Brief Review of a Hybrid Feature Extraction Technique for Face Recognition

Aayushi Sharma[*]
CSE Department & KUK, Kurukshetra,
Haryana, India

Abstract— Face Recognition is a technique that can be used for verification and identification. The main objective is to maximize the accuracy and to minimize the complexity, time and error factors. The success of Face Recognition can be ensured by various techniques like ICA (Independent Component Analysis, PCA (Principle Component Analysis, MIS (Mirror Image Superposition), GF (Gaussian Filtering) and Neural Network. The paper aims to analyse the various techniques to achieve the accuracy and pattern recognition.

Keywords— ICG, PCA, MIS, GF AND NEURAL NETWORK.

I. INTRODUCTION

The consideration has gained attention on face recognition these last years ,by increasing need to access verification system by using various modalities(voice, face image, fingerprints, pin codes,etc.). These systems can be used for the verification's of the user's to identity on the Net, while using the bank automaton, and for when entering a very secured building, etc. Face authentication is a different from other like face recognition (or classification): in authentication tasks, the whole system knowing *apriori* the identity for the user (for e.g. through this the pin code), and has to be *verify* this identity; in all other words, the system can be decide whether to the a priori users can be impostor or not. In the face recognition, a priori identity's was not known: and the system can be decide which of these images can be stored in the database and to resembles the most of these image for recognizing; the decision was no more binary[1]. The Machine recognition of the human face from the video images have become the an active research area in all the communities of the image processing and pattern recognition, and neural networks and all computer vision. The very most remarkable abilities of the human vision are that for the face recognition. It can develops overall years of childhood, and can be important for the various aspects for our social life, and can be together with the related abilities, such as all estimating the expression of the people with all which we can interact, have played an important role in overall course of evolution[2]. A face recognition system can be a computer perception and it can be automatically recognizing the human face image's from a face image's that can be available in all the databases. The face recognition was a technique that can be manipulates on the intensity and for the face images that are used by all human beings for various purpose of the personal identification. The facial images can be convoluted for the objects with all characteristics that can be vary overall time. The human beings that have an efficiency to identify all the face image's and to identity for human for encouragement of the second[3].The Face recognition is the universally an important paradigm to the under pattern recognition with all many applications that are moving towards for the use of the facial features for an authorization and authentication. This is due to that the fact for the facial features are a simpler to obtaining then all that of the other biometrics such as all the fingerprints. The algorithms that can be used for face recognition systems that can extract all the set of the facial features that can be projected on to the feature space for the comparison and for recognition [4].

1.1 Face Recognition

The Face recognition is a typically can be used for the verification or identification. In the verification of an individual can be already enrolled in all the reference database or the gallery i.e. it is an one-to-one matching task whereas in the   identification, a probe image's matched with an biometric reference in the gallery i.e. it can be represents one-to-many problems[5].Face Recognition is an inherent capability of the human beings. For Identifying a person by the face is one of the most fundamental human functions since in the time immemorial. An Artificial Neural Networks (ANN) is a attempt to simulate the human brain; hence its method is named as artificial neural networks. Neural networks, which can inspired from all the studies of biological nervous systems, that can have recently being used for the various applications, due to distributed computing fashion over the large number of a simple processing units (Neurons). These neurons of the nodes, which are very simple, non-linear computational elements that are connected by links with the variable weights [6].

Face recognition have been a popular area of the research over the last decade. Face Recognition technology has been numerous commercial and law enforcement applications. These applications ranged from static matching of the

controlled format photographs like as passports, credit cards, photo ID's, driver's licenses, and the mug shots to the real-time matching of the surveillance video images that presenting different constraints in the terms of processing requirements. Although the humans seem to be recognizing the faces in the cluttered scenes with relative ease, the machine recognition is much more daunting task [9].
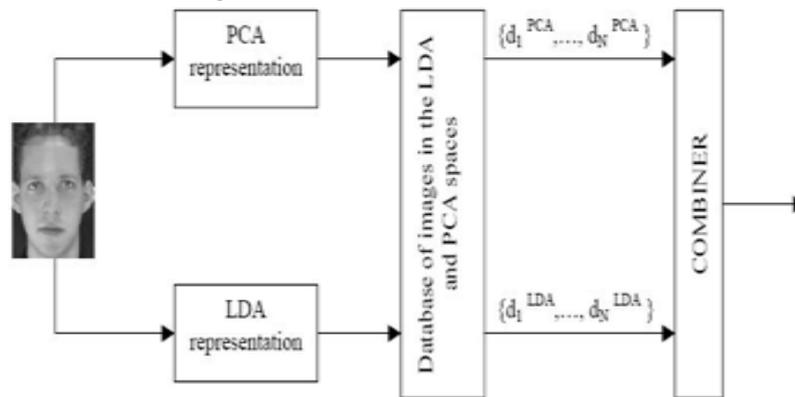

Figure 1: Fusion Methodology.

