An Implementation of PCA and LBP based Real Time Face Recognition with Attendance Recording System Using Matlab

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***Abstract*— Face recognition become very much popular now a day to recognize person with their face, to avoid crime etc. this mechanism is based on the division of the face processing in three phase i.e. face detection, feature extraction based on the input face image and face recognition. In this paper, we are considering three algorithms such as Principal Component analysis (PCA), Linear Discriminant Analysis (LDA) and Local Binary Patterns (LBP). The comparison of the rate of accuracy of face recognition is also compared. The advantages and disadvantages of these algorithms will help in obtaining a solution, so that a better face recognition system can be designed.**

***Index Terms*— Keywords: - DCT, LBP, PCA, LDA, Face recognition, Attendance system.**

I. INTRODUCTION

Facial characteristics are very important in the recognition of the Face. Compared to different biometrics, which include fingerprint, DNA, or voice, face popularity is more natural, nonintrusive and can be used without the cooperation of the difficulty. Due to powerful computers technologies and the advancement in the field of pattern recognition, real time based face recognition systems becomes very much popular and also achieve satisfying performance under controlled conditions, that leads to various applications. A face recognition system can be used in two modes: verification (or authentication) and identification. A face verification device entails the identification of character via verifying their photo one to 1. On the opposite hand, a face identification system tries to set up the identity of a given person out of a pool of N human beings (one-to-N matching). When the identity of the man or woman might not be within the database that is referred to as open set identification. While verification and identity often share the equal category algorithms, each modes target wonderful packages. In verification mode, the primary programs situation get right of entry to control, together with computer or cellular device log-in, building gate control, digital multimedia data access. Over conventional security get entry to systems, face verification has many advantages: the biometric signature cannot be stolen, misplaced or transmitted, like for ID card, token, badges or forgotten like passwords or PIN codes. In identification mode, potential programs specially contain video surveillance (public locations, restricted regions), records retrieval (police databases, multimedia statistics control) or human computer interplay (video games, private settings identity). An automatic face verification gadget consists of two main face detection and face verification. The purpose of the face detection module is to determine whether or not there are any faces in an photograph (or video sequence), and if so, to go back their function and scale. The term face localization is employed at the same time as there's one and handiest one face in the photo. When the localization step handiest gives a hard segmentation of the face vicinity, a put up-processing face alignment step can be required. This step entails locating facial talents, which include eyes, nose, mouth or chin, on the way to geometrically normalize the face place. Face detection is an crucial place of studies in computer vision, as it serves, as a necessary first step, any face processing device, along with face recognition, face tracking or expression analysis. Faces are non-rigid, dynamic objects with a large diversity in shape, color and texture, due to multiple factors such as head pose, lighting conditions (contrast, shadows), facial expressions, occlusions (glasses) and other facial features (make-up, beard). Large variability in face appearance also affects face verification. Same face shows different variations between the images because of the illumination and viewing direction are always more than the image variation due to change in face identity. Another difficulty comes from the lack of reference images to train face templates. The few available training data are usually not enough to cover the intra-personal variability of the face. Moreover a significant mismatch between training and testing conditions may happen (especially lighting). Finally, the verification performance is highly related to the quality of the face localization step.

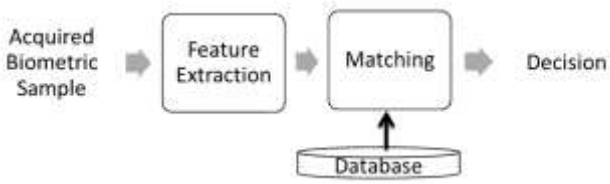

Figure 1: Flow chart of typical biometric system

II. OBJECTIVE

The main objective of this paper is to compare the performance of LBP and PCA the algorithms. Although face detection receives considerable attention, it still remains a difficult pattern recognition task, because of the high variability of the face appearance. We trying to implement a face recognition based attendance tracking system for students.

III. PRINCIPAL COMPONENT ANALYSIS (PCA) ALGORITHM

PCA for face recognition is based at [4] the statistics concept method. It extracted the relevant statistics in a face image and encoded successfully as viable. It identifies the subspace of the image space spanned by way of the training face image facts and de-correlates the pixel values. The classical instance of a face image is [1] obtained via projecting it to the coordinate machine defined with the useful resource of the vital additives. The projection of face snap shots into the principal trouble subspace achieves information compression, de-correlation and dimensionality reduction to facilitate desire making. In mathematical terms, the main components of the distribution of faces or the eigenvectors of the covariance matrix of the set of face photographs, is sought by way of treating an image as a [8][9]. We practice PCA on this database and get the unique feature vectors the use of the following method. Suppose there are P patterns and every pattern has training images of m x n configuration. PCA also known as Karhunen- Loeve [2] method is one of the popular methods for feature selection and dimension reduction. Recognition of human faces using PCA was first done by Turk and Pentland [29] and reconstruction of human faces was done by Kirby and Sirovich [30]. The recognition method, known as Eigen face technique [3] defines a function area which reduces the dimensionality of the unique facts space. This decreased records space is used for popularity. But poor discriminating power in the class and huge computation are the widely known not unusual troubles in PCA approach.

