FACE RECOGNITION IN VIDEO BY USING HYBRID FEATURE OF PCA AND LDA

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ABSTRACT

Face recognition is the process of identifying the face from digital image and video. Face Recognition in video is challenging and long standing problem. Face Recognition in video is going to become most research area of Biometric, pattern recognition and computer vision. In this paper we propose the hybrid feature of Principal component analysis and Linear Discriminate analysis to recognize the face in video. This Face recognition system is more useful and it provides high accuracy and robustness with less computational time. Also the use of hybrid algorithm yields better result in comparison with individual PCA or LDA uses in face recognition.

Keywords: principal component analysis, linear discriminant analysis, hybrid feature of PCA and LDA.

INTRODUCTION

Face recognition is the process of identifying the face from digital image and video. Face recognition has very broad application prospects, such as user-friendly interface between man and machine. Face recognition in video is going on become most research area. Recognition of face in video is typical task. The of the face recognition method uses Principal Component analysis (PCA) another uses Linear Discriminative Analysis (LDA).PCA uses Eigen faces for recognition of face .It algorithm mainly used in Feature extraction and dimension reduction. When we use PCA in different classes it does not extract the similar feature for face recognition and it may lose important information for discrimination between different class, and also amount of dataset is large then PCA is not work accurately. LDA is used for feature extraction and dimension reduction. It uses scatter with in class or between the classes. LDA does not work in nonlinear data set. If dataset is larger then it works more accurately then PCA. Design video based face recognition system is an important future step. Online face recognition is used for recognition face from frames. Online face recognition is real time recognition task. In this work, we presented a hybrid approach of both PCA and LDA to recognize face in video with high accuracy and with minimum computational time. The work includes major steps like Image Acquisition, Enhancement, Preprocessing, Feature Extraction and Recognize the Face. In Image Acquisition Our system acquire the input image from database. Database is a collection of set of input images using research purpose Enhancement is use to enhance the quality of images and it uses gray scale conversion also. Preprocessing improve the visual appearance of image. This technique includes gray scale conversion, noise removal and enhancement. For preprocessing of image we use filtration process. In Feature extraction we extract the feature of the input database and testing video. And we find the distance between Eigen face and weighted face. Testing video is converted in multiple frames. Using hybrid feature of PCA and LDA, we have done face recognition in video.

LITERATURE SURVEY

R. Sharma and M.S. Patterh, [1] proposed pose invariant face recognition system using PCA and ANFIS. We extract the feature by using PCA first after then neuro fuzzy based system and ANFIS recognition the face. By using ANFIS system recognize face under high pose condition. That system provided high recognition ratio. In Gurleen Kaur and Harpreet Kaur[2] proposed combination of two techniques Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) for recognition of face with artificial neural networks. Hyunjong Cho, Rodney Roberts, Bowon Jung, Okkyung Choi and Seungbin Moon [3] provided unique hybrid algorithm feature of Dual stage holistic and local feature based. The proposed system utilized the PCA first and that use local feature. W.J. Li, C.J. Wang, D.X. Xu, and S.F. Chen [4] presented a system that used single neural network to recognize a face specific illumination. it recognize face with uniform way with high performance. Result analysis showed that recognition ratio is higher. X.Xiang, J.Yang, and Q. Chen, [5] presented a technique that based on PCA to improve the accuracy of color face by using color cues. For face recognition that technique use color based matrix. M. Rajapakse, J. Tan, and J. Rajapakse [6] propose a method based on non negative matrix factorization (NMF).That used Color cues that played important rule for recognition face. Z. Li, N. Yang, B. Xie, and J. Zhang [7] proposed a two-phase face recognition method in frequency domain used discrete cosine transform (DCT) and discrete Fourier transform (DFT). That used two-phase face classification method for transformed images. First phase used Euclidean Distance and second Phase used K nearest neighbour .P. Shih and C. Liu[8] presented a method to improve the face recognition performance. The color configuration is defined as an individual or a combination of color component images. C. Liu[9] proposed Uncorrelated color space(UCS),Discriminating color space(DCS) and independent color space(ICS).these spaces is effective for face recognition.

METHODOLOGY

In this paper, we combine the features of PCA and LDA with some simple technique. And such hybrid method allows best face recognition algorithm based on Hybrid feature of PCA and LDA. We use five steps for recognition face from video. Those steps are Training database, Enhancement, Pre-processing, Feature Extraction, Testing database.

