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Implementation of Heterogeneous Face Recognition using SIFT and MLBP Algorithm

Farinaparveen Khan[1], R K Krishna[2]

Student, Computer Science and Engg, Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, India [1]

Professor, Computer Science and Engg, Rajiv Gandhi College of Engineering, Research and Technology, Chandrapur, India [2]

Abstract: Since few years Face Recognition has become quite popular because of its various applications in several domains. In automated face recognition a very difficult challenge is to compute the facial similarities between face images obtained in alternate modalities. To address this challenge Heterogeneous Face recognition (HFR) implementation is considered. This procedure helps to match the two face images which can vary from infrared image to a photograph like, driver's license, passports, etc. or to a face image from different modalities like infrared images, aged images, etc. In this paper we will discuss how HFR can be implemented using SIFT and MLBP algorithm to extract various image features. The main objective is to extract the different invariance features from heterogeneous images that help to give a correct match between probe and gallery images.

Keywords: Face recognition, heterogeneous face recognition, gaussian, DOG, CSDN, SIFT, MLBP, LDA, KLDA.

I. INTRODUCTION

A series of research has been conducted to offer solutions on several face recognition issues. Several approaches are implemented to synthesize a sketch from photograph or vice versa in Heterogeneous face recognition as once the sketch is converted to a photograph, different face recognition algorithms like SIFT and MLBP helps to perform the matching. The noise from the images can be removed and distinct features of the images can be extracted using the algorithms.

Moreover, Forensic sketches are drawn on the basis of verbal description of eye witnesses and matching it with the gallery can be a difficult task in heterogeneous face recognition because of two important reasons. Firstly, forensic sketches are usually an incomplete portrayal of the individual face and secondly, matching is difficult across image modalities as probe images are sketches and gallery images are photographs. To enhance the accuracy, it is vital to improve the matching performance which can be done using the algorithms.

This paper focus on how to apply face recognition approaches in heterogeneous scenario where image of heterogeneous modalities are matches

This paper proposes the steps and algorithm to achieves

1. Face recognition in high dimension data
2. Reduce number of searches for better result in heterogeneous face recognition

II. FACE RECOGNITION SYSTEM

In recent year, researcher drawn considerable attention in human face recognition. This system compute codes from face image for comparing it with thousand of face, for comparing face we should know basic face looks. There are some nodal points in human face which is landmark we can see while we look into mirror. About 80 nodal points are there in human face. Numerical code can be generated by using this nodal point .face in database is represented by string of numbers which is called as numerical code. This system required only 14-22 nodal points.

Face recognition applications may be very useful for personal verification and recognition it is always been difficult to implement due to all heterogeneous scenario that a human face can be found .there are number of techniques due to the difficulty of the face recognition task.

A. Methods of Face Recognition

Changes in clarification, variability in facial appearance, the presence of accessories because of which the problems occurs in face recognition. On the basis of which it has some method, two of them are □face recognition using eigenfaces□ and □ recognition using line edge map□

A.1 Face Recognition using Eigenfaces

This algorithm encodes the extracted relevant information of the image. For obtaining the variation .a collection of images from the same person is evaluated. Mathematically, the algorithm calculates the eigenvectors of the covariance matrix of the set of face images.

A.2 Face Recognition Using Line Edge Map

A new technique based on line edge maps is describes by this algorithm to accomplish face recognition. In opposition with other algorithms, LEM uses physiologic features from human faces to solve the problem; it mainly uses mouth, nose and eyes as the most characteristic ones. In addition, it proposes a line matching technique to make this task possible.

