ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

Face sketch photo synthesis

Shweta Gandhi, Dr.D.M.Yadav
JSPM'S Bhivarabai sawant Institute of technology & research
Electronics and telecom.dept, Wagholi, Pune

Abstract*—Face sketch to photo synthesis has attracted increasing attention in few years .This system of generation of photo from a sketch and sketch from photo have wide applications in digital entertainment , law enforcement and animation procedure. This system works on patch level. All the images are divided into patches. A probabilistic model is designed to synthesize the sketch/photo patch from photo/sketch patch using training photo-sketch paires.All the patches are stitched together to generate the sketch/photo.

***Index Terms*—sketch-photo synthesis, probabilistic model, training patches.**

I. INTRODUCTION

One of the most important applications of the face sketch photo synthesis is in law enforcement. In some of the criminal cases photos of the suspect are not available. In such scenario we need to draw the sketches with the help of artist cooperating the eyewitness.. But there are differences between the actual photo and such sketches drawn by the artists. In such situations if face sketch photo synthesis is used then the task of identifying a criminal will be no longer difficult. Automatic retrieval of the images from police mug shots is critically important in law enforcement.

As it is very difficult to match the photos with the sketches. We need to transform either photo to a sketch or sketch to a photo. We can easily get sketch from a photo as well as photo from a sketch, Sketch–photo synthesis plays an important role in sketch-based face photo retrieval and photo-based face sketch. Photo- based face retrieval is widely applied in many fields, such as access control systems, Internet search engines, and video surveillance. Face sketch synthesis is related in many fields like portrait training, artistic rendering and animation procedure, heterogenious image transformations. The face sketch photo synthesis is done on patch level. All the images are divided into overlapping patches.

II. LITERATURE REVIEW

The paper on Face sketch photo synthesis using EHMM and selective ensemble shows the satisfactory results. There is successful transformation of the sketch to and photo to sketch using the above algorithm. This algorithm first learns the mapping between the photos and the corresponding sketches. This method proves to be good if the relation between the photos and sketches is simple. If the relation between the photos and sketch is complex then this method of face sketch photo synthesis fails. The paper on face sketch photo synthesis using sparse representation there are two stages foe face sketch synthesis. The first step is sparse neighbor selection and the second stage is sparse neighbor enhancement. The face sketch face photo synthesis is done successfully using this algorithm but the quality of image can be further improved by the denoising the pseudo image. Furthermore the paper related on the face sketch photo synthesis using the Bayesian inference, this method have also got the good results but this method transforms the sketch to photo and vise versa for the patches available in the database. If the patch is not matching to available patches in the database then this system fails. This method cannot produce the new patch Work related to face sketch synthesis is still at initial stage. The existing methods can be divided into different categories depending upon different working principles. One of the methods of face sketch synthesis is based upon subspace based methods. This method generally includes linear subspace based methods as well as non linear subspace based methods. There is one of the method based upon the PCA and it is called as Eigen sketch transformation. In this method it is assumed that the source input photo and the target sketch photo share the same projection coefficient. These coefficients are obtained from PCA procedures. There are two types of photos input photo and the target photo, training photos .The coefficients are obtained by the projecting the input photos on the target photos. The target sketch is obtained by the linear combination of the training weighted by the projection coefficients. This method was further improved by separating shape from the texture. The target sketch is obtained fusing the shape and texture using the Eigen transformation. But sometimes the mapping between the sketch and corresponding photo is not linear then synthesis of the sketch is not realistic .Some

ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

deformations near hair region or mouth are included. To overcome this, the images are divided into patches. For the input patch k sketch patches are selected from the training sketch patches weights are calculated my minimizing the least square distance. Finally target sketch is synthesized by fusing all the patches.

The other method is depending upon the sparse representation. The sparse representation have wide application range like image processing, computer vision and pattern recognition. In this method also images are divided into the overlapping patches. There are two dictionaries sketch patch dictionary and the photo patch dictionary. The target sketch patch is obtained by decomposing the input photo on the photo patch dictionary and the target sketch is synthesized by linear combination of the sketch patch dictionary. The method based on the Bayesian inference includes the embedded hidden marcov model. In this method images are divided into the five super states likeforehead,eyes ,nose ,mouth, and chin. Each such state is divided into the sub states It is assumed that the photos and the sketches have the same probability matrix. The model was further improved by dividing images on the patch level.