The training Database is a collection of known images useful for face recognition.

Enhancement:-For Enhancement, we detect the face and contrast the image. For contrast the image we change the original pixels. We improve and change colour.

Pre-processing:-Pre-processing is the initial stage of image processing. This technique remove noise and dimensionality .it based on gray scale conversion. .here we use Gabor and bilateral filter .pre-processing improve the visual appearance of image.

Feature Extraction:-Here we use hybrid fusion of PCA and LDA. We find the PCA feature Eigen face or distance and LDA feature .hybrid algorithm is used for extract the feature from training or testing database.

Testing Database consists of frames extracted form a standard Video. When video is loaded, it is converted into multiple frames .These frames are used to recognise the face in the frame.

ALGORITHMS

We use the weighted PCA and LDA and define the distance of PCA and LDA.

We are not related to different threshold for different class, and single threshold related to class weight. And PCA and LDA used different weight for different class. weightW_j and distance d is the combination of PCA and LDA weight or distance.

For fusion we compared distance with the product of the weight W_j with threshold γ.d^{PCA} and d^{LDA} define the distance.

$$W_j.\gamma > d$$

For normalization of both point we use well known formula

$$valueNorm = \frac{value - valueMin}{valueMax - valueMin}$$

The hybrid fusion algorithm of PCA and LDA are used to some common terms used are given below.

"Mean" Algorithm:

$$d = \frac{d^{PCA} + d^{LDA}}{2}; \quad w_j = \frac{w_j^{PCA} + w_j^{LDA}}{2}$$

"Max" Algorithm:

$$d = \frac{d^{PCA} + d^{LDA}}{2}; \quad w_j = \max\{w_j^{PCA}, w_j^{LDA}\}$$

"MaxMin" Algorithm:

$$d = \min\{d^{PCA}, d^{LDA}\}; \quad w_j = \max\{w_j^{PCA}, w_j^{LDA}\}$$
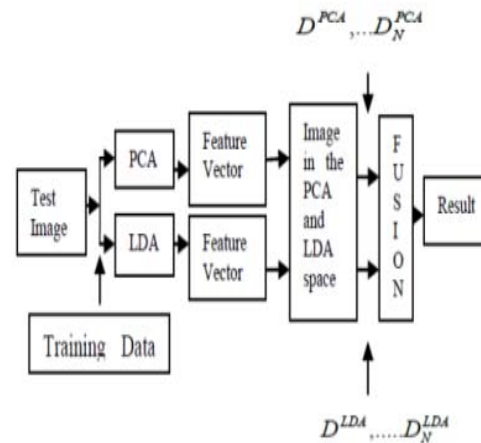
Hybridising PCA and LDA

Figure-1. Block diagram of hybrid PCA and LDA.

Steps of hybrid PCA and LDA

Step1:-Get input from training and Testing Databases
Step2:-Calculate the covariance matrix
Step3:-Calculate the eigenvectors and Eigen values of the covariance matrix
Step4:-Choose components and form a feature vector
Step5:-Get the old data back
Step6:-Compute the d-dimensional mean vectors
Step7:-Compute the Scatter Matrices
Step8:-Solve the generalized eigenvalue problem for the matrix $S{-}1WSB$
Step9:-Choose components and form a feature vector
Step10:- Get Feature vector from step4 and step9 and calculate new feature for each dataset.
Step11:-Selecte linear discriminants for the new feature subspace
Step12:-Check the samples onto the new subspace

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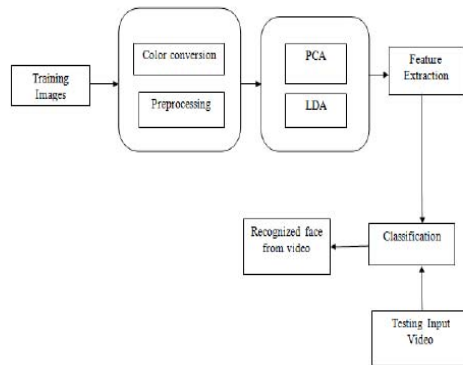## Block diagram of proposed system

Figure-2. Block diagram of proposed system.