- The database is rearranged within the form of a matrix in which every column represents an image.
- With the help of Eigen values [1] and Eigen vectors covariance matrix is computed.
- Feature vector for each picture is then computed.
- This function vector represents the signature of the photograph. Signature matrix for entire database is then computed.
- Euclidian distance of the picture is computed with all of the signatures inside the database.
- Image is recognized as the only which offers least distance with the signature of the photograph to recognize.

IV. LOCAL BINARY PATTERNS (LBP) ALGORITHM

The face detection set of rules delivered in this phase is an extension of Viola and Jones algorithm [15] primarily based on boosted cascades of Haar-like functions. As pointed out by way of Zhang et al. [16], those features are very efficient inside the cascade to quickly discard maximum of the history areas. However, in the last stages of the cascade, a large number of Haar-like features (several hundred) are necessary to reach the desired detection/false acceptance rate trade-off. It results in a long training procedure and cascades with several dozens of stages which are difficult to design. Furthermore, Haar-like features are not robust to local illumination changes. To cope with the limitation of Haar-like features, we propose to use LBP features. The method to build the weak classifiers is inspired by the work of Froba and Ernst [19] and the cascade training is done with AdaBoost [18].

LBP Features

The LBP operator is a non-parametric 3x3 kernel which summarizes the nearby spacial shape of an image. It turned into first added by means of Ojala et al.[26] who confirmed the high discriminative power of this operator for texture classification. At a given pixel role (x_c, y_c), LBP is described as an ordered set of binary comparisons of pixel intensities among the center pixel and its eight surrounding pixels. Ojala et al. [17] prolonged their original LBP operator to a circular community of different radius size. Note that every little bit of the LBP code has the identical significance level and that successive bit values may have a totally special which means. Actually, The LBP code can be interpreted as a kernel structure index. By definition, the LBP operator is unaffected by using any monotonic grey-scale transformation which preserves the pixel depth order in a nearby neighborhood. Later, Ojala et al. [17] extended their authentic LBP operator to a circular community of different radius length. Their LBP P, R notation refers to P similarly spaced pixels on a circle of radius. Recently, new versions of LBP have regarded. For example, Jin et al. [20] remarked that LBP features leave out the neighborhood structure under some positive situation, and for this reason they delivered the Improved Local Binary Pattern (ILBP). Huang et al. [28] pointed out that LBP can handiest reflect the first derivation statistics of pics, but couldn't gift the rate of local version. To remedy this hassle, they proposed an extended model of Local Binary Patterns (ELBP). Due to its texture discriminative assets and its very low computational cost, LBP is turning into very famous in sample reputation. Recently, LBP has been applied for instance to stand detection [20], face recognition [21, 22], photograph retrieval [24], motion detection [25], visible inspection [23]. We subsequently factor out that, approximately in the equal time the authentic LBP operator become brought via Ojala [26], Zabih and Woodfill [27] proposed a completely similar local structure feature. This function, referred to as Census Transform, also maps the local neighborhood surrounding a pixel. With recognize to LBP, the Census Transform most effective differs by means of the order of the bit string. Later, the Census Transform has been extended to grow to be the Modified Census Transform (MCT) [19] which takes into account the center pixel inside the bit string and compares to the average intensity values in the community. The neighborhood binary pattern (LBP) approach could be very effective to describe the image texture features. LBP has advantages along with excessive-pace computation and rotation invariance, which facilitates the wide utilization inside the fields of photograph retrieval, texture exam, face reputation, picture segmentation, etc. Recently, LBP [11] turned into efficaciously implemented to the detection of shifting gadgets thru background subtraction. In LBP, each pixel is assigned a texture cost, which can be certainly blended with goal for

monitoring thermo photograph and monochromatic video. The main uniform LBP styles are used to understand the key points inside the target region after which form a mask for joint coloration-texture feature selection [31]. LBP is defined as an ordered set of binary comparisons of pixel intensities among the centre pixel and its eight surrounding pixels. The decimal cost of the resulting eight-bit phrase (LBP code) ends in 2^8 feasible aggregate that is known as Local Binary Patterns.

