: (1) a generic method is based on the analysis of edges, lines, and curves ; (2) feature-template-based methods is based on the detection of the facial features such as eyes; (3) structural matching methods that take into consideration geometrical constraints on the features [1],[6],[7].

The paper is organized as follows: Section (II) covers our compared methods introduction, section (III) we explain how face recognition is done in each method. In section (IV) we present an experimental results of evaluating the techniques are presented. Finally, conclusions with limitation of work are summarized in Section V.

Research Paper
Impact Factor - 2.262
Peer Reviewed Journal

II .INTRODUCTION TO COMPARED METHOD

2.1 LDA Method

Latent Dirichlet allocation (**LDA**) is a generative model that allows sets of observations to be explained by unobserved groups that explain why some parts of the data are similar. For example, if observations are words collected into documents, it posits that each document is a mixture of a small number of topics and that each word's creation is attributable to one of the document's topics.

2.2 PCA

Principal component analysis (**PCA**) is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called **principal components**. The number of principal components is less than or equal to the number of original variables. This transformation is defined in such a way that the first principal component has the largest possible variance (that is, accounts for as much of the variability in the data as possible), and each succeeding component in turn has the highest variance possible under the constraint that it is orthogonal to the preceding components. The resulting vectors are an uncorrelated orthogonal basis set. The principal components are orthogonal because they are the eigenvectors of the covariance matrix, which is symmetric. PCA is sensitive to the relative scaling of the original variables.

2.3.SIFT(**Scale-invariant feature transform)**

Using SIFT (Scale Invariant Feature Transform) feature which are invariant to rotation, scaling and translation for identifying faces. The rotation, scale and translation invariant SIFT features are extracted from the face image**.**

III.METHODS USED

Classify face images based on LDA and the nearest neighbor classifier. For matching score calculation the 'cos' distance is used. After computing the similarity matrix the results are evaluated and some graphical and numerical results are shown.

Classify face images based on PCA and the nearest neighbor classifier. For matching score calculation the 'mahcos' distance is used. After computing the similarity matrix the results are evaluated and some graphical and numerical results are shown.

SIFT key points of objects are first extracted from a set of reference images and stored in a database. An object is recognized in a new image by individually comparing each feature from the new image to this database and finding candidate matching features based on Euclidean distance of their feature vectors. From the full set of matches, subsets of key points that agree on the object and its location, scale, and orientation in the new image are identified to filter out good matches. The determination of consistent clusters is performed rapidly by using an efficient hash table implementation of the generalized Hough transform. Each cluster of 3 or more features that agree on an object and its pose is then subject to further detailed model verification and subsequently outliers are discarded. Finally the probability that a particular set of features indicates the presence of an object is computed, given the accuracy of fit and number of probable false matches. Object matches that pass all these tests can be identified as correct with high confidence.

A match is accepted only if its distance is less than dist. Ratio times the distance to the second closest match.

IV.EXPERIMENTAL RESULTS

For better result we use 400 face images of 40 different people with several expressions. It is store in 40 subfolders should contain 10 images in PGM format. We select 120 images as trained image randomly and tests are done in 400 images. Then make recognition and calculate recognition rate for each method and FAR (False Acceptance Rate). Through this we compare these three methods.

Face detection itself is a challenge. We have presented in this paper a novel technique of face recognition that is independent of the aging factor, orientation, pose, facial expression and presence of accessories like glasses, beards, etc by considering the fiducially points. But it has certain limitations of recognition under various lighting conditions. At first glimpse, the results on test data was in between 60% and 70%. This was much lower than results reported so far. On Analysis carefully we explore that this was due to robustness in lighting conditions in selected images.

Further research is proposed to develop person identification numbers (PINs) on the basis of these fiducially points. PIN's system is more accurate and inexpensive. As the PIN's are individualized character so can't be stolen by someone. There is no need of carrying or remembering them like passwords.

IJMDRR
E- ISSN –2395-1885
ISSN -2395-1877

The proposed system focused on still images, a video-based face recognition provides several advantages over still image-based face recognition [19],[20].