RESULT AND ANALYSIS

The proposed hybrid approach of PCA and LDA was implemented and tested with standard database. And for testing we use video. Comprising of frames extracted from video. We compare each and every frame with database. More than 20 images to be recognised were used to check the validity of the proposed algorithm. It exactly recognized all the frames successfully. While we use PCA alone then we need to find the covariance matrix, Eigen value, Eigen vector that define Eigen Faces. In PCA finding covariance matrix is difficult and it is time consuming approach. In PCA we need to use low level pre-processing. And in class we could not get accurate recognition of face. While we use LDA alone we need find scatters with in a class or between a class. And if all scatter is singular than LDA fails to perform. In LDA we have sample size problem. When sample is large then LDA Outperform of by PCA. It shows that combined feature Of PCA and LDA are more capable than individual PCA and LDA algorithm. The Sample result are shows.

TRAINING DATABASE

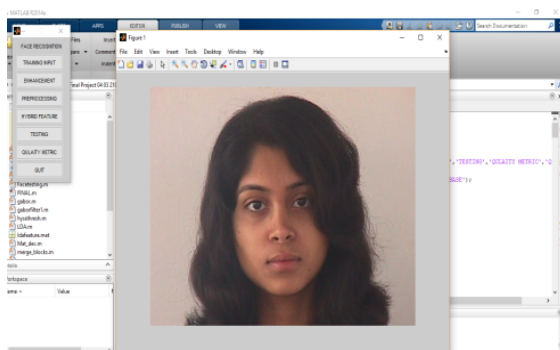In Train Database we upload database for training the images.

Figure-3. Train database.

PRE-PROCESSING RESULT

After Training and Enchantment we get all pre-processed training database. Here we remove noise and reduce dimensionality.
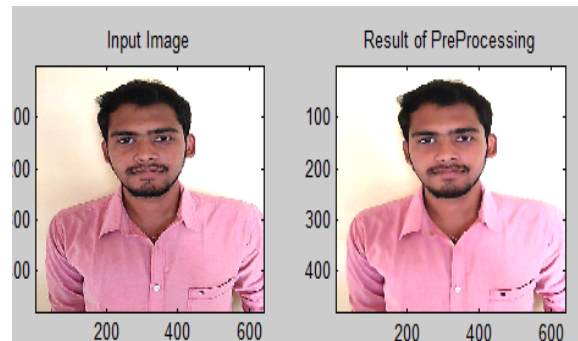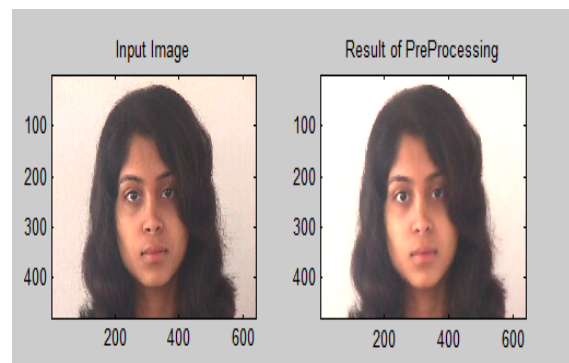

Figure-4. Pre-processing result.

Figure-5. Pre-processing result.

FEATURE EXTRACTION

Here we get Hybrid feature of database. That hybrid feature help us to recognize the face.

Table-1. Extracted features.

Images	Hybrid Feature
Image1	73.6000
Image2	99.9000
Image3	110.5000
Image4	111.7000
Image5	103.5000
Image6	106.6000
Image7	103.0000
Image8	78.5000
Image9	110.3000

Here we get hybrid feature of 9 images. Each image has different feature value. Using hybrid approach we got these feature value for each image.

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RESULT

Table-2. PSNR and MSE value.

Method	Images	PSNR	MSE
Hybrid PCA and LDA	Image1	21.0386	63.2278
	Image2	20.5735	89.3256
	Image3	20.5952	89.3251
	Image4	20.6887	72.0875
	Image5	21.3873	63.5897
	Image6	20.6370	52.8646
	Image7	20.6782	52.8646
	Image8	20.8408	73.9609
	Image9	20.9735	67.5556

Peak signal noise ratio(PSNR) and MSR(mean square ratio) values is vary for each image. It is define the quality of Image.

Figure-6. Matched face.

For getting result each and every frames of video is checked with the training database. It finds which frame is match with database Result .In fig6 we shows the match image of train image and test database.

CONCLUSIONS

Face recognition in video is an important requirement in many applications. In our proposed system, we easily recognize Face in video by using hybrid feature of PCA and LDA. By using hybrid feature we improved the accuracy of finding face. Here, we found static or dynamic face. By using hybrid feature we generated a unique proposed system.

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