Basic LBP operator

The LBP operator is based on the binary and grayscale images, in the field of texture description which has many advantage over other methods designed earlier. This is done by thresholding every pixels of the image by assigning a label. This figure 4 shows the use of the 3x3 neighborhood.

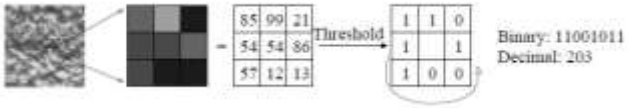

Figure 2: Basic LBP operator [20]

Steps involve in LBP Algorithm

1) In this LBP histogram method, labeling is done to each pixel of an image with the LBP code.
2) This LBP code image is divided into several blocks.
3) LBP Histogram for each block of an image is calculated and the histogram calculated for each blocks is combined together so that actual image can be obtained.

V. TEST AND IMPLEMENTATION

In this Project we use a GUI model to get attendance of each student of college. We have many functionality in this system. We can be add students details in excel based database and can be track their all records year by year, day by day. This is very helpful for organization. In our project we used face a medium to recognition of authentication. We use different methods LBP and PCA. We also compare this method. This methods are used for classification and Identification of face.

We have some different steps in our project.

1. We need to set the Excel database where the Attendance can be recorded.
2. We need to set of student name and their face images. So, we take many pictures from my classmate's face images.
3. We start and load the testing of Student Face images for recognition and attendance.
4. We record the current day and time of attendance.
5. Apply Segmentation of face in EYES and FACE Area.
6. Apply different recognition methods for check the authentication details.
7. If details and face are matched then take attendance for this day if details are not found then display not matched.

Figure 3: Test image matched with the Database and Find the respective matched image

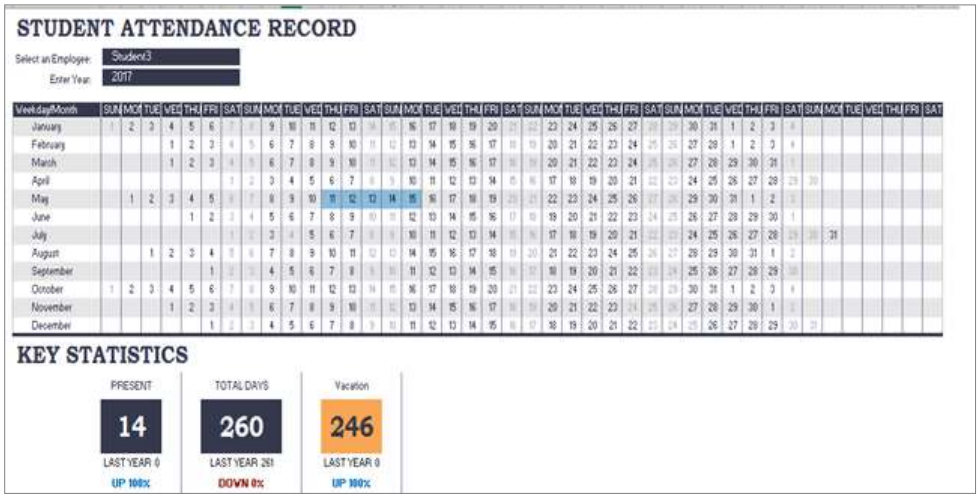

Figure 4: Attendance Records tracker

In our system attendance is recorded using the xlswrite() system of Matlab, we can show all students each year of data. We can be monitor each student records simply open the excel sheet.

VI. RESULTS

We have some face images which apply in this system and recognize using PCA and LBP method. After watching in this system LBP is fast then other methods. It is more successful in recognition. We are work in color images for recognition. We store attendance in database using Matlab GUI. We make add students face images in data base.

