A Face Recognition Technique using Principal Component Analysis
Ankush Choudhary¹ Ashish Kumar Sharma² Jyoti Dalal³ Leena Choukiker⁴
¹,2,3,⁴Department of Electronics & Communication Engineering
¹,2,3,⁴Amity University, Haryana, India

Abstract—This paper describes an for an robust face recognition system in order to overcome many of the limitations found in existing facial recognition systems. This paper addresses the problem of detecting faces in color images in the presence of various lighting conditions and various poses. In this paper the face is preprocessed using histogram equalization to avoid illumination problems and then is detected using skin segmentation method. The facial features are then extracted and recognized using principal component analysis. The dimensionality of the image is reduced by using PCA.

Key words: Histogram equalization, Principal component analysis

I. INTRODUCTION

Face recognition has recently received significant attention as it is one of the most successful applications of image analysis during the past several years. Recognition of face images acquired in an outdoor environment with changes in illumination and/or pose is a not yet solved problem. In other words, current systems are still far away from a robust face recognition system.

In general, face recognition involves two things i.e. identification means who is X and authentication that means is this X? Face recognition system combines three steps that are (a) face detection (b) feature extraction (c) face recognition. Face detection detects whether there is a face in the picture or not. If it is present, then it finds its location. Feature extraction extracts the facial features of the training image and at the last step i.e. face recognition those extracted features are used to match them with the test images. There are two possibilities: (1) match will found (2) match will not found.

II. LITERATURE SURVEY

Face recognition is one of those challenging problems and till now, there is no technique that provides a robust solution to all situations. Several algorithms and techniques for face recognition have been developed in the past by researchers. Some of them are discussed briefly in this section. The problem of automatic face recognition involves three key steps/subtasks:

1) Detection of faces
2) Feature extraction
3) Identification and/or verification.

Sometimes, different subtasks can be carried out simultaneously. For example, the facial features (eyes, nose, and mouth) extraction step can be performed with the face detection. A popular and robust face detection algorithm uses an object detector developed at MIT by Viola and Jones [1]. The detector uses a cascade of boosted classifiers working with Haar-like features to decide whether a region of an image is a face. On web blogspot [2] present a face recognition system that attempts to recognize faces using skin segmentation technique. Yanjiang Wang et al. [3] proposed a fast face detection method in color images under complex background. The method firstly calculates similar pixel color image with the person’s skin color clustering and region segmentation, and then use the face features of the wavelet decomposition analysis for each candidate area, if the detection is similar to the characteristics of the regional distribution of the face with one of the predefined model, the regional representative of the face. In [4], Aamer S.S.Mohamed presented an approach that relies on skin based color, while features can be extracted from two dimensional Discrete Cosine transform and neural networks which used to detect faces by using skin color from DCT coefficient of Cb and Cr features vectors.

III. METHODOLOGY

The previous section illustrated a number of techniques of all the three stages of face recognition. Each category of method has some advantages and drawbacks too. Systems with good accuracy are still far away.

For face recognition we will be using a holistic matching approach i.e. PCA using neural method. To perform PCA several steps will be performed:

Step 1: Subtract the Mean of the data from each variable (our adjusted data)

Step 2: Calculate and form a covariance Matrix

Step 3: Calculate Eigenvectors and Eigenvalues from the covariance Matrix

Step 4: Chose a Feature Vector (a fancy name for a matrix of vectors)

Step 5: Multiply the transposed Feature Vectors by the transposed adjusted data

Fig. 1: Steps to perform PCA

The eigen object recognizer class performs all of this and then feeds the transposed data as a training set into a Neural Network. When it is passed to recognize it performs PCA and compares the generated Eigen values and Eigenvectors to the ones from the training set. The Neural Network then produces a match if one has been found or a negative match if no match is found.

IV. EXPERIMENTAL ANALYSIS

Firstly we have loaded the database of 400 images of 40 people (AT&T database) in which there are 10 photos of
each person under various illumination and poses. Then we took one picture that we have taken for recognition and rest 399 as the testing images. Then as per figure 1 we have followed the steps and at last the picture nearly same as the picture that was taken for recognition purpose was found as output.

Fig. 2: Recognized Image

V. CONCLUSION

This paper presents an efficient approach for face recognition of image which handled illumination issues and poses variation using Principal Component Analysis. We worked on single image. In future we will be working on multiple people in a single photo for recognition purpose.

REFERENCES


[8] Gunjan Dashore and Dr. V.Cyril Raj, An Efficient Method For Face Recognition Using Principal Component Analysis(PCA), IJATER, Volume 2, Issue 2, March 2012


[18] V.Vezhnevets, V.Sazonov, A. Andreeva ,” A Survey on Pixel- Based Skin Color Detection Techniques”, Graphics and Media Laboratory, Moscow State University, Moscow, Russia.