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MATCHING SKETCHES USING COMBINE LFDA AND INTERACTIVE EVOLUTIONARY MODEL FOR FORENSIC SCIENCE

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Abstract

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The problem of matching a forensic sketch to given image database describe in this paper. There are two types of sketches. The sketched image by simple artist and forensic sketches. These sketches are different in term that they are drawn by a police sketch artist using the description of the person that has made crime provided by a witness who was present at the time when crime occurred. This paper is based on sketch image or face-sketch identification, recognition and synthesis methods based on LFDA (local feature discriminant analysis) extraction method of facial feature. Multiple discriminant projections are then used on partitioned vectors of the feature-based representation for minimum distance matching. LFDA offers substantial improvements in matching forensic sketches to the corresponding face images and we implement this technique for generation of photo with interactive evolutionary model.

I. INTRODUCTION

As biometric technology has been progressed in providing law enforcement agencies, many techniques were used to help in determining the identity of criminals. Along with DNA and evidence present at the place of crime, if a manifest fingerprint is found at an investigative scene or close observation under taken by cop's camera captures an image of a suspect's face, then these clues can be used to determine the guilty person's identity using automated biometric identification. However, in the absence of such clues many crimes can be occur, but instead of an eyewitness account of the crime is available. In such circumstances, a forensic artist is sometime used to work with the witness in order to draw a sketch that depicts the facial appearance of the culprit according to the verbal description. Once the sketch image of the culprit is complete, it is then provided to law enforcement officers and publishes in media with the hopes of someone identified the suspect. These sketches are known as forensic sketches and this paper describes local feature discriminant analysis LFDA for

matching forensic sketches to large mug shot (image) databases maintained by law enforcement agencies. This paper also describes the interactive evolutionary model for generation of photo when the related photo was not available within database.

II. RELATED WORK

Juanjuan Zhong, Xinbo Gao, and Chunna Tian in 2007 discuss the problem of the large geometrical deformations and large difference of texture and grayscale caused by the different generating mechanism and information expressing manner between sketches and photos^[1] for this automatic sketch generating algorithm is based on embedded hidden Markov model (E-HMM) and selective ensemble strategy. Xiaogang Wang and Xiaoou Tang, discussed synthesize of sketch/photo images, with the divided face region^[2] multiscale Markov Random Fields (MRF) model is used. Yong Zhang, Christine McCullough, John R.Sullin An eigen face method based on the PCA was used in computer evaluations of hand-drawn sketch and probe sketch. direct combined model (DCM) algorithm^[4] gives

automatic facial sketch synthesis system. Nannan Wang, Xinbo Gao. Dacheng Tao 2011 discuss the issue in order to improve the quality of the synthesized images^[8]. Direct sketch-photo identification achieves a low accuracy using traditional face recognition algorithms.

III. PROPOSED PLAN OF WORK

A) Local feature-based discriminant analysis and interactive evolutionary model framework.

To handle the combination of a large feature size and small sample size, linear discriminant classifiers called LFDA is proposed. LFDA is designed in such way with combination working with feature descriptor, and which gives the high recognition accuracy.

In the LFDA framework, each image feature vector is first divided into "slices" of smaller dimensionality, where slices correspond to the concatenation of feature descriptor vectors from each column of image patches. Next, discriminant analysis is performed separately on each slice.

To train the LFDA, use a training set which consisting of pairs of a corresponding sketch and photo of n subjects, which are then training classes. In the first step of LFDA is to separate the image feature vector to slices. Patches on the image can be identified by SIFT and MLBP descriptor whole process will slices total image into N patch column.

Next, dimension of each training slice reduced by using PCA by grouping all patch vectors into slices. Similar process will be performed on each photo of database as training sample and known as local featured training. With these local featured trained samples matching of sketches and photos performed using nearest neighbor method based on concatenate slices of both sketch and photo. Normed distance between LFDA representation of sketch and photo is used to select the minimum difference between database photos to forensic sketch.