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III. HETEROGENEOUS FACE RECOGNITION

Heterogeneous face recognition can involve matching between any two imaging modalities, the majority of scenarios involve a gallery dataset consisting of visible light photographs. We are matching the two face images from different imaging modalities. prod image can be of any other modality. The central part of the proposed approach involves using a relational feature representation for face images. We are able to use the kernel tricks, which allow us to generate a high dimensional nonlinear representation of a face images using compact feature vectors by using kernel similarities between a novel face pattern and a set of prototypes. It is very important in various applications such as forensic, airport security, surveiliance where gallery database are populated with photographs but the search images often limited to some alternate modality. Existing system in which only a particular modality of a face images is available for querying a large database visible face image. Such as, when a probe image can only be acquire in night time milieu, use of infrared imaging may be the only modality for acquiring a useful face image of the subject. The existing systems not design to handle face recognition in different scenario.

We are proposing methods to recognize heterogeneous face recognition. The first step in representing face image using feature descriptor is to geometric normalization. Geometrically normalize the face images with respect to location of eyes .this step ease the effect of scale rotation and translation variation. The eye locations for the face images from all modalities are automatically guesstimate using cognitees face VACS SDK. Face image geometrically normalized by

A. Applying planer rotation to set the angle between the eyes to 0 degree.
B. Scaling the images so that the distance between two pupils is 75 pixels.
C. Cropping the image to a height of 250 pixel and width of 200 pixels

After image is normalized. Three different filters apply on normalized face image. i.e Gaussian, DOG, CSDN

1)Gaussian- For image processing application ,Gaussian filter has been used to remove noise .after applying Gaussian filter on probe image we will get the result image.
2)DOG (Difference of Gaussian)- it is based on feature enhancement algorithm that involve subtraction of one blure version of original image from another .a difference of Gaussian image is generated by convolving an image with a filter obtained by subtracting a Gaussian filter of width 1 from a Gaussian filter of width 2 , where width 2 > width 1 .
3)CSDN (Center-Surround Divisive Normalization)- CSDN image is obtained by intersection between center and surround region of receptic field .the CSDN filter divides the value of each pixel by the mean pixel value in the s × s neighbourhood surrounding the pixel.

After applying different filters on probe image respective filter images are found as shown in fig.2, fig.3, fig.4.The image after being filtered by Gaussian filter, DOG, CSDN. The SIFT and MLBP algorithm apply on probe image for feature extraction.

Fig.1 probe image

fig.2 gaussian filter image

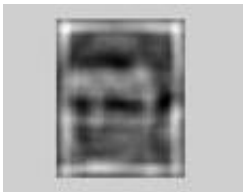

Fig.3 DOG filter image

fig.4 CSDN filter image

IV. SCALE INVARIANT FEATURE TRANSFORM(SIFT)

To detect and describe the local features in the images SIFT algorithm is applied in computer vision. Interesting points of any object in an image can be extracted using the algorithm that helps to offer a feature description of the object which is extracted from a training image and when it comes to locating a particular object in a test image that has many other objects already, the algorithm is useful to identify the particular object easily. SIFT helps to detect and use a good amount of features from the images which decreases errors that can be caused because of local variations. SIFT can powerfully identify the objects among the clutter as SIFT feature is invariant to orientation, uniform scaling and it is partially invariant to illumination changes and affine distortion.
In this paper , utility of SIFT for face recognition under illumination and expression variation has been explored. Feature extracted from probe image (fig.1) by SIFT algorithm is shown in fig.5

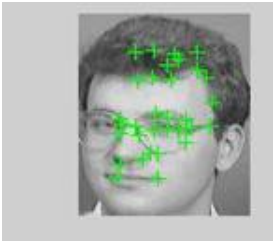

Fig.5 SIFT extraction

V. MULTI SCALE LOCAL BINARY PATTERN (MLBP)

MLBP is a variant of LBP descriptor that helps to improve the face recognition accuracy. MLBP is useful to detect and describe local features of image. Features are

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extracted for each facial component using MLBP and then per component similarity are calculated. Finally, the similarities scores are obtained from the facial components of an individual are fused together resulting in a similar score between a composite sketch and the face photograph. Then using the gender information matching performance is improved filtering large gallery of the mug shot images.