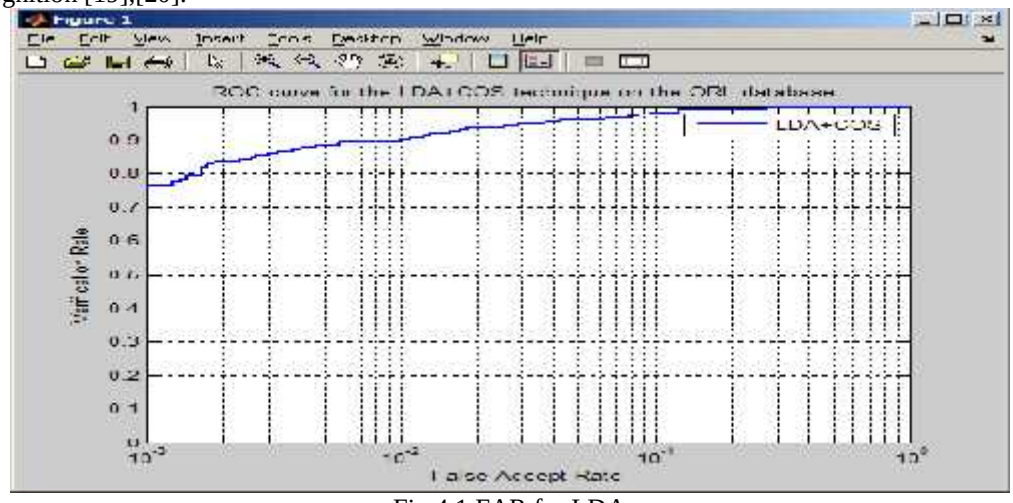

Fig 4.1 FAR for LDA

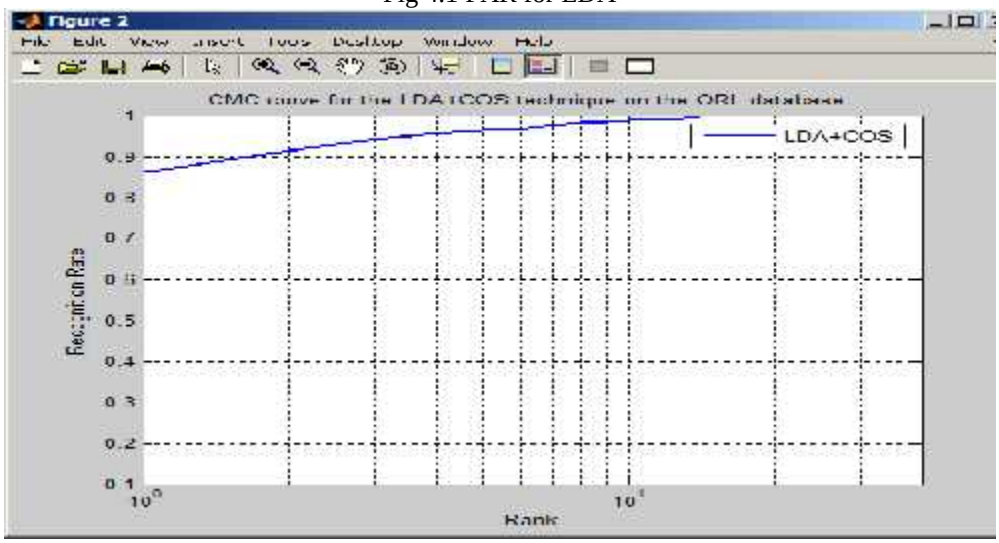

Fig 4.2 Recognition Rate for LDA

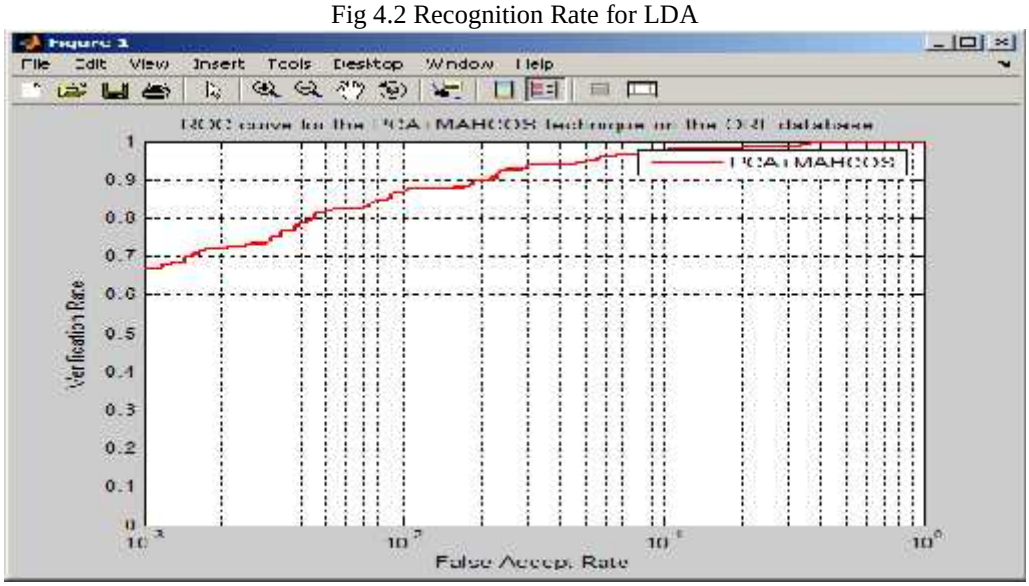

Fig 4.3 FAR for PCA

IJMDRR
E- ISSN –2395-1885
ISSN -2395-1877

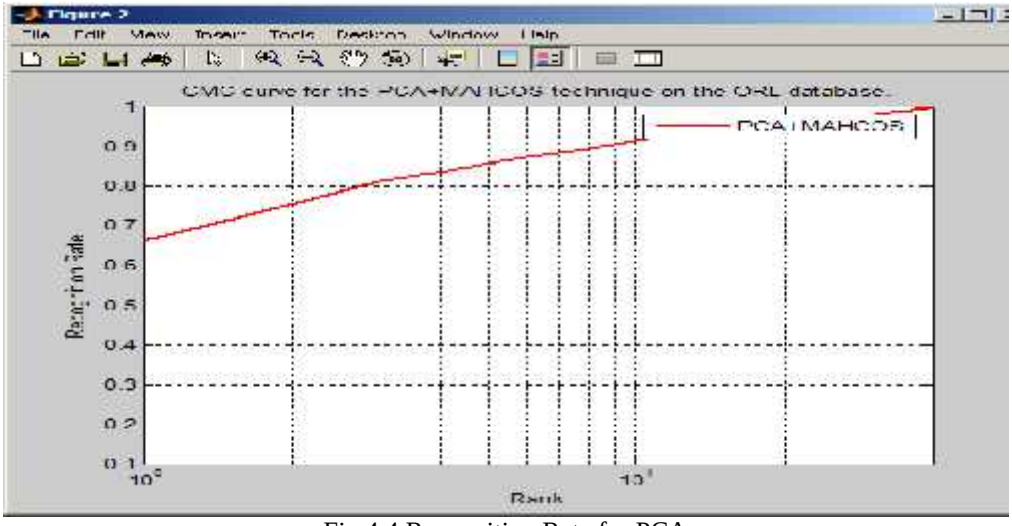

Fig 4.4 Recognition Rate for PCA

SOME PERFORMANCE METRICS:

Identification experiments :(LDA)
The rank one recognition rate equals (in %): 66.07%

Verification/authentication experiments:
The equal error rate equals (in %): 5.03%
The minimal half total error rate equals (in %): 4.72%
The verification rate at 1% FAR equals (in %): 86.79%
The verification rate at 0.1% FAR equals (in %): 66.79%
The verification rate at 0.01% FAR equals (in %): 45.00%

Identification experiments (PCA)
The rank one recognition rate equals (in %): 86.07%
Verification/authentication experiments:
The equal error rate equals (in %): 4.28%
The minimal half total error rate equals (in %): 4.09%
The verification rate at 1% FAR equals (in %): 90.00%
The verification rate at 0.1% FAR equals (in %): 76.43%
The verification rate at 0.01% FAR equals (in %): 64.29%

Identification experiments :(SIFT)
The rank one recognition rate equals (in %): 96.07%
Verification/authentication experiments:
The equal error rate equals (in %): 4.28%
The minimal half total error rate equals (in %): 4.09%
The verification rate at 1% FAR equals (in %): 90.00%
The verification rate at 0.1% FAR equals (in %): 76.43%
The verification rate at 0.01% FAR equals (in %): 64.29%

Through this experiment SIFT give accurate result. It also gives high recognition result. SIFT also give accurate result in Scale variation, rotated picture, emotional variation etc.,

V. CONCLUSION

Face recognition is taking place in many sectors nowadays because it works well under constrained conditions. But there can be many advances in this direction because there are vast scopes of improvement and development. As considered above, all current face recognition the algorithms fail under the vastly varying condition under which humans need to and able to identify other people. So, future work can be done in the direction that people can recognize the images in „Real-Time" in

IJMDRR
E- ISSN –2395-1885
ISSN -2395-1877

less constrained condition. Almost all traditional and recent methods of face recognition are facing the problems such as change in illumination, pose variation, and change in expressions, aging factors and alignment. So, SIFT is one of the promising future in face recognition approach to solve above said drawbacks.