This framework is to analyze the feature of given sketch and photo to match with each other. However this technique not useful to matching sketches when its database is not present.

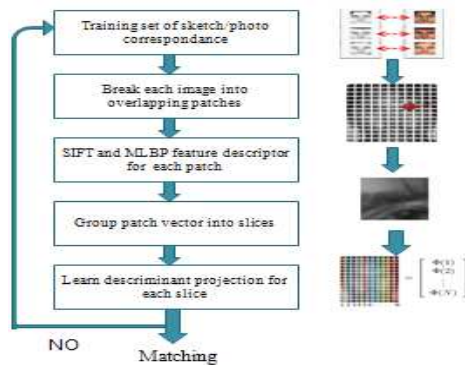


Fig.1 local feature based discriminant analysis framework.

B) Interactive evolutionary model

This technique is interactive evolutionary model. Proposed mechanism can be shown as follows:

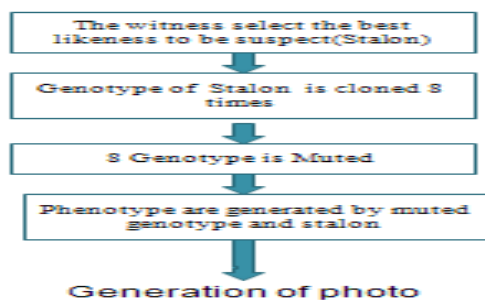


Fig.2 Interactive evolutionary based model

This technique will generate photos from the sketch and which is interactive based method. This method that allows witnesses to determine the optimal vector of appearance model parameters that can be

used to construct a suitable likeness to the target face.

Genetic algorithm design for the task has been termed as select, multiply and mutate (SMM).

This algorithm has been working as follows:

1. An initial population of faces is presented to the witness via a graphical user interface.
2. The witness *selects* the phenotype that exhibits the best likeness to the suspect - the *fittest* face, labeled the *stallion*.
3. The genotype of the stallion is cloned (*multiplied*) eight times.
4. Each of the eight genotypes is *mutated* by making random changes to the genetic material (appearance model parameters).
5. The eight mutated genotypes and the stallion are then placed into an array.
6. Phenotypes are generated and displayed to the user for rating.
7. Steps 1 to 6 are repeated until the witness is satisfied. They could not generate a better likeness to the suspect.

The above algorithm will generate photo of the suspects which is more likely to it.

C) Combine LFDA and Interactive Evolutionary Model

Proposed plan of work is to combine both the models of LFDA (local feature discriminant analysis) and Interactive evolutionary model.

This technique will solve problem of matching those sketches whose database is not available. First LFDA module matches the sketch with whole database and finding those photos which is nearly similar.

Secondly, next module will process that photo with interactive evolutionary model as explain in section B with SMM algorithm and generating suspect's image with more accuracy.

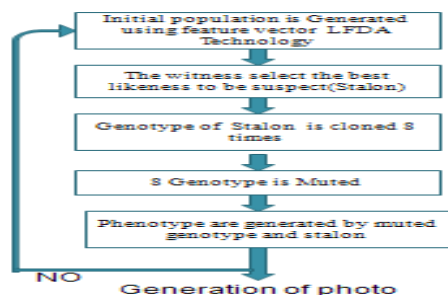


Fig.3: Combine LFDA and Interactive Evolutionary Model

IV. CONCLUSION

This paper presents matching forensic sketches with photographs. Key contributors in this paper is LFDA and interactive evolutionary based model for generations of the photographs of those sketches whose corresponding photographs are not available while matching with the given database. This paper combine two framework that will solved the problem to find the accused photographs whose database is not available within the law enforcement agencies.

V. ACKNOWLEDGEMENT

This is an M-Tech project and work is under development, under the guidance of Mrs. T.K. Khan. Expected outcome of this proposed technique used to generating images of those sketches whose corresponding photos is not available within the database maintained by law enforcement agencies.

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