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A robust feature extraction technique for content based image retrieval

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***Abstract*— In this paper, a robust feature extraction technique for content based image retrieval proposed. Most of the research scholars do with the different feature extraction for feature extraction techniques to enhance image retrieval recognition efficiency. Content based image retrieval algorithms concentrate on the local mean- nearest neighbor classifier and use its decision rule to supervise the design of a discriminator to verify the retrieval images from the training database. Firstly the input color images can be represented as different sub-blocks to take the features from the train database widely uses COREL database. Then those images are applied for local mean nearest neighbor classifier. The proposed method is a robust feature extraction for content based image retrieval gives better results in terms of recognition rate and less computational rate as compared to existing techniques.**

***Index Terms*— KLDA, local mean nearest neighbor and distance measures classifiers**

I. INTRODUCTION

In recent days, face recognition system has gained its popularity due to its importance in security and surveillance. This system is useful in computer vision and biometric authentication. So, there is a need of automation of this face recognition system. So many numbers of researchers are worked on this face recognition system by using different techniques and transformations PCA, KPCA, LDA, KLDA, LPP, KLPP etc... Widely most of the researchers do in color based content based image retrieval it shows improve the recognition rate compared to the existing methods. The methodology of the presenting paper is to seek theoretically representation of content based image retrieval has been proposed. First consider the two dimensional input image consisting color, texture and shape. Now a days there are different types of transforms are used to take the features for dimensionality reduction. Secondly linear discernment analysis (LDA) is widely used to classification of training database and query images. Linear like DCT, FFT, discriminate analysis is concentrated on scatter representation of the given input images of the database This is widely concentrated on between the scatter and within the scatter to argument of the correlation between train and query. The nearest neighbor classifier is most powerful and popular method to recognition the query images from database due to its simplicity and effectiveness. The existing discriminentation analysis method design which is generally independent of the classifier model. Thirdly local mean based nearest neighbor classifier which is instead of searching for the 1- nearest neighbor of the given sample of the input image. There are different parameter of nearest neighbor and GMM, HMM etc. In all these holistic methods they concentrated on the global information of the face images. Only the pixel information is considered and the relation with the neighboring pixels is missed. In order to incorporate the relations with the neighboring pixels they introduced the local matching methods. In this local matching method, it considers only local information but it misses the global information of the face images. To fill the gap, we incorporate both features by considering both local matching method (Local binary pattern) with DCT. Since they assume each face is a collection of K-different components like eyes, nose, chins, cheeks, forehead etc., each represented by a Gaussian distribution, the mixture model is considered. But, the Gaussian mixture model has certain drawbacks such as the feature vector in each component is symmetric, meso kurtic and should have infinite range. However, in many face recognition problems, the feature vector of each individual face may not be distributed as meso kurtic and symmetric. Also, it has finite range bounded by two finite values, i.e., in many face images, the feature vector lies between two finite values. Ignoring the nature of finite range and asymmetrically distributed feature of the feature vector in each component may bring falsification. The value of is significant based on the values of the mean vector and variance covariance matrix . The doubly truncated multivariate Gaussian distribution includes several asymmetric / symmetric, lepto kurtic / meso kurtic/ platy kurtic distributions with finite range. It also includes Gaussian distribution as a limiting case when the truncating parameters tend to infinite. The effect of transformation on multivariate Gaussian distributions is highly influenced by and . Hence, to have an accurate face recognition system it is needed to characterize the feature vector of each component in each individual face is to be characterized by a doubly truncated multivariate Gaussian distribution and the whole face image is to be characterized by K-component doubly truncated multivariate Gaussian mixture model (Norman et al., (1995), Sailaja et al., (2010), Haritha et al., (2012)). Very little work has been reported in the literature regarding utilizing doubly truncated multivariate Gaussian mixture distribution in face recognition systems. Here, it is to be mentioned that, even though, several systems have

Basics concepts of local discriminate analysis(LDA), kernel linear discriminate analysis (KLDA), local mean nearest neighbor (LM-NN) are discussed in section II. Proposed method is discussed in section III. Experimental results are presented in section IV. Concluding remarks are discussed in section V.

