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Face Recognition using improved local directional pattern approach for low resolution images

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Abstract-face recognition is the process that has been used for surveillance and authentication purpose. In the process of face recognition template features have been extracted from the face image and matched with dataset features. In this paper a low resolution based face recognition approach has been purposed. This approach is used for computation of texture features from the image and these features have been matched with dataset image features for recognition purpose.

***Keywords*:** blurred face images using LDP and DWT, False Acceptance Rate and False Rejection Rate, EULBP for face recognition.

1 INTRODUCTION

1.1 Biometric

The field of biometric examine the unique physical and behaviour traits, which can be used to observe a person identity. Biometric recognition also called automatic recognition of a person. The word "biometrics" is also used to denote biometric recognition methods.

1.2 Face

The face plays a very important role in our social intercourse to find identity & emotion. The human ability of find face is remarkable. We can recognise much face in our whole life on daily bases. The skill is quite robust, despite large changes in the visual stimulus due to viewing condition, expression, aging & distraction. An active area of research is computational modelling since 1980 such as criminal identification, security systems, image and film processing, and human-computer interaction, etc. To develop computational model faces is quite different because faces are complex, multidimensional, change with time.

Three phases of face recognition is

- Face representation
- face detection
- Face identification.

1.2.1Face representation

Face representation is the most important task to modal a face. The way to represent a face finds the successive algorithm of detection & identification. For entry level recognition, a face category should be identified by generic properties of all faces and for the sub coordinates level recognition. The detailed feature of eyes, nose and mouth has to be assigned to each individual face. There are a variety of approaches for face representation, which can be roughly classified into three categories: template-based, feature-based, and appearance-based. Simple template matching approaches represents a whole face using single templates i.e a 2-D array of intensity, which is usually an edge map of the original face image. The most attractive advantage of template-matching is the simplicity; however, it suffers from large memory requirement and inefficient matching. In feature-based approaches, geometric features, such as position and width of eyes, nose, and mouth, eyebrow's thickness and arches, face breadth, or invariant moments, are extracted to represent a face. Feature-based approaches have smaller memory requirement and a higher recognition speed than template-based ones do.

They are used for face scale normalization and 3D head model based pose estimation. Perfect extraction of feature is difficult to shown in implementation.

1.2.2 Face verification (or authentication)

Face verification is the process to verify person's identity that has been claimed to be matched with template. Face verification is the process of one to one match that comparing a query face with claiming face. Authentication is to be done on the basis of features of template image and query image to evaluate performance of the face verification different parameters have to be top secret that has been used for different ROC curves. False acceptance and false rejection rate has to be computed to compute verification rate of the claimed query. A good verification system should balance these two rates based on operational needs.

1.2.3 Face identification (or recognition)

Face identification is the process of matching of single person image with multiple images available in the folder. This face identification process is also known as one too many matching process. In this process inquiry face image is compared with all the template images available in the face image database. The image that is closest match with the database images is most identifying image that match with test image. The query face

image features has been compared with the database face images so that can identify that maximum matched image on the basis of distance. The distance has been compute with all the images available in the database of facial images. These distances have been arranged numerically in ascending order. The top level image distance is maximum matched image with the test image available in the database. If the top arranged distance is minimum then that define maximum matched image has been found with test image. On the basis of these test results the parameters for face thanks system. False Acceptance Rate (FAR) and False Rejection Rate (FRR) had to be compute for performance evolution of face recognition system.

2.REVIEW OF LITERATURE

JianYang et.al(2004)"Two Dimensional PCA: A New Approach to Appearance base face representation and Recognition" [3] in this paper author purposed a new technique 2-Dimensional Principal Component testing for facial image description. 2DPCA is mostly based on different 2-D image matrices that are necessary for feature extraction rather than that require 1-D in principal component testing. From 2D metrics of the image covariance matrix has to be derived so that the Eigen values can be computed and used for feature extraction on the basis of those Eigen values. These Eigen values are used for production of Eigen faces. Eigen faces are the basic features of facial image. 2DPCA technique is applied on different face image databases. Performance of purposed approach is always better than that of PCA in conditions of accuracy. There is one drawback with respect to PCA that is it needs more coefficients for image representation.2DPCA approach is appropriate for the small sample size problems.

TimoAhomen et.al (2006)"Face Description with Local Binary Patterns: Application to Face Recognition" [4]purposed a new approach for image representation by using the LBP (local binary pattern). The face image is separated into several regions. On each region of the face image a 3*3 mask in apply that computes the binary patterns for each divided region. These binary patterns are concatenate to derive face descriptor. That face descriptor is the face feature that is known as quality features of facial image. This approach is mainly used for gray scale facial images. In this paper the accuracy of LBP for diverse dataset has been discussed.