VI.REFERENCES

1. Intelligent Face Recognition Techniques: A Comparative Study. GVIP Special Issue on Face Recognition, 2007
2. Q. Liu, X. Tang, H. Lu, and S. Ma, "Face recognition using kernelscatter-difference-based discriminant analysis," IEEE Trans. Neural Netw., vol. 17, no. 4, pp. 1081–1085, Jul. 2006.
3. W. Zheng, X. Zhou, C. Zou, and L. Zhao, "Facial expression recognitionusing kernel canonical correlation analysis (KCCA)," IEEE Trans.Neural Netw., vol. 17, no. 1, pp. 233–238, Jan. 2006. 6
4. X. Tan, S. Chen, Z. H. Zhou, and F. Zhang, "Recognizing partially occluded,expression variant faces from single training image per personwith SOM and soft k-NN ensemble," IEEE Trans. Neural Netw., vol.16, no. 4, pp. 875–886, Jul. 2005.
5. De Vel, O.; Aeberhard, S., "Line-based face recognition under varying pose".Pattern Analysis and Machine Intelligence, IEEE Transactions on , Volume: 21 Issue: 10 , Oct. 1999, Page(s): 1081 -1088.
6. SumanthTammaDecember5, 2002S. Face Recognition Techniques. [Online]. Available: http://ie.emu.edu.tr /admin /dosyalar/%7Be3F-az2-Rta%7Dneura.pdf
7. B. L. Zhang, H. Zhang, and S. S. Ge, "Face recognition by applyingwavelet subband representation and kernel associative memory," IEEE Trans. Neural Netw., vol. 15, no. 1, pp. 166–177, Jan. 2004.
8. Rama Chellappa, Charles L. Wilson and SaadSirohey, "Human and machine recognition of faces:A survey," Proceedings of the IEEEvol.83,no.5.pp.705-740 May1995.
9. Mehmoud Ismail, Reda A. El-Khoribi "HMT of theRanklet Transform for Face Recognition andVerification," ICGST's Graphics Vision and Image Processing Journal, vol.6, issue3,dec06,pp7-13.
10. Debasis Mazumdar, Santanu Dutta and Soma Mitra "Automatic feature detection of a face and recovery of its pose" Communicated to Journal of IETE.
11. Breu, Heinz, Joseph Gil, David Kirkpatrick, and Michael Werman, "Linear Time Euclidean Distance Transform Algorithms," IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 17, No. 5, May 1995, pp. 529-533.
12. http://en.wikipedia.org/wiki/Backpropagation
13. http://page.mi.fu-berlin.de/rojas/neural/chapter/K7.pdf
14. K. V. Mardia, J. T. Kent, and J. M. Bibby, Multivariate Analysis. Academic Press, 1979.
15. M.A. Tanner, Tools for Statistical Inference: Methods for the Exploration of Posterior Distributions and Likelihood Functions. Springer, 1996.
16. Version 5.0 the CSU Face Identi_cation Evaluation System. Web ad-dress:http://www.cs.colostate.edu /evalfacerec /algorithms5.html. 2003.
17. R. O. Duda, R E. Hart, and D. G. Stork, Pattern Classification. Wiley-Interscience, 2001 .
18. K. Delac, M. Grgic, S. Grgic, Statistics in Face Recognition: Analyzing Probability Distributions of PCA, ICA and LDA Performance Results, Proceedings of the 4th International Symposium on Image and Signal Processing and Analysis, ISPA 2005, Zagreb, Croatia, 15-17 September 2005, pp. 289-294.
19. W. Zhao, R. Chellappa, A. Rosenfeld and P.J. Phillips.Face Recognition: A literature survey. Technical Report CART-TR-948. University of Maryland, Aug. 2002.
20. L. Torres, J. Vilà, "Automatic Face Recognition forVideo Indexing Applications", Pattern Recognition, Vol 35/3, pp. 615-625, December 2001.