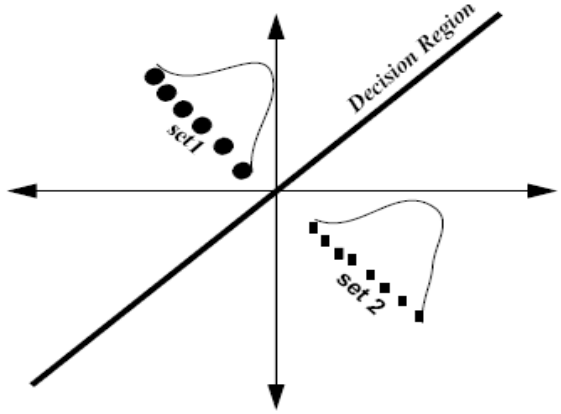
II. LDA, KLDA AND LM-NN

In this section, we briefly review some important contributions in the face recognition system based on local binary patterns (LBP). We wish to predict group membership for a number of subjects from a set of predictor variables. The criterion variable (also called grouping variable) is the object

of classification. This is ALWAYS a categorical variable. Simple case: two groups and *p* predictor variables. We want to know whether somebody has lung cancer. Hence, we wish to predict a yes or no outcome. Possible predictor variables: number of cigarettes smoked a day, caughing frequency and intensity etc. Linear discriminant analysis constructs one or more discriminant equations D_i (linear combinations of the predictor variables X_k) such that the different groups differ as much as possible on D.
Discriminant function

$$D_i = b_0 + \sum_{k=1}^{p} b_k X_k$$

More precisely, the weights of the discriminant function are calculated in such a way, that the ratio (between groups SS)/(within groups SS) is as large as possible. Number of discriminant functions = min(number of groups. Suppose we have a set of g classesLet W denote the within-class covariance matrix, that is the covariance matrix of the variables centered on the class mean B denote the between-classes covariance matrix, that is, of the predictions by the class means. The sample covariances are different First discriminant function D_1 distinguishes first group from groups 2,3,..N, Second discriminant function D_2 distinguishes second group from groups 3, 4…, N.etc Timo Ahonen et al., (2003) studied a face recognition system based on LBP. They divided the face area into small regions and applied LBP. The extracted local features are then concatenated to construct the overall feature vector. Qian et al., (2007) considered a face authentication algorithm based on LBP. They applied the LBP for each block of the face image after dividing the face image into several blocks. After obtaining the LBP image, they applied likelihood ratio The histograms of LBP are extracted and concatenated, the resultant histogram represent the feature vector. The nearest neighbor classifier used for classification. Yann Rodriguez et al., (2006) analyzed an approach for face authentication, based on a LBP description of the face. A collection of LBP-histograms are considered for a generic face model. From this generic model, a client-specific model is obtained by an adaptation technique under a probabilistic framework. Yann Rodriguez et al., (2006) analyzed a face authentication experimental protocol. They compared their approach with the two approaches: LBP-b, LBP description of the face. classifier