Jian Yang et.al (2010) "Bi-2DPCA: A Fast Face Coding Method for Recognition" [7] proposed a algorithm the works same as that of the 2DPCA in this method the coefficients are more than that of the PCA. So this leads the slow classification speed and large storage needs for large scale database. In this algorithm to overcome this problem the 2DPCA density is done two times the first one in flat way and second one in the vertical way. By using this approach classification speed of the algorithm increases and the cargo space requirements decreases for the large scale databases. In the whole procedure, the first 2DPCA transform B=AU performs the compression of 2D-data in horizontal direction, making the image power pack into a small number of columns. While the second 2DPCA make over C=transpose of V*B performs the compression of 2-D data in vertical direction, eliminating the correlations between columns of image Band making its energy further solid into a small number of rows.

Niloofar Amani1 et.al (2013)"A new approach for face image enhancement and recognition" [5] in this paper author purposed an approach that has been used for face recognition on the basis of histogram features. This approach is based on the contrast enhancement using high-frequency emphasize filtering and histogram. In this method image contrast and the global (or local) visualization are enhanced using digital filtering and equalizing the histogram of the pixel values over whole image. For this, first the face images are altered into a high-frequency domain and then the global thresholding method, by Otsu method, is useful to the image. Then, the values lower than threshold has only been considered. For dimension reduction and also feature extraction purpose the linear method such as two dimensional principle component analysis (2DPCA) and two dimensional linear discriminate analysis (2DLDA) are adopted. In the last stage of the algorithm, the simple minimum distance method is exploited for the classification.

Dong-Ju Kim et.al (2013) "Face Recognition with Local Directional Patterns" [6]in this paper proposes an illumination-robust face recognition system via local directional outline images. Usually, local pattern descriptors including local binary prototype and local directional pattern have been used in the field of the face recognition and facial expression recognition, since local pattern descriptors have significant properties to be robust adjacent to the clearing up changes and computational straightforwardness. Thus, this paper represents the face recognition approach that employs the local directional outline descriptor and two-dimensional principal investigation algorithms to achieve enhanced recognition accuracy. In exacting, we propose a novel methodology that utilizes the transformed image obtained from local directional outline descriptor as the direct input image of two-dimensional most important analysis algorithms, unlike that most of previous works employed the local pattern descriptors to obtain the histogram features. The concert evaluation of proposed system was perform using recognized approaches such as principal component analysis and Gabor-wavelets based on local binary prototype, and in public available databases as well as the Yale B database and the CMU-PIE database were in employment.

3. PROBLEM FORMULATION

Face recognition based on Euclidean distance and texture feature. A method for face recognition by using the GLCM (Gray Level Co-occurrence Matrix) and texture features. Euclidean distance classifier is used for the matching between the training and testing images.

Texture features are particularly susceptible to the resolution of images, when the resolution changes the calculated textures are not accurate. Texture features calculated by the GLCM is not adaptive for low resolution images or blurred images. For blurred images this method achieves poor accuracy.

The purpose of the research is to improve the accuracy for the low resolution images. By analysing various approaches for face

recognition there is need to develop a new approach which can provide better results using texture features for blurred images.

Objectives

- To achieve the better performance for blurred face images using LDP and DWT approach.
- To decrease the False Acceptance Rate and False Rejection Rate.
- To reduce the dimensions of feature vector.
- To validate the work comparison is made with the approach using EULBP for face recognition.