1.2 Face Detection
Face Detection is the part of an wide area of the pattern Detection technology. Detection and especially face Detection covers the range of an activity from the many walks of life. The Face Detection is a something that the humans are particularly better at science and technology that have brought various similar tasks to us. The Face Detection in the general and the Detection of the moving people in the natural scenes in all particular that require a set of the visual tasks that can be performed robustly. The process includes mainly the three-task acquisition, normalisation and the Detection. By all these terms acquisition we mean that the detection and the tracking of the face -like image's patches in the dynamic scenes. Normalisation is the process of segmentation, alignment and normalisation for the face images [3], and for the finally Detection that can be representation and for modelling of the face images as for identities, and the association of the novel for face images with the known models [7].

1.3 Techniques:-
1.3.1 Principal Component Analysis (PCA)
A traditional way for extracting features to use the PCA technique. In a set of *N* *d*-dimensional image's the learning set (*d* being to the number of pixels in each and every image), the PCA method extracting so-called *principal components* as to the eigenvectors of all the covariance matrix of over all the data. Geometrically, the principal components are that in which the directions of the data space maximizing the variance of all the projection in the original vectors over these axes. The idea is then to replacing PCA by a method that can be able to extract more and more perceptive features from the faces. By the perceptive, we mean's features that can be used by all the human being for discriminate between or to describer's the faces [8].

1.3.2 Independent Component Analysis (ICA)
ICA technique can be a data analysis tool that derived from the "source separation "as the signal processing techniques. The aim of the source separation is to recover's the original signals S_i, from the known observations X_j, where the each observation is unknown as the mixture of all the original signals. The algorithmic techniques by making this entire task possible that are often called as ICA, as these factorise the observations for a combination of original source's [1].

1.3.3 Neural Network
The Neural Network based on the face recognition approaches that include as the use of convolutional Neural Networks, as the radial basis neural's networks, and the other types of the Neural Networks. . All of these focus on the recognition performance of the leading to the complex learning algorithms and all the non-linear neurons. In the several of these works, the Neural Networks act as aclassifiers.The Separate feature's extraction algorithms that extract the relevant features that can be fed to all the Neural Network classifiers. The complexity of the learning algorithms and the feature extraction algorithms that make's the existing Neural Network-based on the face recognition methods in an inefficient for the hardware mapping [3].

II. LTERATURE SURVEY
Sukhvinder Singh, Meenakshi Sharma and Dr. N Suresh Rao (2011) Face recognition from the images is an sub-area of the general object's for recognize the problem. It is particular the interest in an wide variety of the applications. The proposed algorithm is based on all the measure of the principal components of these faces and it also finds the shortest distance between them. The experimental results that demonstrate this arithmetic can be improve the face recognition's rate. .The Experimental results on the ORL face databases show that all the method has a higher correct recognition the rate and the higher recognition speeds than the traditional PCA algorithm [7].

Alaa Eleyan and Hasan Demire (2006), describes the Principal component analysis (PCA) and the Linear Discriminant Analysis (LDA) techniques that are among the most common features for extraction techniques that can be

used for the recognition of the faces. In this paper, the two face recognition systems, in which one based on the PCA followed by the feed forward neural network (FFNN), are called as PCA-NN, and the other that based on the LDA followed by an FFNN called as LDA-NN, to be developed. Additionally, the recognition performance of the LDA-NN is a higher than the PCA-NN method among all the proposed systems [8].

C. Havran, L. Hupet(2002),describes the Independent Component Analysis (ICA) was presented as alternative feature extraction algorithm for Principal Component Analysis (PCA) that are widely used in the automatic recognition/authentication tasks. We show that the entire promising ICA algorithm that extracts from the faces features that are relevant and are efficient for authentication. This leads to improve the success rates and to reduced the client model size over a PCA based feature's extraction [1].

