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PCA BASED FACE SKETCH SYNTHESIS USING EIGEN TRANSFORMATION

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ABSTRACT:

A face recognition system is based on face sketches, shape and texture information in a facial image. Therefore, automatically searching through a photo database using a sketch drawing is very useful. It will not only help the theft issues to locate a group of potential suspects, but may also help the witness and modify the sketch drawing of the suspect interaction based similar retrieved image. The proposed system contains two elements: Pseudo-sketch synthesis and Sketch recognition. The pseudo-sketch generation method is based on local linear preserving of geometry between technical image and sketch images, which is inspired by the locally linear embedding techniques. The new approach of the Facial image can be reconstructed from Eigen faces in the PCA representation. Since Eigen face is computed from the training set, the reconstructed facial image can also be expressed as the linear combination of training samples. The proposed the Eigen transformation algorithm for Principal component analysis (PCA). This method provides a powerful tool for data analysis and pattern recognition which is often used in signal and image processing as a technique for data compression, data dimension reduction or their de correlation as well, multivariate analysis or neural networks .The high frequency information or intensity can be obtained be test patch and the candidate image patches. This technique reduces the transformation error in recognition.

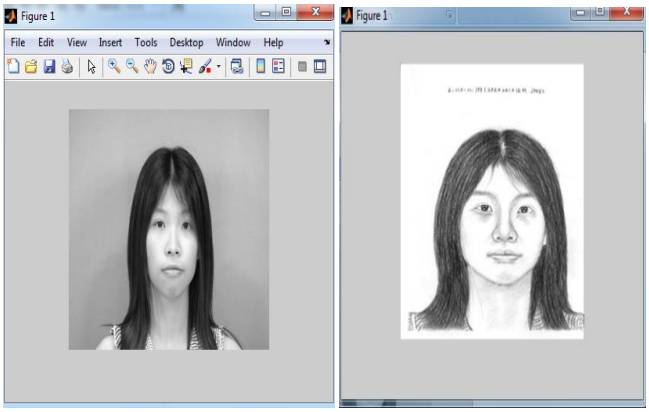
Keywords- Face Recognition, PCA, Neural Network, face photo and face sketch images.

I. INTRODUCTION

Face is a very important part of the human body through which and individual can be identified. The Face is a primary focus in the society and it plays a major role in conveying identity and emotions of an individual. Other than identical twins every individual has unique facial features. Facial recognition is a form of computer vision which uses human faces to attempt to identify an individual or verify a person's claimed identity. Face Recognition has become an important issue in many applications such as security systems, credit card Verification, criminal identification etc. Even the ability to merely detect faces, as opposed to recognizing them, can be important. To recognize a face sketch through photo database, it is necessary to reduce the modality difference between face photos and face sketch images. Every face recognition system need to perform mainly three subtasks: face detection, feature extraction and classification. But face sketch recognition

system through face photo database need to perform mainly four subtasks: face detection, modality reduction, feature extraction and classification.

Developing a computational model of face recognition is quite difficult, because faces are complex, multi-dimensional visual stimuli. Therefore, face recognition is a very high level computer vision task, in which many early vision techniques can be involved. In Face recognition, there are two techniques-verification and identification. During verification the system compares the individual with who say they gives the decision yes or no. and in Verification the system compares the individual with all other individual present in the database and gives the ranked list matches. This technique will gives introduction about literature analysis, how the system will work, working of PCA algorithm, working of Neural N/w system, comparison of PCA & NN, & Result of the system.



Every face has numerous nodal points that make up facial features .Some of the features measured by the software are

1. Distance between the two eyes

2. The shape of the cheek bones

3. Eye socket's depth

4. Jaw line"s length

5. Nose width

These nodal points are measured creating a numerical code called Face Print and is stored in the data base as a face representation.

Regardless of any specific method, face recognition compromises of five steps

1. Acquiring the image of individual face using digital scan of a photograph or live picture of the individual.

2. Location the face in the image

3. Analysis of facial image according to nodal points and creating a face print

4. Comparison of face print obtained with all the face prints present in database

5. Declaration of match or no match

This technique is organized as follows. Section 2, lists the survey on previous re-search that is most closely related to the present work and finds out problems. This is followed by a detailed description of the proposed system follows in section 3. Experimental results are presented in section 4.Finally; Section 5 ends the paper with several conclusions drawn from the design and the work with the proposed system.

II. RELATED WORK

There was only limited research work on face sketch recognition because this problem is more difficult than photo-based face recognition and no large face sketch database is available for experimental study. Methods directly using traditional photo-based face recognition techniques such as the eigen face methods [3] and the elastic graph matching methods [4] were tested on two very small sketch data sets with only 7 and 13 sketches, respectively. In [5] [6], a face sketch synthesis and recognition system using Eigen transformation was proposed. In [7] proposed a nonlinear face sketch synthesis and recognition method. It followed the similar framework as in [5] [6]. The drawback of this approach is that the local patches are synthesized independently at a fixed scale and face structures in large scale, especially the face shape, cannot be well learned. In [8], [9] proposed an approach using an embedded hidden Markov model and a selective ensemble strategy to synthesize sketches from photos. The transformation was also applied to the whole face images and the hair region was excluded. In [2], proposed a face sketch synthesis and recognition approach based on local face structures at different scale using a Markov Random Fields model. But the drawback of this approach is that it requires a training set containing photo-sketch pairs. In [10], proposed an example-based face cartoon generation system. It was also limited to the line drawings and required the perfect match between photos and line drawings in shape. These systems relied on the extraction of face shape using face alignment algorithms such as Active Appearance Model (AAM) [11]. These line drawings are less expressive than the sketches with shading texture.

