A New Approach for Face Recognition using CBIR with LDA

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***Abstract* – As face recognition is very necessary in now day, there are no of places where we use this to identify any person. Here we proposed a method that is useful for this area. The method uses the method CBIR and LDA for face recognition. More over it we implement Interactive user feedback based image classification by using Suitable Classifier. This approach is applied to improve retrieval performance. Our aim is to select the most informative images with respect to the query image. We also compare the results with neural network**

Keywords – CBIR, LDA, Neural network, Classifier

I. INTRODUCTION

Much of this information is multimedia in nature, including digital images, video, audio, graphics, and text data. In order to make use of this vast amount of data, efficient and effective techniques to retrieve multimedia information based on its content need to be developed. In these above image has more informative data on the web so we have to find the system that efficiently retrieve the images from the databases [1]. Conventional and common techniques of retrieving images make use of adding metadata namely captioning keywords so as to perform annotation of words. There are two methods for image retrieval.

- Text based Image retrieval system
- Content Based Image retrieval system

Here we use the content based image retrieval system (CBIR). Content Based Image Retrieval is a set of techniques for retrieving semantically-relevant Images from an image database based on automatically derived image features. CBIR avoids the use of textual description and retrieves images on the base of visual description. CBIR reduces the human intervention in the system. The content-based approach can be summarized as follows:

1. Computer vision and image
2. processing techniques in are used to extract content features from the image
3. Images are represented as collections of their prominent features. For a given feature, an appropriate representation of the feature and a notion of similarity are determined.

Image retrieval is performed based on computing similarity or Dissimilarity in the feature space, and results are ranked based on the similarity measure. Now the visual features of images are:

A. Color Feature

Color is often used as a major feature for indexing or retrieving in color images because of the important role it plays in vision in general and in the identification and discrimination of objects in particular. Some representative studies of color indexing and color spaces can be found. There are several color models used in the literature, but HSV (Hue, Saturation, and Value), RGB (Red, Green, and Blue) and YUV models are more popular.

B. Texture Feature

Texture is a difficult concept to represent. The identification of specific textures in an image is achieved primarily by modeling texture as a two-dimensional gray level variation [2], [12]. The relative brightness of pairs of pixels is computed such that degree of contrast, regularity, coarseness and directionality may be estimated. The problem here is in identifying patterns of co-pixel variation and associating them with particular classes of textures such as “silky” or “rough”.

C. Shape Feature

The primary mechanisms used for shape retrieval include identification of features such as lines, boundaries, aspect ratio, and circularity, and by

identifying areas of change or stability via region growing and edge detection. The combination of three features is used these days to acquire the better results.

D. Similarity computation

Similarity measurement is a key to CBIR algorithms. These algorithms search image database to find images similar to a given query, so, they should be able to evaluate the amount of similarities between images. Therefore, feature vectors, extracted from the database image and from the query, are often passed through the distance function d. The aim of any distance function (or similarity measure) is to calculate how close the feature vectors are to each other. There exist several common techniques for measuring the distance (dissimilarity) between two N-dimensional feature vector f and g. Each metric has some important characteristics related to an application.

E. Linear Dicriminant Analysis

LDA is the one of the most popular statistical technique of pattern recognition & machine learning. It calculates the linear combination of all the features of the image which separates the class of image. The resulting combination may be used as a linear classifier or, more commonly, for dimensionality reduction before later classification. Images can be classified into transformed space by these approaches. [10]

(a) Class-dependent transformation: This type of approach involves maximizing the ratio of between class variance to within class variance.