Manal Abdullah[1], Majda Wazzan[1] and Sahar Bo-saeed (2012), describes the Principle Component Analysis PCA is classical for feature extraction and for data representation technique that are widely used in the pattern recognition. It is one of the most successful techniques in the face recognition. But it has various drawback in a high computational especially for the big size database. This paper can conducts to a study that can optimize the time complexity of PCA (Eigen faces) that doesn't affects for the recognition performance. The performance of the entire original and the enhanced proposed algorithm was tested on the face94 face database. The Experimental results show that a recognition time is reduced by 35% by applying proposed enhanced algorithm. DET Curves can be used to illustrate the experimental results [5].

Shukanya Roychowdhary, Sharavari Govilkar (2013) describes face recognition system that works best in the ideal condition. But it can be very sensitive in the real time. We have presented the methodology for improving the robustness and accuracy for the face recognition system based on combination of the PCA and LDA face representation technique. We show that the combination of PCA and LDA will be outperforming best the individual face recognition algorithm based on the PCA or LDA [2].

The Human face image is a contexture multidimensional point of the perception version and for developing computational version for the face recollection is a rigid. The paper that presents the two methods for the face identification, feature extraction is a first method and the classification is the second method. For the face image that identifies the Eigen face image recognition in the Eigen face perspective that uses Principal Component Analysis (PCA) algorithm. The proposed system tested on the 165 images from the Yale face database. The Test results that gave the recognition rate above the 97% [1].

M.Saraswathi, Dr. S. Sivakumari (2015) present the face recognition system that can identifies the person from an input image given, for the authentication purposes. As the feature extraction technique, Linear Discriminant Analysis (LDA) can be used. After the generation of the features and the classification is to be performed by using the Euclidean Distance classifier. Recognition rates are to be calculated for the varying sizes of the training data and the corresponding test data. The data set is the ORL face database in which is an standard face database for the face recognition systems. The database consists of the 400 images of the 40 people within 10 different poses for an each individual. Towards the end, of the experimental results show that a high recognition rate of 93.7% obtained by the use of the LDA feature set [4].

Naresh Babu N T, Annis Fathima A (2011), Multiresolution representations and the Subspace analysis have been widely accepted in all the face recognition systems. This research paper that combines all the benefits and presents all the feature extraction method by using Discrete Wavelet Transform (DWT) and the Independent Component Analysis (ICA). The DWT provides multiresolution representations and that are effective in the analysing information content of the image and to generate the feature sets for the images from an individual wavelet sub bands. It was observed that the proposed methods that classifies the images with the better accuracy and the outperforms with the existing methods. [10].

Kishor S Kinage, and S. G. Bhirud (2010), in this paper the new face recognition technique can based on the Independent Component Analysis of the Gabor Jet (Gabor Jet-ICA) is a proposed. The Existing face recognition systems by using Gabor wavelets that convolve the whole face image with a set of the 40 Gabor wavelets. The results that show maximum accuracy of 82.25% and 84.5% for the Gabor Jet-PCA and Gabor Jet-ICA respectively. This proves that the difference in the performance between ICA and PCA is 2.25%, which is a insignificant[11].

Table I

Author	Year	Reference	Parameters	Tools/methods	Findings
C. Havran, L. Hupet, J. Czyz, J. Lee, L. Vandendorpe, M. Verleysen	2002	1	Feature Extraction, Recognition and Authentication, Improved Success Rates	ICA(Independent Component Analysis) technique	1Reduced Client Model Size Over PCA Based Feature Extraction 2.Increased Performance With Respect to the use of PCA
Alaa Eleyan, Hasan Demirel.	2006	2	Testability.	PCA and LDA Techniques	1.Performance of LDA-NN is higher than the PCA-NN 2.Shows Improvement on the Recognition Rates
Kishore S	2010	3	Maximum Accuracy	PCA and ICA	1. It Captures Salient

Kinage 1 and S. G. Bhirud2			.Reduce Redundancy and Represent Independent Feature Explicitly.	Gabor-Jet Techniques are used	Visual Properties Such as Localization, Orientation Selectively and Spatial Frequency.
Naresh Babu N T 1, Annis Fathima A 2	2011	4	Multiresolution and Subspace Analysis and Reduce Dimensionality.	DWT (Discrete Wavelet Transform) and ICA method.	1. Recognition Rate is Found to be High and Produce Low False rejection.
Manal Abdullah, Majda Waddan, Sahar-so-saeed.	2012	5	Complexity, Testability and Decrease Computation time.	Feature Extraction Data Representation Technique.	1.Recognition Time is Reduced By 35% 2 repositories. Enhance the Accuracy of Feature Recognition and Decrease the False Acceptance
Venkat R Peddigari, and Phanish Srinivasa	2015	6	Overcome Pose, Expression And Lightening and Increase Accuracy.	MIS , HE AND GIF technique.	1.Enhanced the peak performance from 89.33% to 96% .