III. PROPOSED APPROACH

All the above mentioned methods have got good results but they are having some drawbacks. The above methods may obtain the promising results but can result in loss for some data samples. The paper presents one of the method of face sketch photo synthesis. This method takes the images in the frontal pose with neutral expressions and normal lighting into account. All the images are divided into the overlapping patches. To synthesize the sketch from the photo we need to establish the relation between the photos and the corresponding sketches. To model the relation between the photos and the corresponding sketches we need to design the probabilistic model. This model will take into account the relation between the images and the Sketches.

Fig 1: Images divided into patches

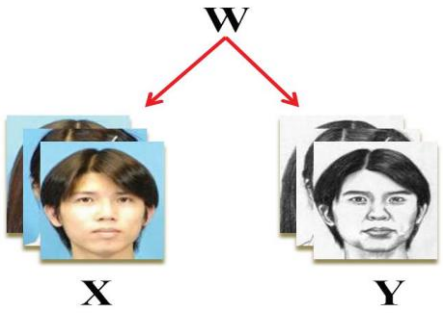

Fig 2: Generative process of photo patches and sketch Patches from hidden parameters.

ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

This model will design the sketch from photo and will reconstruct the photo again. This method will synthesize photo from sketch and sketch from photo. Both the procedures are symmetric. We need the photos and their corresponding sketches as the training database. Let we have N photo sketch pairs as the training set. Let (P^1,S^1) ……(P^N,S^N) where P^i and i=1,2,…….N. These are the N training sketch photo paires.The photo whose sketch we want to synthesize can be called as input photo and denoted by X and its corresponding output sketch Y.We will divide all the images into M patches. We will have training image patches and test photo patches and target sketch patches. We need the probabilistic model which will model the relation between the sketch patches and the photo patches. For the probabilistic graphic model there will be three matrices. The matrix X will denote all training and test photo patches. The matrix Y will contain all the training and target output sketch patches. The matrix W contain the weight vectores.The sketch photo patch pairs are sampled by the joint distribution P(X,Y,Z) and governed by the weight matrix W. In this method we select the k nearest neighbors as the candidate to synthesize the sketch patch. The most time consuming part in face sketch photo synthesis is the neighbor selection. In face sketch photo synthesis we are given the input photo as the test image and the number of sketch photo pairs as the training images and objective is to infer the sketch. In all previous methods the only single pair was selected to synthesize the sketch patch from the training set. But in this method we select k nearest neighbors which have continuous state value. This property allows us to synthesize the new sketch patch which is not available in the training set. This is one of the advantages over rest of the methods.

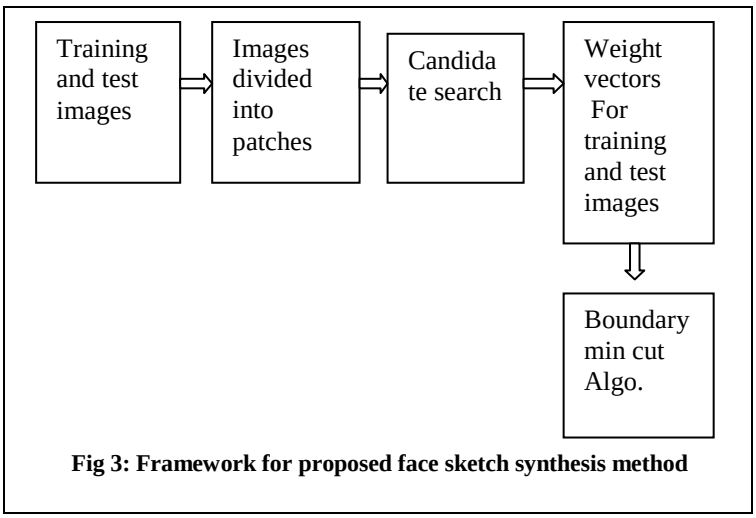

Fig 3: Framework for proposed face sketch synthesis method

Each row of weight matrix W contains the k nonzero elements corresponding to k candidate. We can decompose the update procedure of W into N+1 sub problems each sub problem will be related to patch and its neighboring patches .We need to calculate the weight vectors corresponding to k selected candidates. We will calculate the weight vectors until the convergence and will initialize them to be 1/K..Thus we will obtain the individual sketch patch corresponding to individual photo patch. After getting all the parts of the images we can combine and stitch them together.