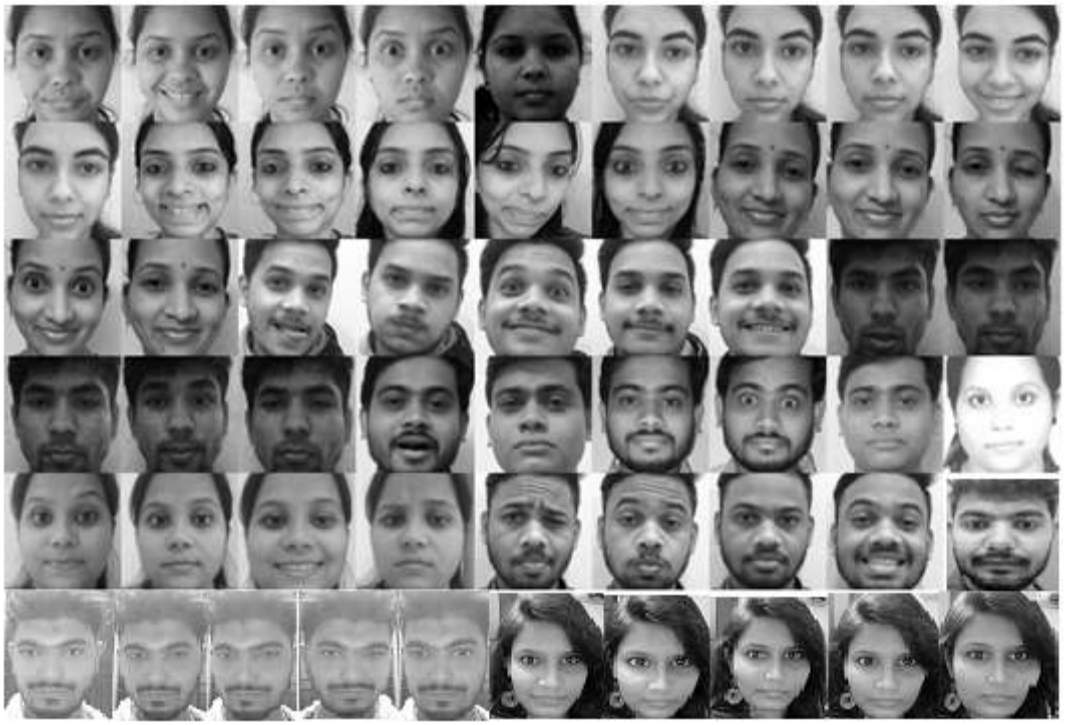

Figure 5: Available Datasets of Students in database

After the matching with their respected picture we can see the histogram differences. In their we calculate the distance between two images , where we can choose min distance image. We apply a proper threshold value for matched and not matched image.

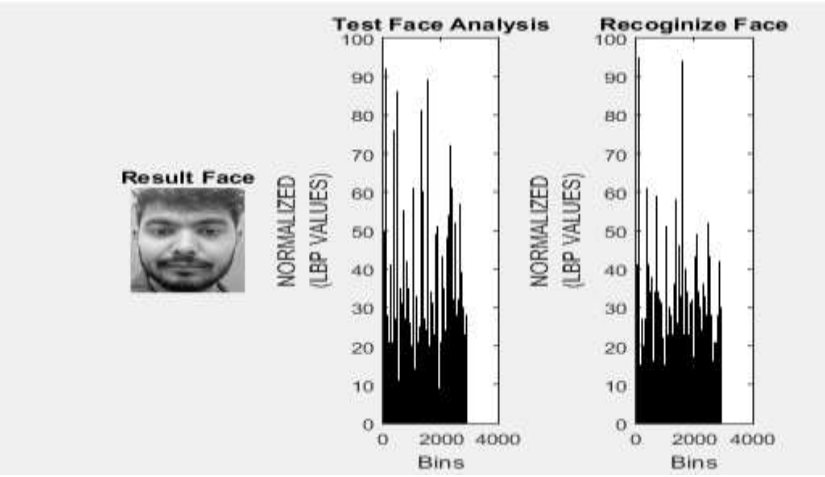

Figure 6: Result output face histogram comparison with test image histogram

After the analysis of PCA and LBP we have some of performance evolution.

Performance Evolution Condition	***Principal Component Analysis (PCA)***	***Linear Binary Pattern (LBP)***
Face Localization	92%	92%
Face Detection	90%	90%
Eye Detection	--	85%
False positive rate	55%	25%
Processing time	29798 millisecond	563 millisecond
Recognition rate (Image)	75%	95%
Recognition Rate(Real time Webcam)	60%	85%

Table 1: Comparison of performance of PCA and LBP with many images

VII. DISCUSSIONS

In this paper, we work for face recognition based attendance system. This is helpful for count and recognize number of person in any seminar and conference hall. This application can be used in educational institutions, company administrators for regular maintain the attendance records of employee, students and admin. We already survey the different attendance system, the previous system works manually needs to touch or be key-press system. This project have easy installation process with low cost.

VIII. CONCLUSION

LBP algorithm is much better than other methods of the face recognition. This algorithm uses Haar-Like features for the instance of the face detection, face recognition, image retrieval, motion detection, visual inspection, motion detector etc. comparatively PCA is having limited scope of recognition of face or motion. The extended version of this algorithm is based on the texture discriminative property and its very low computational cost, LBP is becoming very popular in these types of the recognition. Above the table 1 we have the some of performance data, which is shows the LBP is works better than PCA.

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