(b) Class-independent transformation: This approach involves maximizing the ratio of overall variance to within class variance. let us represent the data sets as a matrix consisting of features in Set1 and set2.Compute the mean of each data set and mean of entire data set. Let and be the mean μ1of set 1 and μ2 set 2 respectively and be mean of entire data μ3, which is obtained by merging set 1 and set 2, is given by

$$\mu 3=P1* \mu 1+P2*\mu 2 \qquad (1)$$

where P1 and P2 are the apriori probabilities of the classes.Then find the mean corrected data X_i that is the feature data for group i. It can be calculated from the subtracting the global mean vector and primary vector of features [11]. Then find the Covariance matrix of group i from:

$$C_i=\frac{(xi)T(xi)}{ni} \qquad (2)$$

Then find the prior probability vector $P_i=\frac{ni}{N}$

At last find the Discriminant function from the standard equation.

$$f_i= \mu_i C^{-1} X_k^T-1/2\ \mu_i C^{-1} X_k^T+\ln(P_i) \qquad (3)$$

We should Assign the object k to the group i that has maximum f_i.

II. RELATED WORK

The work presented here replaces the previous work happened in last year's. In most of the methods needs some research in this field. The methods used in Face recognition are PCA, CBIR, Neural Network [2], LDA, SVM [5] and many more. Fuzzy logic can be used with these methods. Different methods used different techniques for feature combination and learning and different classifier for classify the classes where the test query image belongs.

III. PROPOSED WORK

Designed system is composition of small subsystems and individual unit is complete in its own. The proposed system works for the images with broader classes which is problem in previous system [7].

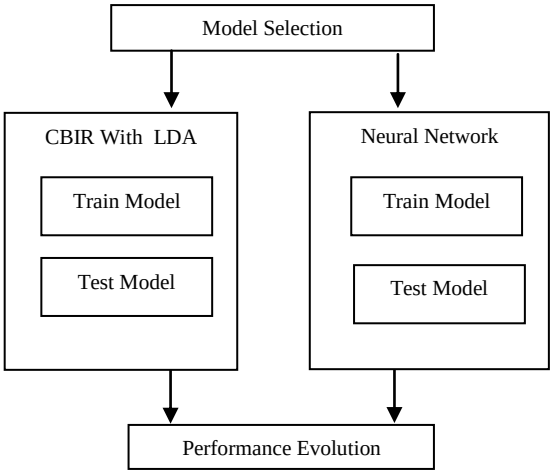

Fig. 1: Proposed system model

Training

1. Input image and class name

   I = Image

   H= HSV image

   C= Image classes (name of person)

   - Add one or more images in same class
   - Convert image RGB to HSV format

2. Convert image into matrix as

   mat[]=i1

3. Find average image

   A class may contains more than one image ci1, ci2, ci3…… cin

   And in same way we have Cmat1, Cmat2, Cmat3……

   Average of all class image = (Cmat1+ Cmat2+ Cmat3……)/ n

4. Find average image of all average image Data base contains n number of images i1,i2,i3…..

   Thus we have matrix of all images mat1,mat2, mat3……..

   Thus average = (mat1+mat2+ mat3……..)/n

5. Save all data
6. If new class added repeat all above steps

Testing

1. Input image for test TI
2. Convert image RGB to HSV
3. Project image face to combine average face.
4. LDA considers maximizing the following objective

$$J(W) = \frac{W^T S_B W}{W^T S_W W}$$

Where

$$S_B = \sum_{C=1}^{C} (\mu_C - X^-)(\mu_C - X^-)^T$$

$$S_W = \sum_{C=1}^{C} \sum_{i \in c} (X_I - \mu_C)\left(X_{i-\mu_c}\right)^T$$

S_B & S_W are between-Class Scatter Matrix and within-Class Scatter Matrix, respectively. The optimal solution can be found by computing the Eigenvalues of S_B & S_W and taking the Eigenvectors corresponding to the largest Eigen values to form a new basis for the data. Those can be easily obtained by computing the generalized eigenvalue decomposition of S_B and S_W.

1. If image found in data base then compare all average image and input image one by one using Euclidean distance
2. Minimum distance Image is detected as image class.