IV. RELATED THEORY

Image patching provides the ability to select arbitrary shaped regions on an image and replace them with a surface fit to other arbitrary shaped regions, together with an artificial noise component. This is an ideal way to remove unwanted defects from an image for cosmetic reasons. Images can be divided into two ways .The first way is to divide image into non overlapping patches and other way is to divide image into overlapping patches. In our implementation we need to divide the image into overlapping patches. Further operation of the method is the candidate search. We need to select the candidate patches which are similar to our target sketch or photo patch. The central patch and the all candidates around it are taken into consideration. The quality of the image can be judged by changing the no of candidates. This algorithm have the capacity to create the new patch which is not available in the database by recombining the available patches. The operation of weight vectors depends upon the updating of the weight matrix W. The first values of the rows of the weight matrix will be unchanged but during the implementation we need to change and update the values of rows. We need to do the candidate search till the convergence. Nearest neighbor search is the fundamental computational problem A set of n data

ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

point is given in the d dimensional d space and we need to preprocess these points in such way that the given query point the nearest neighbors can be processed easily.. The cost function is defined in terms of boundary and region properties of the segments. These properties can be viewed as soft constraints for segmentation

V. ALGORITHM

Step 1: Divide the images into patches with some overlap.
Step2: For training sketch photo pairs initialize the K weights to be 1/k and solving atomic quadratic problem will lead to update of weight matrix W
Step3: Initialize the k weights of the test photo patch to be 1/k and obtain the initial target sketch as the linear combination of the patches.
Step4: Update the target sketch patch weight matrix.
Step5: Iterate the target step 3 and 4 until convergence and stitch the target sketch using boundary min cut algorithm.

Fig 4:Top row test photos Bottom row Estimated output sketches

Fig 5:Top row test sketches Bottom row Estimated output photo

ISSN: 2319-5967
ISO 9001:2008 Certified
International Journal of Engineering Science and Innovative Technology (IJESIT)
Volume 3, Issue 4, July 2014

We can randomly choose the sketch photo pairs and implement the face sketch photo synthesis. To assess the quality of the image, it can be compared with the other face sketch photo synthesis algorithms. The FERET database from different organizations can be used to check the quality of the image. The different face recognition algorithms can be used to demonstrate the pros and cons of the proposed approach. We can check the image quality by varying the no of candidates in the search reigion,i.e by changing the K nearest neighbors. The face recognition algorithms can be used to assess the quality of the image but either on all photos or sketches. We can do it in two ways. First transform all the photos in the database to sketches using the proposed face sketch synthesis algorithm and target sketch is identified from synthesized sketches. We can transform all the sketches in the database to photos, and then match the photo to photos in the database so as to identify the person. The different face recognition algorithms like Fisherface, Null-space LDA, Random Sampling LDA etc.

VI. DISCUSSION

The probabilistic graphic model is constructed to map the relationship between the photos and the corresponding sketches .The alternative optimizing method can be implemented to achieve the same results. In optimization scheme the problem is divided into sub problem to achieve the better and faster results. It is estimated that the proposed method will produce the better visual quality image as compared to other face sketch photo synthesis algorithms. The different FERET database and face recognition algorithms can be used for the analysis .The system of face sketch photo synthesis can be applied in face super resolution ,heterogeneous image transformation and facial animation in combination with 3D enhancement. It is also useful in artistic rendering, portrait training and intemodality biometrics and also helps to simplify the animation procedure. In future we can explore the relation between the different methods to achieve the better results.

REFERENCES

[1] X. Wang and X. Tang, “Face photo-sketch synthesis and recognition,”IEEE Trans. Pattern Anal. Mach. Intel., vol. 31, no. 11, pp. 1955–1967 Nov. 2009.

[2] X. Gao, J. Zhong, J. Li, and C. Tian, “Face sketch synthesis using E-HMM and selective ensemble,” IEEE Trans. Circuits Syst. Video Technol., vol. 18, no. 4, pp. 487–496, Apr. 2008.

[3] A. Efros and W. Freeman, “Image quilting for texture synthesis and transfer,” in Proc. 28th Annu. Conf. Comput. Graph. Interact. Tech.2001, pp. 341–346.

[4] X. Gao, N. Wang, D. Tao, and X. Li, “Face sketch-photo synthesis and retrieval using sparse representation,” IEEE Trans. Circuits Syst. Video Technol., vol. 22, no. 8, pp. 1213–1226, Aug. 2012.

[5] R. Vanderbei, “LOQO: An interior point code for quadratic programming,” Optim. Methods Softw. vol. 11, no. 1, pp. 451–484, 1999.

[6] Xiaogang Wang, and Xiaoou Tang, “Face Photo-Sketch Synthesis and Recognition” IEEE Trans. On Pattern Analysis and Machine Intelligence