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Feature extraction Of Heterogeneous Face images using SIFT and MLBP algorithm

Farinaparveen Khan[1], R K Krishna[2]
[1]*Computer Science, Rajiv Gandhi College of Engineering & Research Technology, Chandrapur, India.*
[2]*Professor, Computer Science & Engineering, Rajiv Gandhi College of Engineering & Research Technology, Chandrapur, India.*

***Abstract*— Humans often use the faces to recognize and similar recognition can enable automatically now by advancement in computing capabilities. The recognition process has now been matured into a science of sophisticated mathematical representation and matching process than early face recognition have been used simple geometric models. Face recognition has received a great deal of attention over the last few years because of its many applications in various domains. The main objective is to extract the distinctive invariance features from the Heterogeneous images that can be use to perform reliable matching between probe and gallery images. The features are highly distinct, so that single feature can be correctly matched with high probability against a large database of features from many images. Initially we remove the noise from the image. To remove the noise present in the image we use three filters. Then to extract distinct features by using SIFT and MLBP.**

***Index Terms*- Face Recognition, Heterogeneous Face Recognition, Gaussian, Difference of Gaussian, CSDN, SIFT, MLBP.**

I. INTRODUCTION

Facial recognition technologies are used in a wide array of contexts, reflecting a spectrum of increasing technological sophistication in today's world. At the simplest level, the technology can be used for facial detection; that is, merely to detect and locate a face in a photo. Current uses of facial detection include refining search engine results to include only those results that contain a face; locating faces in images in order to blur them. A more refined version of facial recognition technology allows assessing characteristics of facial images.

Face recognition has always been a very challenging task for the researches. On the other hand, it has always been very difficult to implement due to all different situation that a human face can be found. Due to the difficulty of the face recognition task, the number of techniques is large and diverse. It is not think that images are always capture in ideal conditions, there may be illumination, pose, and expression variation. Such challenges are more prominent in heterogeneous face recognition. In last decades there were many method developed to tackle such problem.

Almost all face recognition techniques follow same flow of recognition process. Very first capturing image from photos, detectining object as face then feature extraction and last matching against available datasets. If it match with available datasets, the input face image is known else unknown. At each level various algorithms are involve to make recognition process efficient.

In proposed work deals with the recognition of heterogeneous faces. Previously most of research was kept on simple single type of face images. So it only applicable on images captured from same source, not deals with images with pose or illumination variation. Heterogeneous faces are the images captured from different camera source also in varying illumination of light, pose variation. Proposed methods address the different HFR(Heterogeneous Face Recognition) scenarios .There efficiency are then compare to find effect one among them .

This paper discuss the two main levels in face recognition .First is detection of faces in images, denoising using filters, then applying effective feature extraction algorithm. Filtering is used to improve quality of image by removing unwanted noise or clutter. Human face is most expressive part of body, therefore it get used as identification purpose in many applications. The Expression of human face may vary thereby varying face image pattern. This may cause the problem in face recognition. Also it is difficult the classification of collection of such images in high dimensional space. As per recent advance trend in various fields automation of face recognition is becomes important. To make it possible in practical algorithms has vital roles. Here SIFT and MLBP algorithms are proposed for feature extraction.

A. Kernel Method

In past decade a major revolution has been taken place in pattern recognition technology with introduction of mathematical approach .The use of convex optimization and

statistical learning theory has been combined with ideas from functional analysis and classical statics to produce class of algorithms called kernel methods.[10] This book provides the practical evidence for use in application that have made kernel method a fundamental part of toolbox for machine learning, statics and signal processing. The kernel method has provides new insights and new algorithms [10].

The proposed method uses the different algorithm using kernel trick. Proposed method done recognition on matching between a novel face pattern and a set of prototypes, which allows us to generate a high dimensional, nonlinear representation of a face image using compact feature vectors. Therefore matching process of face recognition for heterogeneous face images will minimum with high accuracy.

II. RELATED WORKING

Normally from last decades face recognition has only particular modality of face images for querying a large database. This occurs problem if there are face images from different modalities. So Brendan F. Klare in [2] motivates face recognition from different modalities name as heterogeneous face recognition.[2] Address some HFR (heterogeneous face recognition) scenarios with nonlinear mapping in high dimensional space.

One of the HFR scenario is illustrated in [5].heterogeneous face images are face images captured from varying camera setting or in varying illumination condition or pose variation. Forensic sketches are one of this type.[5] Heterogeneous face recognition can be one with matching of two different images on their features basis or using kernel trick .[5]address the matching of forensics and mug shot photos ,are heterogeneous to each other. Here a feature of one image is match to other for recognition.[5]also contributed two algorithm that are used for face image representation.