This generic face model is derived by the collection of LBP-histograms. Hazim et al., (2007) studied a face recognition system with DCT and LBP. They divided the face image into several blocks. For each block of the face image LBP is applied. The obtained LBP representation is then decomposed into non-overlapping blocks and on each local block the DCT is applied to extract the local features.
. Xiaoyang Tan et al., (2007) studied a face recognition system with Gabor Wavelets and LBP. LBP concentrate on the textual features of the face image and Gabor features encode facial shape over a broader range of scales. For dimensionality reduction they applied PCA for both feature sets. After extracting the feature vector, the Kernel Discriminative Common Vector method is then applied to the combined feature vector to extract discriminant nonlinear features for recognition. Aroussi et al., (2008) analyzed a face recognition system with LBP and DCT. For representing facial image they combined LBP (which provides micro texture in spatial domain) and DCT (which acquires macro information in frequency domain). The support vector machines (SVMs) is used to perform the classification of these feature sets. Chi Ho Chan et al., (2007) studied a face recognition system using Multi-scale Local Binary Pattern Histogram (MLBPH) descriptor. They also studied on other descriptor namely Multispectral Local Binary Pattern Histogram (MSLBP).Gritti et al., (2008) studied a system for facial expression recognition with LBP. They used histogram of oriented gradients (HOG) descriptors for facial representation. They applied LBP and local ternary patterns (LTP). Timo Ahonen et al., (2009) studied a face verification system based on kernel density estimation of local LBP distributions. The developed system is a spatially precise model. They used the weighted information fusion for each individual pixels by using the linear support vector machine. Hazim et al., (2010), evaluated four local descriptors, namely, A V1-like feature, the LBP and two patch-based variants, the three patch local binary pattern (TPLBP) and the four patch local binary pattern (FPLBP). An image pair is extracted as a feature from each image using one of the local descriptors. They used four different comparison methods: concatenating, similarity measure, block wise similarity measure and LDA one shot similarity score. Among the four local descriptors, V1-like features do not perform well. Pei-zhi Chen et al., (2010) studied a face recognition system based on DCT and LBP. They applied DCT for the input face image. For dimensionality reduction they used only few DCT coefficients. A few DCT coefficients on the left top corner are chosen as the global feature. The face image is divided into several blocks. For each block they applied LBP and then LBP histogram sequences (Uniform LBP used) are accepted as the local feature. For classification they used Support Vector Machine (SVM). Juefei Xu et al., (2010) investigated the feature extraction methods for biometric identification. They considered LBP, DCT and DWT. They used simple distance measures for the verification rate (VR). Rui et al., (2011) studied a face recognition algorithm by combining LBP with SRC. Divide-and-conquer technique is used in order to solve the problem of dimensionality and the discriminative power is strengthen via its pyramid architecture. Huang et al., (2011) analyzed a comprehensive survey of LBP methodology, including several more recent variations. The standard LBP approach was discussed and also facial image analysis using this LBP approach is

reviewed. In addition to this, its successful extensions, which deal with various tasks of facial image analysis, are also highlighted. Several variations to the LBP technique are also mentioned. In the local or component-oriented LBP representations are effective representations for facial image analysis, as they encode the information of facial configuration while providing local structure patterns. Md Jan Nordin et al., (2011) analyzed combination techniques of appearance-based and feature-based feature extraction on the T-Zone face area to improve the recognition performance for the face recognition system. They studied the influence of T-Zone area and the combined technique on the face recognition rate. A T-Zone face image is first divided into small regions where LBP histograms are extracted and then concatenated into a single feature vector. The T-Zone area consists of only eyes and nose region. Further dimensionality reduction of feature vector, PCA technique is applied.

III. PROPOSED ALGORITHM

Proposed method is presented below:

1. There are N face images belonging to M persons in the training set; N = N1+N2+N3+…NM. Images size is represented as no. of rows and columns (A1×A2). By using sub-pattern method Each face image is first partitioned into S equally sized, these sub-pattern images are transformed into corresponding column vectors with dimensions of d = (A1×A2)/S using non-overlapping method.
2. In the first step calculate mean value of sub-pattern images. Each of them can be expressed in the form of a d by-N Column data matrix.
3. Similarly same procedure for independent component analysis and linear discriminate analysis.
4. Each of them can be expressed in the form of d-by-L Eigenvector matrix.
5. Afterwards, S extracted local sub feature weights of an individual vertically are synthesized into a global feature.
6. At final stage necessary to identify a new test image, this image also partitioned into S sub-pattern images. Each of them is represented as C test i and it's vertically centered.
7. Finally, the identification of the test image is done by using nearest neighbor classifier with cosine measure, in which the cosine of the angle between the test image and each training image in the database.

IV. EXPERIMENTAL RESULTS

Recognition performance in terms of average recognition rate and recognition time of the proposed face recognition system is tested by conducting an experiment on hybrid approach face database. A face database [6] test set was constructed by selecting 100 images of 10 individuals, ten images per person. These images of a person used for training and testing. the experimental results are tabulated in Table 1. Since the recognition accuracy of the sub-pattern image, several sizes of sub-pattern images were used in our experiments as shown below: 56×46(S=4), 28×23(S=16), 14×23(S=32), 7×23(S=64), and 4×23(S=112). Result has been presented in hybrid approach with S<64.