IV. RESULTS

We take facial images in counting's multiple of 4 and 5 for our result. The given graphs show the results for both the systems (CBIR with LDA Vs Neural network)

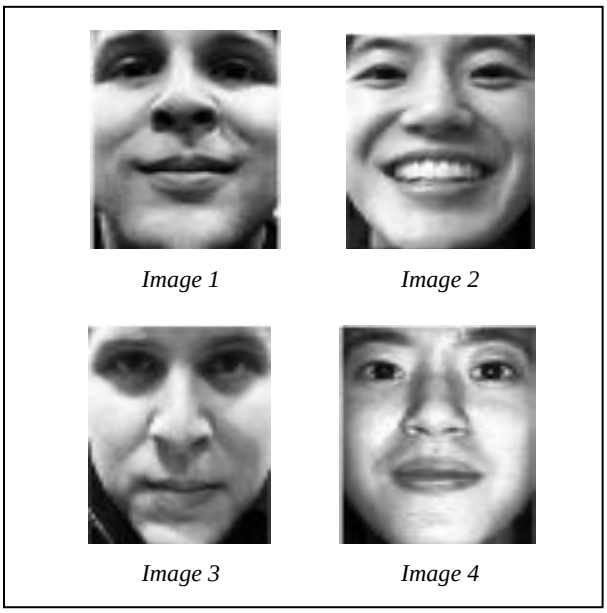

Image 1 *Image 2*

Image 3 *Image 4*

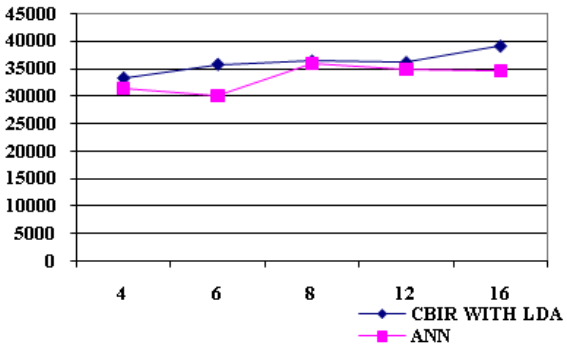

Fig. 2: Memory Used

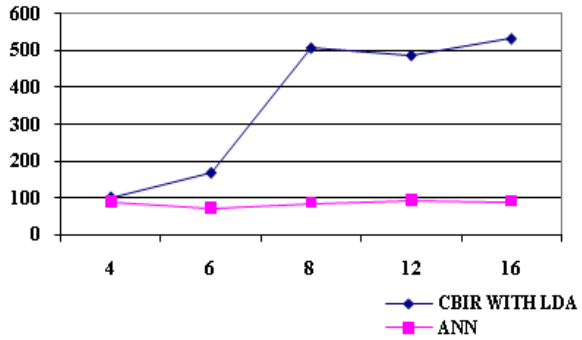

Fig. 3: Time Required

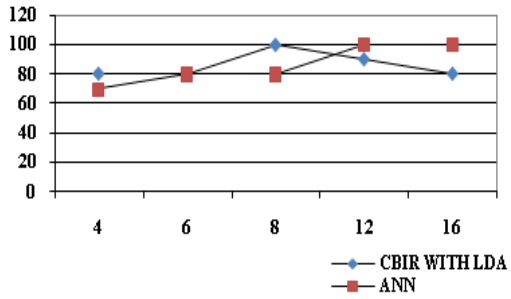

Fig. 4: Accuracy

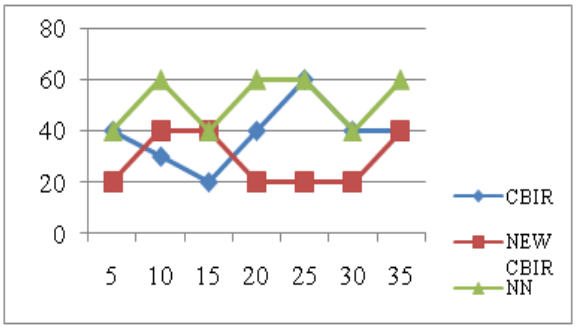

Fig. 5: Error Rate

If take a look on the results it is clear that the system is more accurate than the exiting. The other methods may be efficient in terms of time and memory but in such kind of system the accuracy is more important.

V. REFERENCES

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