4. METHDOLOGY

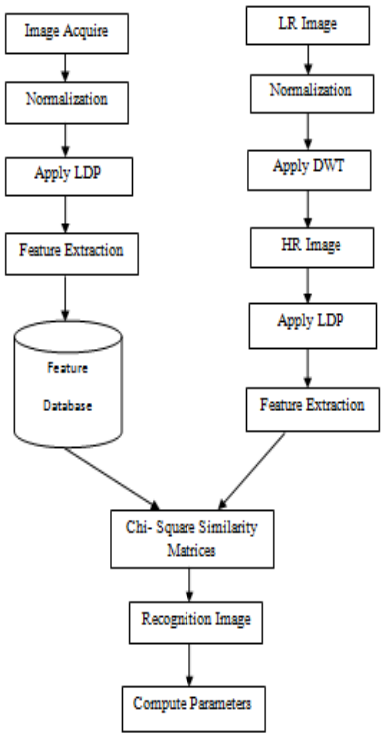


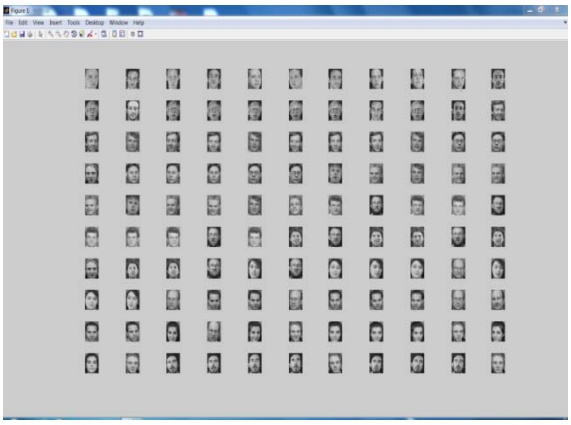
Fig 4.1 Flow diagram for purposed work

In this flow chart of the purposed system the chart explain the flow of work in the system that has been purposed. This chart shows how the data flows in the system and which steps are used for the development of the system.

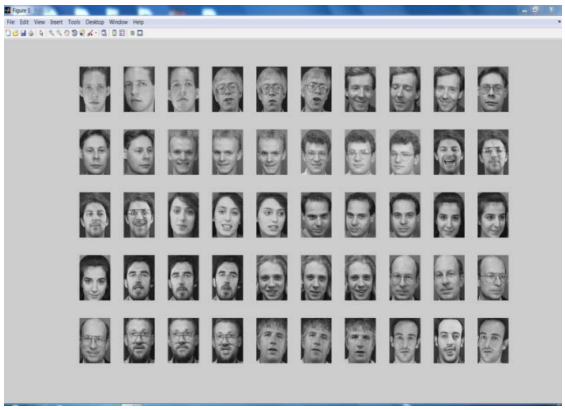
In the purposed system face recognition has been done on the basis of various features that has been evaluated from facial images for the process of recognition.

Local Directional Pattern is applied to the image produced by using the discrete wavelet transform. A 3*3 matrix will move on the different regions of the image and computes the features on the basis of threshold set by the user. The histograms are computed by using the values computed by LDP. The histograms of each region on which mask will move are generated and concatenated these histograms to develop a feature set that is used for matching purpose.

5. RESULTS



This figure shows the database images that have been used for the creation of the database of the images. In this database the 10 samples of an individual has been taken at different times with luminance and pose variations. In this work the 7 samples of an individual has been used for the feature extraction and save to the database. These features of the database images have been stored in the mat file. This mat file can be used for the matching purposes with the test image. The features extracted using LTP and DWPDCT are useful for the pattern matching using the distance classifier. The features generated are less in dimensions due to the histogram concatenation of upper local ternary code and lower local ternary code. These features show the optimized values of the features.



This figure shows the test images that have been taken for the testing phase in the face recognition system. Three face images have been taken for the testing phase in the system. These images have been taken from the set of 10 images per individual. The feature of the test image has to be used for the matching process by using chi square classifier.

Approaches	Mismatched Images	Matched Images	Percentage
DCT+LDP	**16**	**144**	**90%**
DWT+LDP	**14**	**146**	**91.25%**
DCT+ DWT	**11**	**149**	**93.12%**

+LDP			
EULBP	**26**	**134**	**83.75%**

Table 5.1: Table of approaches

This table is representing different approaches and their respective results of matched and mismatched images with the percentage values of their results.

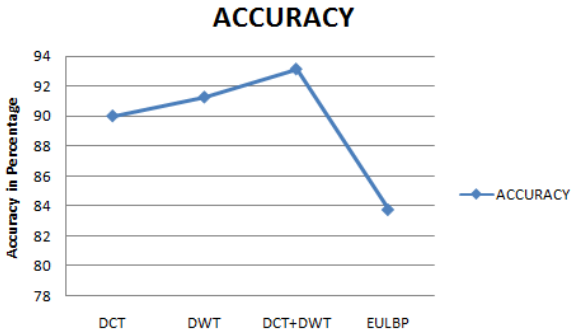


Figure 5.1: Graph of accuracy as per the values of DCT, DWT, DCT+DWT and EULBP

6. CONCLUSION & FUTURE SCOPE

Face recognition is used for matching of individual identity with many dataset images. In this paper face recognition has been done using texture features of the image. These features have been extracted using LDP approach. in this paper ORL dataset has been used for recognition process and images has been downsamlted to compute face recognition accuracy has image enhancement approach has been used for image blurriness removal in low resolution images. On the basis of accuracy one can say that purposed approach provides much better accuracy at low resolution face images.

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