[4] Research the demographic information which is study of statics of birth, death, gender etc. can have influence on face recognition. The large gallery were partition into different demographic cohorts. Demographic cohorts were isolated based on gender, race/ethnicity, age etc.[4] had demonstrate six different types of face recognition algorithms (three commercial, two no trainable, one trainable) on these cohorts. On analysis of these algorithms [4] was found that three commercial of the shelf (COTS) face recognition system are black box system that not able to retrain algorithm while only measures the similarity between pair of images. The experimental results in [4] shows COTS FRS performs worse on female, black and younger subjects cohorts than other. It leads to new scenario called dynamic face matcher to improve face recognition accuracy.

[7]A photo-sketch synthesis is one of HFR scenario. The multiscale Markov Random Fields (MRF) model was used in [7] for face photo and sketch synthesis and recognition. They assumes that it is carried under conditions are faces under suited are in frontal pose, have no occlusion, and normal lighting and neutral expression. In Multiscale Markov Random Fields (MRF) model face image are dived into overlapping patches for learning. Then either transferring face photo to sketch or sketches to photo to reduces difference between them their by allowing effective face recognition.

[6] Face recognition under different lighting condition is one of difficult task. Previously research had been takes place on this issues. [6] Paper deals with this problem there by enhancing the local texture features. For this purpose it combine strength of robust illumination normalization, distance transform based matching, local texture-based face representations, kernel based feature extraction and multiple feature fusion. It introduce simple and effective pre-processing chain, LTP (Local Ternary Pattern) is more discriminant and less sensitive to noise in uniform regions. [6] Used Kernel Principle analysis for robust feature extraction and use LBP and Gabor filter in combination which more accurate rate than in feature set alone. Experimental results on FRGC-204 data set shows that it halves the error rate, by achieving a face verification rate of 88.1% at 0.1% false accept rate. In pre-processing chain it also discus abut DOG (difference of Gaussian) filter and masking.

Local Binary Patterns (LBPs) is means of summarizing local gray-level structure. [3]The LBP algorithm found to be performing well against pose and illumination variation.LBP takes a local neighbourhood around each pixel, thresholds the pixels of the neighbourhood at the value of the central pixel. And consider result as binary-valued or decimal number. Then histogram of each image patch is use as a local descriptor [6][3].LBP was originally define for 3×3 neighbourhood pixels, which then gives 8 bit integers value. [3]MLBP (Multiscale local binary pattern) is extension of LBP operator. MLBP encodes not only microstructure but also macrostructures of image patterns. Hence Provides more complete image representation than LBP .In some challenging facial datasets, it require improved facial feature classification for better performance. In such cases MLBP proven to improve the recognition performance.

The most commonly used algorithms which uses appearance based approach are PCA(principal component analysis) and LDA(Linear discriminant analysis).[11]discuss the PCA and LDA also their compatibility with databases.[11] analysed performance of PCA v/s LDA .Images of n×m pixels is represents by vector in n*m dimensional space. This space is very large in practical to permit robust and fast recognition. The solution of this problem is to use techniques of dimensional reduction. Principal component is one sophisticated technique that uses mathematical principals of

transformation for conversion of number of correlated variables into smaller number. This process is actually reduction process so the called Principle component analysis.[9]had been discuss about the LDA as another dimensionality reduction algorithm.

The basic difference between PCA and LDA is former deals with the data in its whole for principle component analysis and latter deals with the discrimination between classes [11]. [8]Projection of most descriminent information of face is main aim of LDA.[11][8] found that LDA perform better than PCA for large database.[10]But also surveys that for nonuniformly sample data PCA outperform than LDA .If for high dimensional feature spaces the distribution is complex [9] purposed a kernel approach for LDA i.e. KLDA.The use of KLDA were results more better and feasible to solve pose and illumination problems. The kernel approach has limitations that are selection of parameter of kernel and kernel function .Improper selection may affect KLDA performance.

[9] This paper introduce facial extraction of images using kernel approach in PCA[11].[9] reduce error rate to 2.5% from experimental results.

Recently face recognition becomes automated to cope with advance real time systems. Robustness is very important factor in such cases .It need most effective algorithm for feature extraction to work in variation condition also.[1] address one such algorithm to deal with this problem is SIFT (scale invariant feature transform). SIFT is algorithm use to extract the most peculiar facial features required for mapping in feature spaces.[1]face recognition become automatic now a day by using may face recognition technique like LDA ,PCA. But they may be problematic due to pose variation, illumination variation. This feature descriptor diminishes the interpersonal variation while still maintaining sufficient information for interclass discrimination [1].