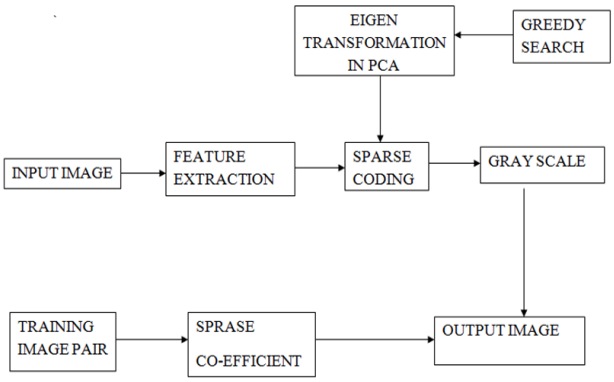
III. PROPOSED WORK

Face Photo Sketch Recognition & Synthesis was proposed for recognizing face in straightforward way. This technique is used to overcome the difficulty of matching photos & sketches in 2 different modalities. Automatic retrieval of photos of suspects from police mug-shot database can help the police narrow down potential suspects quickly. However, in most cases, the photo image of a suspect is not available. The best substitute is often a sketch drawing based on the recollection of an eyewitness. Therefore, automatically searching through a photo database using a sketch drawing is very useful. It wills not only help the police to locate a group of potential suspects, but also help the witness and the artist to modify the sketch drawing of the suspect interactively based on the similar photos retrieved. The key objective for sketch-based face photo recognition is to reduce the difference between the two modalities i.e. to bring photo & sketch into same mode so that recognition process become easier. It can also be used in many other fields where photo is not available but we can describe the details of the photo. This method significantly reduces the difference between photo and sketch. We show that the synthesized sketch by the any of this method transformation is a good approximation to the real one when the transformation procedure can be approximated as linear.

IV. SYSTEM BLOCK DIAGRAM

System Block Diagram for face recognition using PCA is as shown in fig. In to this architecture we convert data base photo in to sketch by using PCA algorithm (by using above steps).Then this sketch is converted into train sketch. The Train sketch is then compare with sketch drawn by the Artist. Then find out the maximum match that will be our result.

The working of PCA algorithm proceeds as follows. Initially, faces from database are selected one by one then face Image is removed from photo excluding background detail. Then face image is converted in to sketch, by using PCA sketch is then converted in to Eigen Face by considering the intensity of image. In this way average of all Eigen face is find out. Now convert artist sketch in to Eigen face & mix it with average of all faces from databases. Now find out the maximum match of two faces which will be the output. Here sketch is converted in to Eigen face which is then compare with the sketch which is generated from photo from the criminal record of police. The face region is divided into overlapping patches. During sketch synthesis, for a photo patch from the face to be synthesized, to find a similar photo patch from the training set and use its corresponding sketch patch in the training set to estimate the sketch patch to be synthesized. Underlying assumption is that, if two photo patches are similar, their sketch patches should also be similar.



V. PRINCIPAL COMPONENT ANALYSIS

Principal Component Analysis is a technique used for pattern recognition and signal processing in data reduction and feature extraction. The main aim of PCA is to find set of orthogonal components to minimize error in the reconstructed data. The pattern often contains redundant information, hence it has to be mapped to feature vector to get rid of redundancy and yet preserve the intrinsic features of the pattern. A 2-dimension face image with size N × N can also be considered as one dimensional vector of dimension N2. An ensemble of images maps to a collection of points in this huge space. Images of faces, being similar in overall configuration, will not be randomly distributed in this huge image space and thus can be described by a relatively low dimensional subspace. The main idea of the principle component is to find the vectors that best account for the distribution of face images within the entire image space. These vectors define the subspace of face images, which we call "face space". Each of these vectors is of length N2, describes an N × N image, and is a linear combination of the original face images. According to mathematics, Eigen faces are the principal components of the distribution of faces, or the eigenvectors of the covariance matrix of the set of face images. To represent the different variations in faces we use Eigen vectors. Each face can be represented exactly by a linear combination of the Eigen faces. It can also be approximated using only the "best" eigenvectors with the largest Eigen values. The best M eigenfaces construct an M dimensional space, i.e., the "face space".

VI. CONCLUSION

In this technique, the proposed system has a novel method to recognize a face sketch, based on modality reduction. This is different and difficult than face photo recognition because faces are much different from sketches in terms of color, texture, and projection details of 3D faces in 2D images. To recognize a face sketch image through face photo database, first brought training set and testing images towards the new dimension and then features are extracted from new dimension images using Principal Component Analysis (PCA).The system has improved with high frequency information to synthesize the final sketch. The experimental results demonstrate the generative, robustness and generalization ability of our presented approach.

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