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A REVIEW PAPER ON AUTOMATED ATTENDANCE MANAGEMENT SYSTEM USING FACE RECOGNITION ALGORITHMS

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Abstract: The face is identity of person. Human face recognition is an important branch of biometric verification and has widely used in many applications such as video monitor system, human computer interaction and network security. A large number of face recognition algorithms have been developed in last decades all having respective advantages and disadvantages. Some of the algorithms improve the efficiency of face recognition, under different varying illumination, pose variation and expression conditions for face images. The different authors have described novel approaches for face recognition. In this paper an attempt is made to review a wide range of methods used for face recognition.

Keywords: Principal Component analysis (PCA), Linear discriminant Analysis (LDA), Face Recognition, Biometric, Attendance Management.

I. INTRODUCTION

Person identification is one of the most crucial building blocks for smart interactions. Among the person identification methods, face recognition is known to be the most natural ones, since the face modality is the modality that uses to identify people in everyday lives. Although other methods, such as finger print identification [1], can provide better performance, those are not appropriate for natural smart interactions due to their intrusive nature. Face recognition technology is gradually evolving to a universal biometric solution since it requires virtually zero effort from the user end while compared with other biometric options. Biometric face recognition is basically used in three main domains: time attendance systems and management; visitor management system; and last but not the least authorization systems and access control systems. This is mainly because these applications help the top-management take decisions that improve the performance and effectiveness of organization. Face recognition is considered to be most successful applications of image analysis and processing; that is the main reason behind the great attention it has been given in the past several years. Traditionally, student's attendances are taken manually by using attendance sheet given by faculty members in class, which is time consuming event. Moreover, it is very difficult to verify one by one student in a large classroom environment with distributed branches whether the authenticated students are actually responding or not. Basically this research is aimed for implementing a system that is capable of identifying students in the class and marking their attendance[2]. Every face has numerous, distinguishable landmarks, the different peaks and valleys make up facial features. FaceIt defines theses landmarks as nodal points. Each human face has approximately 80 nodal points. The facial recognition process can be divided into two main stages: processing before detection where face detection and alignment takes place and afterwards recognition occur through feature extraction and matching steps.

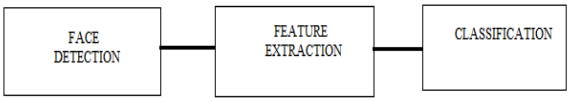

FIGURE: 1 Block Diagram of a Face Recognition System

The first step in face recognition system is to detect the face in the image. The main objective of face detection is to find whether there are many faces in the image or not. If the face is present then it returns the location of the image. Pre processing is done to remove noise. The facial feature extraction is the process to detect the presence and location of features like nose, eyebrow, eyes, lips, nostrils, mouth, ears, etc. this is done with the assumption that there is only single face in an image[3]. In the face recognition process the input image is compared with database. Then it provides a report about match, if any and then classification is done to identify the subpopulation to which new observation belong.

II. VARIOUS TECHNIQUES

A. Principal Component Analysis (PCA)

Principal component analysis (PCA) is a powerful tool for feature extraction as proposed by Turk and Pentland [4]. This is a statistical analytical tool that is used to explore, sort and group data. It takes a large number of correlated variables and transform this data into a smaller number of uncorrelated variables while retaining maximal amount of variation, thus making it easier to operate the data and make predictions. PCA is a way of identifying patterns in data and expressing the data in such a way as to highlight their differences and similarities. Since patterns in data can be hard to find in data of high dimension, where the luxury of graphical representation is not available, PCA is a powerful tool for analyzing data. This method is successfully used in order to perform dimensionality reduction. One of the advantage of PCA is that instead of using all the dimensions of image only meaningful dimensions are considered to represent the image. Disadvantage of PCA is that, it is a unsupervised technique, maximizes overall variance of the data along a small set of directions. It does not know anything about class labels, can pick direction that make it hard to separate classes. PCA does not consider the discriminative

information in the data. It is too expensive for many applications.