III. PROPOSED SYSTEM

A. Applying different filters on input image

Images are often corrupted by random variation in intensity, noise, clutter, illumination or have poor contrast and can't used directly. Solution on this is to use filter which transform pixel intensity value to reveal certain image characteristics such as improves contrast, remove noise. Here in proposed work three different filters are apply on given input image. They are –

- Gaussian filter
- CSDN Filter
- Difference of Gaussian filter

a. Gaussian filter

Images are corrupted by random variations in intensity values called noise due to non-perfect camera acquisition or environmental conditions. Gaussian noise is one type of noise, its intensity values are drawn from Gaussian distribution.

Fig.1: Input Image

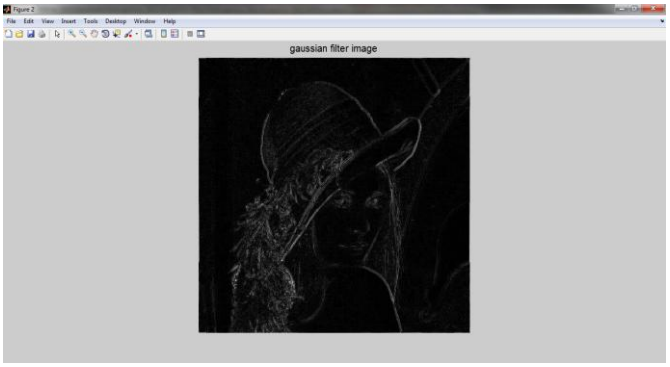

Fig.2: Gaussian Filter

b. CSDN(Centre Surround Devise Normalization)

It is interactions between centres and surround regions of the receptive fields. A constant plus a measure of local stimulus contrast.

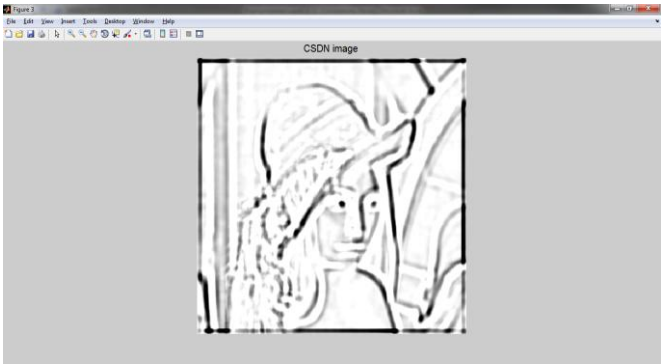

Fig.3: CSDN Filter

c. DOG (Difference of Gaussian)

To improve the performance of face recognition from varying illumination we use DOG which is the feature enhancement algorithm. It subtracts the blur image from less blur image. The main job of this filter is to sharp the edges of image.

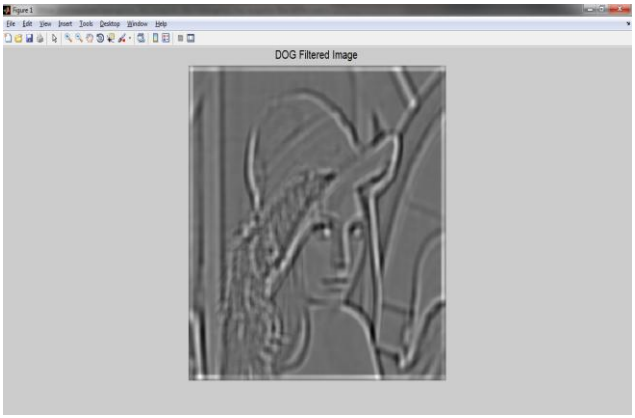

Fig.4: DOG Filter

B. Feature Extraction using SIFT and MLBP

a. SIFT (Scale Invariant Feature Transform):

It is an algorithm in computer vision to detect and describe local features in images. For any object in an image, interesting points on the object can be extracted to provide a "feature description" of the object.

-SIFT Algorithm Step

Step1. Constructing a scale space

To create the scale space first successively blurring is done on original image using Gaussian blur.

Gaussian Blur

$L(x,y,6)=G(x,y,6)*I(x,y)$ (1)

Where, L → blurred image

x, y → Location coordinator

6 → Scale parameter (Amount of blur)

SIFT then takes scale space to next level and resize the original image to half size.

Step2. Laplacian of Gaussian approximation (LOG)

Typical LOG operation involve taking image, blurring it a little, calculate 2^{nd} order derivative. It is good for finding key points in image but cost of computationally intensive. So, better solution is to use DOG. It is great for finding out the interesting key points in image.

Step3. Finding a key points

In this process has iterate through each pixel and check for all its neighbors, Checking is done within the current image and above and below it.

Step4. Eliminates edges and Low Contrast regions

In previous step lots of key points are produce. Some of them lie along an edge, and on they do not have enough contrast. In both case they are not useful as features, so need to get rid of them.