The prior methods were use feature vector to represents the image data to recognize the image from several database .it uses the single prototype for each input image, which effect accuracy of face recognition for different modalities. Here we will presents the method which uses the two prototype images per modality. The method going to use is refer as kernel similarities.

The core of the proposed approach involves using a relational feature representation for face images. By using kernel similarities between a novel face pattern and a set of prototype, we are able to exploit the kernel trick, which allows us to generate a high dimensional, nonlinear representation of a face image using compact feature vectors.

Kernels have the best; they are able to learn non-linear functions while they do so with a reasonable number of training examples. Using a kernel function, we project the data in a higher dimensional feature space that can potentially make the data linearly separable. Thus, the number of training examples is smaller since we use training algorithms similar to those of perceptrons to learn the function F in this feature space. The kernels biggest advantage is that one can use several different kernel functions with the same algorithm, and different algorithm with the same kernel function. we are able to quickly swap them around to run several experiments with little effort.

VI. LINEAR DISCRIMINANT ANALYSIS (LDA)

Fisher Linear Discriminant is also known as LDA that performs face recognition grouping the images of the same class and it separates the ones of different classes. It is a method used in statistics, pattern recognition, machine learning to get a linear combination of the features that separates more classes of events and objects. The result of the combination is used for dimensional reduction before being classified or as a linear classifier.

VII. KERNEL LINEAR DISCRIMINANT ANALYSIS (KLDA)

KLDA technique is the one that considers high order statistics and therefore through non linear mapping input space is first mapped in the feature space and after that principal components are decided in the feature space. For two feature vectors, dot products are computed without understanding or knowing what they are and any algorithm which doesn't use the variables and can be expressed in terms od dot products, the kernel method becomes absolutely helpful to make the non linear versions of it.

The flow of process is like we have to give input image, input image is go through preprocessing where we are removing noise from image and identified additional noise will be remove . Image also get filter by DOG and CSDN .So after identifying image, it will go through SIFT and MLBP feature extraction method .with the help of SIFT and MLBP intersection point on image can be extracted then it is compared with kernel prototype from database and finally we will get exact match and all the similar match image as shown in fig.6.

Fig.6 equivalent image

VIII. CONCLUSIONS

A training set acts as a set of prototype in which each prototype subject has an image in both the gallery and probe modalities. The nonlinear kernel similarity between an image and the prototype will be measure in the corresponding modality. A random subspace framework will be employed in conjunction with LDA subspace analysis to further improve the recognition accuracy.

Result will be compared against a leading commercial face recognition engine.

The use of SIFT and MLBP algorithm in Heterogeneous Face recognition (HFR) plays an important role for getting high accuracy. SIFT helps to extract features from the image and identifies objects in the image easily to get good image accuracy. On the other hand, MLBP local features of the image can be detected and described. For each facial component features are extracted and matching performance is improved on the similarity scores.

LDA on the other hand is feature extraction method which helps to decreases the dimension of the image efficiently and reduces number of variables in face recognition whereas KLDA is the most used approach that derives non linear classifiers intrinsically and it is a better algorithm than LDA as shown in fig.7 on the basis of accuracy.

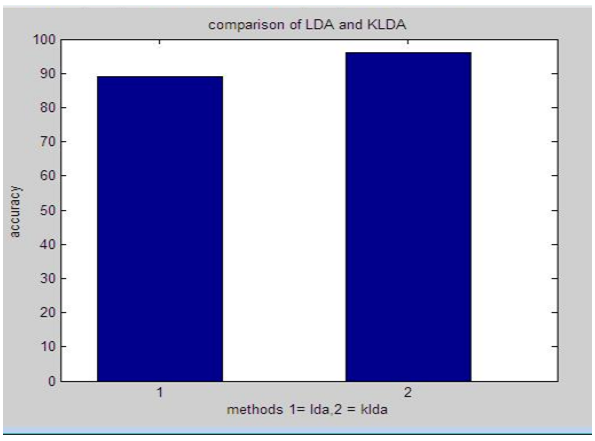

Fig.7 comparing LDA and KLDA

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