A. Feature selection

Figure2: Sample image

A sample image from face database and by using sub-pattern technique it can be divided by equal parts. Feature of the query image size is (64×1) by using sub-pattern method. Some of the recognized results when all the 10 images (N=10) in one subject of the image database are recognized are shown in figure 3. From the query image feature is taken based on sub-pattern method .After that in this paper we take only 64 feature of this query image. That may be depends up on the sub-parts of this image(S=16). For each sub-pattern we consider four positive eigenvectors that is largest eigenvector of the subpart. It is represented as only local feature of the query image. After that combination of all sub-parts local feature it can be represented as global feature of the query image. Comparative performance of all training global feature with this query image finally recognized results images with top left image as query image. Subpattern method and principal component analysis [8] can significantly improve the recognition accuracy of sub pattern vertically centered method. Since the vertical centering process centers the data by removing the mean of each image, it can be used to eliminate the effect of the values. In other words, the property of vertical centering process [9] can be helpful in eliminating the shifted values of original-pixels. Further, the sub-pattern technique can be utilized to encourage the efficiency of the vertical centering process. Therefore, sub-pattern technique is actually useful to vertical centering process of sub-pattern technique. The vertical centering may benefits for the recognition in varying illumination. Now, we have confirmed this possible forecast and strongly increased the efficiency of the vertical centering process by sub-pattern technique in this paper. From the total experimental results, it can also be seen that for expression variant test, sub-pattern technique and Eigen vector can slightly improve weighted angle based approach classifier, the similarity between a test image and training image is defined as In the weighted angle based approach method cosine measurement.

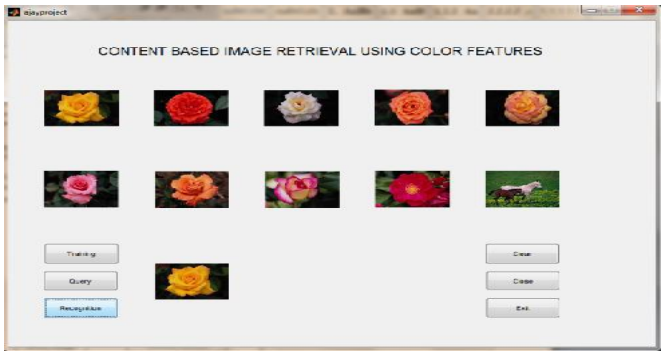


Figure 3. Recognized images.

B. Average recognized rate

The average recognized rate for the query is measured by counting the number of images from the same category which are found in the top 'N' matches.

Table 1. Recognized rate on face database.
(1, 3, 5,7,10 are Top 'N' recognized images)

	Number of top matches				
Methods	1	3	5	7	10
Local mean-NN	100	60	54.5	48.2	42.25
KLDA	100	91	84	72	65
Combined technique (Proposed)	**100**	**98**	**95**	**87.4**	**78.5**

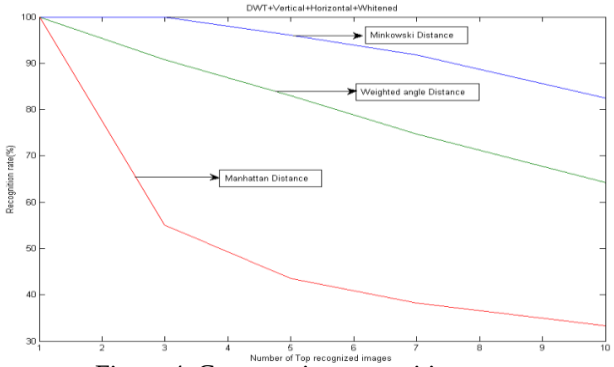


Figure 4. Comparative recognition rates.

C. Recognized Time

Face recognition system with weighted angle based approach technique for largest four eigenvector recognized time is 50.42 seconds (training time is 50 seconds and recognitized time is 0.42 seconds), hybrid approach technique for all positive eigenvector recognized time is 51.20 seconds, Existing method in PCA recognized time is 1.65 seconds, LDA time is 2.90 seconds and LPP method recognized time is 2.72 seconds.

V. CONCLUSIONS

A novel robust feature extraction for content based image retrieval has been proved in this paper.content of the different expressions recognition based on dimensionality reduction technique. Global feature vector is generated and used for face recognition. Horizontal and vertical variations are considered in feature vector. Facial expression recognition based on dimensionality reduction techniques gives better performance in terms of average recognized rate and retrieval time compared to existing methods.

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