Step5. Assign and Orientation to key points

To provide rotation invariance most prominent orientation in that region are figure out.

The image with SIFT features is shown in fig.5 and fig.6.

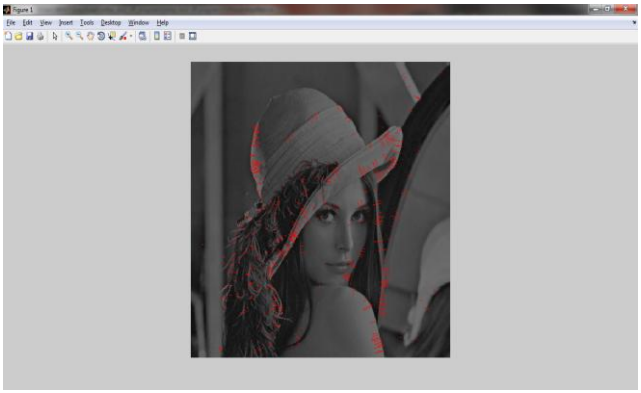

Fig.5: Key points of Image

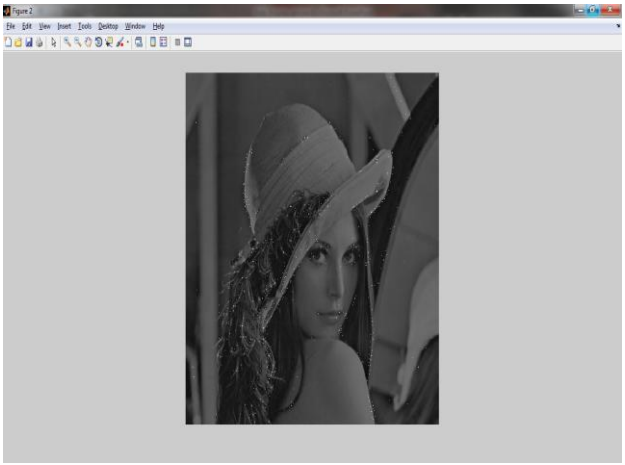

Fig.6: SIFT Features

b. MLBP (Multiscale Local Binary pattern)

MLBP is extension of LBP operator.LBP proved o to powerful local descriptor but inefficient in case of heterogeneous faces. In MLBP size of block indicates scale, yields more robust representation. Besides multiscale representation MLBP encodes not only microstructures but also macrostructures of image pattern and hence provide more

complete image representation than LBP.

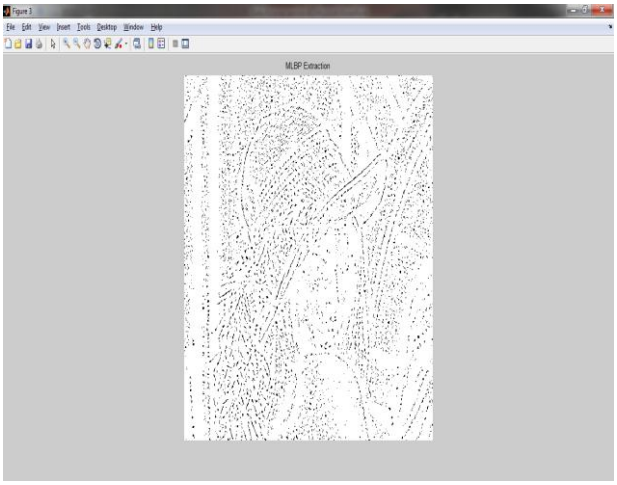

Fig.7: MLBP Features

C. Kernel Prototype representation

In the heterogeneous face recognition challenging task is classification or representation of different face images of various modalities. A prototype representation is shown to approximately maintain the desired properties of the high dimensional kernel space in a more efficient representation by using the kernel trick. In this we will implement the prototype representation in non linear high dimensional space. Also we will take analysis of emerging HFR scenarios. This will increased accuracy and reduce time required for matching probe image with gallery image. In this work we emphasize the fact that kernel methods use a training set of images to implicitly estimate the distribution of the nonlinear feature space.

D. Applying Reconition Algorithm

The recognition algorithm is very important factor of proposed system. In future algorithm which has greatest performance in high dimensional space will choose. At the last matching results will calculate i.e. whether the given input image is match or not.

IV. CONCLUSION

There are many challenges in HFR. Also basic problem is of additional noised, has removed by using three different filters on each new input image. Then it only proceeds further. This improves performance of recognition. To deals with varying conditions such as illumination, pose variation etc. a robust SIFT algorithm is used. MLBP gives more prominent feature extraction. Both filtering and feature extraction method are help in increasing accuracy of HFR.

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