B. Linear Discriminant Analysis (LDA)

Linear Discriminant Analysis (LDA), is sometimes known as Fisher's Linear Discriminant, after its inventor, Ronald A. Fisher[5]. It is typically used as a feature extraction step before classification. LDA determines a subspace in which the between class scatter is as large as possible while within class scatter is kept constant. In this sense, the subspace obtained by LDA optimally discriminates the classes-faces[6]. LDA stores the discriminative information in the data. LDA may recognize an image in well-illuminated condition but fails in bad-illuminated condition. There is one problem with LDA that within the class the scatter matrix is always single, since number of pixels in image is larger than the number of images so it can increase detection of error rate if there is a variation in pose or lightning condition within same face image. So to overcome single matrix problem, many algorithms have been proposed[7].

C. Local Binary Pattern Histogram(LBPH)

Local Binary pattern Histogram(LBPH) is recently proposed algorithm for face feature extraction. In this method image is segmented into local regions and histogram of each is extracted and are concatenated to form a face descriptor. One drawback of this method is that it assumes that a given Image region corresponds to the same part of the face in all the faces in dataset. This is only possible if the face images are fully frontal, scaled and aligned properly. In addition, while LBP invariant against monotonic gray-scale transformations, they are still affected by illumination changes that induce non monotonic gray scale-changes such as self-shadowing [8].

D. Support Vector Machine (SVM)

Support Vector Machine (SVM) is supervised learning models with associated learning algorithms that analyze data and recognize pattern, used for classification. SVM is recently proposed algorithm which is an effective pattern classification algorithm. For pattern recognition SVM finds the optimal separation of closest points in the training set. This separation can be done linearly or non-linearly. To improve the classification performance of the PCA and LDA subspace features SVM is used [9]. SVM is considered easier to use than neural networks.

III. CONCLUSION

This paper presented an independent study of techniques. Present study reveals that for recognition, PCA technique is a statistical approach that deals with pure mathematical matrixes. PCA can also be used for detection.LDA can make correct discrimination between the images only if the discrimination is provided in the database. In real time scenarios LBPH outperforms other techniques with better recognition rate and low false positive rate. Accuracy of the system implemented using PCA and LDA are affected by database size which is not the case in LBP [10]. SVM prove to be better classifier.

REFERENCES

[1] Salil Prabhakar, Anil Jain, "Fingerprint Identification". Available: http://biometrics.cse.msu.edu/fingerprint.html [Accessed: 20th of Feb 2012].

[2] Mr. A. R. Gadekar1 ,Mayuri K. Chandak2 ,Bharat S. Budhalani3 , Sarang S. Chawale ,"Automated Employee Face Recognition System", IORD Journal of Science & Technology E-ISSN: 2348-0831 Volume 1, Issue III (MAR-APR 2014) PP 01-05

[3] H.P. Graf, T. Chen, E. Petajan, and E. Cosatto, "Locating Faces and Facial Parts," Proc. First Int'l Workshop Automatic Face and Gesture Recognition, pp. 41-46, 1995.

[4] M. A. Turk and A. P. Pentland, "Face Recognition Using Eigen faces," in IEEE CVPR), 1991,pp. 586-591.

[5] R. A. Fisher, "The Use of Multiple Measurements in Taxonomic Problems", 1936.

[6] Anissa Bouzalmat, Jamal Kharroubi , Arsalane Zarghili, "Comparative Study of PCA, ICA, LDA using SVM Classifier", JOURNAL OF EMERGING TECHNOLOGIES IN WEB INTELLIGENCE, VOL. 6, NO. 1, FEBRUARY 2014

[7] M. Bartlett, J. Movellan, and T. Sejnowski. Face recognition by independent component analysis. IEEE Trans. on Neural Networks,13(6):1450–1464, November 2002

[8] X. Tan and B. Triggs, "Enhanced local texture feature sets for face recognition under difficult lighting conditions," Lecture Notes in Computer Science, vol. 4778, p. 168, 2007

[9] B. Heisele, P. Ho, and T. Poggio, "Face recognition with support vector machines: Global versus component-based approach," Proceeding of ICCV, vol. 2, pp. 688-694, 2001.

