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FACE DETECTION USING FISHERFACE METHOD REVIEW

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ABSTRACT

The techniques of the face detection has become so accurate within these 25-40 years. The purpose of this research paper is to make a review on a face recognition using fisherface method. In here, we are going to see comparison between some methods which are used to face detection. Further, we have analyzed about eigenface, fisherface, elastic bunch graph matching method. Fisherface technique has lower error rates that are significantly better than the both eigenface method as well as elastic bunch graph matching.

I. INTRODUCTION

In the present information period, human's biometric data turn out to be important information. It can be used for the identification purpose. Therefore, many recognition techniques have developed to find individuals. Face recognition is comparatively an easy and possible solution to find out specific person among a great number of people. Automatic face detection system has face localization, face tracking, extraction of face characteristics, face direction and facial features and facial expressions to deal with.

Efficiency is important for a instantaneous face recognition system. It has to be a user friendly as users cannot abide a slow functioning to identify a person or waiting for the results. The data storage should also not be too outsized. It is not convenient to store enormous amount of data.

II. METHODOLOGY

The features of face of each person is dissimilar from any other human being same as DNA or fingerprints. As fingerprints or DNA are used to distinguish the identity of any individual in same manner face can also be used to identify any individual. From the image of face, individual person can be distinguish and acknowledged more rapidly and simply. Therefore to identify a person a face is more reliable.

Usually, the Face recognition system is bificarted into two types first is feature-based system and second is image-based system. In the feature based system, features extracted from the image and get the components like eye , nose, mouth, etc. From this components a relation has established between these features by some model. While in the image pixels which are then represented in certain methods such as Principal Component Analysis(PCA), wavelet transformation, etc. which is then used to form a training set and image identification classification.

Feature extraction is a process for obtaining characteristics that distinguish a face sample from another face sample. Reliable feature extraction techniques are key in solving pattern recognition problems as the principal component analysis method (PCA) used for face recognition[2].

The PCA method aims to project data in the direction that has the greatest variation (indicated by the eigenvector) corresponding to the largest eigenvalues of the covariance matrix. The weakness of the method is less optimal in the separation between classes[2][3].

Linear Discriminant Analysis (LDA) method for face recognition. This method tries to find a linear subspace that maximizes the separation of two pattern classes according to Fisher Criterion[5].

The fisherface method for face recognition. This method is a combination of PCA and LDA methods. The PCA method is used to solve singular problems by reducing the dimensions before being used to perform the LDA process. But the weakness of this method is that when the PCA dimension reduction process will cause some loss of discriminant information useful in the LDA process**Error! Reference source not found.**.

In last few years, there are many number of face recognition algorithms given by scholars.

The three methods are:

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- Eigenface
- Elastic bunch graph matching
- Fisherface

Eigenface:

Mathematically speaking, eigenfaces are a smaller set of eigenvectors that are derived from the covariance matrix of the probability distribution of the high-dimensional vector space of possible faces of human beings[9]. The basic design of eigenface is to obtain the features in form of mathematical logic instead of physical face feature by using some kind of mathematical transform for detection. Eigenface technique has two stages for face identification. The first part is known as the training phase. In training phase, a group of individual faces is collected to form a the training set. These training sets should be in a good representation of all the faces that one has to be checked[1]. The image size, orientation of image and intensity of light should be consistent. For example, all face images are of size of 130 x 130 pixels and all are frontal faces[1]. Each of the images in the training set is represented by a vector of size M by M, with M representing the size of the image[1]. By using Principal Component Analysis (PCA) a set of eigen vectors are formed With the help of training images. PCA's fundamental idea is to make use of the training set's redundant information in order to simplify the set's representation. Using PCA, we can represent an image using N eigenvectors where N is the number ofeigenvector used.

Elastic Bunch Graph Matching:

Elastic Bunch Graph Recognition is depends on the facial points of an image but not like the entire image as Eigenface and Fisherface[1].This is more suitable for face recognition because it provides important features from the face[1].Face detection by elastic bunch graph matching is depends on detection of novel faces by estimating a set of novel features using a data structure called a bunch graph[1]. Similarly for each query image, the landmarks are estimated and located using bunch graph[1].Then the features are extracted by convolution with the number of instances of Gabor filters followed by the creation of face graph[1]. Face graphs of database and query images are compared to finding the matching score (MS_{EBGM}).Eyes, nose, mouth these facial points are repeatedly traced by elastic bunch graph and used to detect the individual face according to these facial appearance. Elastic Bunch Graph Matching (EBGM) uses the composition information of a face feature to plot a image plane[1]. Image plane consists the information like translate, scale, rotate. EBGM uses labelled graph. In this labelled graph edges, distance information and node of the images are labelled. To construct a image graph the model graphs are used.

Fisherface:

In fisherface method both principal component analysis (PCA) and linear discriminant analysis (LDA) is required. LDA and PCA method collectively used to generate a matrix, called subspace projection matrix. Which is also be used in the eigenface technique. The main difference between Eigenface method and fisherface method is that fisherface technique maximize the ratio of the between-class scatter matrix S_B with respect to the within class scatter matrix S_W. The fisher's technique maximized the ratio of the between-class scatter matrix S_B and the within-class scatter matrix S_W. If the between-class scatter matrix S_B has a large collection of data, then the within-class scatter matrix S_W has might also huge, which is difficult to handle[9]. However, the fisherface system has an advantage of minimising variations in within each classes and still maximize class separation. Under the ideal conditions the classes are linearly separable this is an advantage of the Linear Subspace technique.

1. The Design system: Face detection system using fishersface method is intended to identify the facial feature by matching the results of its extracted data. The system will determine whether the training image to be tested is predictable properly or not.

2. Process Design: This steps used to accumulate data in the form of face image. Collection of samples images is created with face image. The position of the face is critical so facing is in the direction of the front and upright position and not covered by other objects.

3. Image Processing: This part has two stages Image preprocessing stage and Image processing stage which includes feature extraction and recognition.

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- Image Preprocessing: The set of images needs to go through the process of preprocessing first. Image acquisition and RBG image conversion to grayscale are included in this stage. Utilizing a camera, capturing images of faces. This acquisition's image has a size of 90 x 110 pixels and is a 24-bit RGB JPG file. Acquisition face image conversion from RGB to .pgm format, 35 x 35 pixels, 8-bit grayscale. Additionally, the face data is split in two, with one portion serving as a training image for the training dataset and the other as a test image for the testing dataset.
- Image Processing: In the image processing stage, Fishersface technique is apply to produce scattering vector from face image database and then match up to with vectors of training image. The euclidean distance formula is used to compare Features with test image.

4. Reognition process: If both training images and testing images are same. In this case system will effectively recognize test image accurately upto 100%.The test image and training image must be of same person. System will now effectively recognize test image accurately upto 90%.

III. CONCLUSION

Face identification with fisherface technique not only capable of performing the test face images with different color components of the training image and a sketch of the original image. This technique is immune to blurring effect on the image and also for light variation in face . Here, most of the images that fails in detection are caused by scaling factors and poses. scaling factor can be fixed by using better image scaling, and pose problem can be remove by collecting more training images with different poses. We have also checked statistical and theoretical aspect of the different statistical approach face recognition algorithm (Eigenface, Fisherface and Elastic Bunch Graph Matching).

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