III. CONCLUSIONS

In this paper we have studied the concept of Face Recognition by various techniques Like ICA(Independent Component Analysis) and PCA(Principle Component Analysis) help us to generate accuracy by pattern recognition.ICA technique for feature extraction recognition and authentication and to improve d success rates as output can reduced client model size over PCA based feature extraction and Increased performance with respect to the use of PCA technique.MIS,HE and GIF Technique can be used to overcome pose expression and lightening and Increased accuracy as output enhanced the peak performance from 89.33% to 96% . In this way, it helps to recognize pattern.

REFERENCES

[1] C. Havran, L. Hupet, J. Czyz, J. Lee, L. Vandendorpe, M. Verleysen,"Independent Component Analysis for face authentication",2002.

[2] Shukanya Roychowdhary, Sharavari Govilkar, "Improved Face Recognition By Combining LDA And PCA Techniques", 2013.

[3] Ganesh V. Linge[A*] and Minakshee M. Pawar[Å]," Face Recognition using Neural Network & Principal Component Analysis", 2014.

[4] M.Saraswathi, Dr. S. Sivakumari, "Evaluation of PCA and LDA techniques for Face recognition using ORL face database", 2015.

[5] Manal Abdullah[1], Majda Wazzan1 and Sahar Bo-saeed[2]," OPTIMIZING FACE RECOGNITION USING PCA", 2012.

[6] Kulwinder Singh, 2Ashok Sardana, 3Kiranbir Kaur," Face Recognition by Plotting Different Facial Marks using Neural Networks", 2011.

[7] Sukhvinder Singh, Meenakshi Sharma and Dr. N Suresh Rao," Accurate Face Recognition Using PCA and LDA", 2011.

[8] Alaa Eleyan and Hasan Demirel,"PCA and LDA Based Face Recognition UsingFeedforward Neural Network Classifier",2006.

[9] Venkat R Peddigari, and Phanish Srinivasa, rakesh.ee18@gmail.com,Enhanced ICA Based Face Recognition Using Histogram Equalization and Mirror Image Superposition, IEEE International Conference on Consumer Electronics (ICCE),2015.

[10] Naresh Babu N T, Annis Fathima A, An Efficient Face Recognition System Using DWT-ICA features, 2011 International Conference on Digital Image Computing: TechniquesandApplications,ntnareshbabu@gmail.com,2annisfathima@yahoo.com.

[11] Kishor S Kinage,and S. G. Bhirud,Face Recognition using Independent ComponentAnalysis of GaborJet (GaborJet-ICA),2010 6th International Colloquium on Signal Processing & Its Applications (CSPA).

[12] Karande Kailash J,Talbar Sanjay N.,"Face Recognition using Oriented Laplacian of Gaussian (OLOG) and Independent ComponentAnalysis (ICA)",2012,kailashkarande@yahoo.co.in.

[13] Peter N. Belhumeur, Joao, P. Hespanha, and David J. Kriegman, "Eigenfaces vs. Fisher faces: Recognition Using Class Specific Linear Projection"IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 19, NO. 7, JULY 1997 711.

[14] Yon sheng Gao,Member,IEEE, and Maylor K.H. Leung,Member,IEEE,"Face Recognition Using Line Edge Map",EE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 24, NO. 6, JUNE 2002.

[15] Kumari Ramnika Kailash J.Karande,"Laplacian of a Gaussian (LOG) Edge Detector And PCA For Face Recognition ", IRF International Conference, 2014.

[16] Ming-Hsuan Yang Member IEEE, David J.Kriegman Senior Member IEEE, and Narendra Ahuja Fellow, IEEE," Detecting Faces in Images: A Survey", EEE, Transaction aaaaaaaaon Pattern Analysis And Machine Intelligence, VOL.24, NO.1, JANUARY 2002.