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IMPLEMENTATION OF CFDA METHOD FOR MATCHING INFRARED AND OPTICAL FACE IMAGE

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ABSTRACT

In the industry the major issue is to match the infrared face images to the optical face images. The difficulty come of the variation between two images which is refers as modality gap. This is occur because of the infrared image taken by inferred imaging device and optical image taken by optical imaging device. Effective method is use to reduce the modality gap in the images. The method is Common feature discriminant analysis. This method increases infrared-optical face recognition performance. Method provides result in two steps in which it extract first the common features from infrared face image and optical face images. In the Second step get the final result applied to resulting features.

KEYWORDS: Heterogeneous Face recognition, Infrared face, Face descriptor, Face recognition.

INTRODUCTION

Traditionaly optical imaging devices need suitable brightness surroundings to work suitably, which is difficult to complete suitably in useful face recognition uses. To fight low illumination at darkness, devices captured the inferred images have been commonly practical to many automatic face recognition (ARF) systems. The assignment of infrared-based ARF systems is to equal a probe face image captured with the infrared imaging device to a gallery of face images captured with the optical system access authentication, automatic face recognition has involved more devotion in recent years. Recognition results can be corrected in uncertain cases by people without extensive training face recognition systems are more effective to use.

Face recognition supports for the imaging device, which is measured to be a key application of heterogeneous. Human frequently use faces to identify specific and progress in computing capability over the past few decades now enable similar recognition mechanically. Infrared photos are typically

Unclear, low contrast and have different gray distribution. Optical photos are clearer.

An IR image of the human face offerings its exclusive heat-signature. It also can be used for recognition. Due to increasing loads, application areas such as banking, law enforcement, video surveillance and security safety purpose. Identical face images of dissimilar modalities is mentioned to as heterogeneous face recognition. Heterogeneous face recognition is the combination of infrared face images and optical face images.

The significant application of heterogeneous face recognition is to match a probe face image to a gallery of face image by infrared-based ARF system. The probe face images are captured by infrared device and a gallery of face images captured by optical device. The critical issue in heterogeneous face recognition, the face images related with the same person but captured with the different devices might be unequal because of discrepancy between the images which is mentioned as modality gap.

The challenging issue is the modality gap between the infrared images and optical images. Human face recognition shown an important role in application, such as, credit card verification, criminal identification, scene surveillance, security system etc.

(1) (2)

Fig:(1) Infrared Face Image, (2)correspondingOptical Face Image.

An infrared face recognition scheme can work on all-weather conditions. It has no shadow problem. So, infrared face recognition is vigorous research area during last years. The difficulty of infrared face recognition mostly come from the, low resolution, external environment temperature. Face recognition is one of the biometric methods to identify people by the feature of face. And it is very important for many applications such as retrieval of an identity from a database for banking system and, video surveillance, criminal investigations smart cards, entertainment, forensic applications, virtual reality.

Face recognition can be used for verification as well as identification. Face recognition technology is being used to battle identify missing children, minimize benefits, identify frauds, passport fraud. Old-style optical devices have need of proper illumination conditions to work properly, which is difficult to achieve satisfactorily in practical face recognition applications.

RELATED WORK

This section describes the various existing schemes which are compared in this paper:

Brendan F. Klare and Anil K. Jain [3] proposed a method for heterogeneous face recognition. Heterogeneous face recognition (HFR) involves identical two face images from interchange imaging modalities, such as infrared image to photograph or a sketch to a photograph. HFR systems are of huge value in various applications e.g. surveillance and forensics , where the gallery databases are occupied with photographs e.g. passport photographs or mug shot but the probe images are regularly partial to some exchange modality. A generic HFR framework is projected in which probe and gallery images and these images are represented in terms of nonlinear similarities to a gathering of prototype face images.

The prototype subjects it means the training set have an image in image is measured against the prototype images from the parallel modality. The correctness of this nonlinear prototype representation is enhanced by analytical the features into a linear discriminant subspace. Random sampling is developed into the HFR framework to superior handle challenges arising from the small sample size problem. Probe and gallery images are initially filtered with three dissimilar image filters, and two different local feature descriptors are then extracted. A random subspace framework is employed in conjunction with LDA subspace analysis to further recover the recognition accuracy.

Xiaogang Wang and Xiaoou Tang [7] proposed that a novel face photo-sketch recognition and synthesis method by using multi-scale Markov Random Fields (MRF) model. It has three components; given a face photo, first it synthesizing a sketch drawing, and then given a face sketch drawing, synthesize a photo, and penetrating for face photos in the database based on a query sketch drawn by an artist. To combine sketch/photo images, the face region is separated into overlapping patches for erudition. From a training set which contains photo-sketch pairs, the joint photo-sketch model is well-read at multiple scales using a multi-scale MRF model.

A face photo or a face sketch, its sketch or photo can be which learns the face structure across different scales. After the photos and the sketches have been changed to the same modality, various face recognition methods are evaluated for the face sketch recognition task.

Zhi-HuaXie, JieZeng ,Guo-Dong Liu [6] , proposed a novel infrared face recognition method which is based on LBP. An infrared face recognition system work on any weather conditions. There is no shadow problem. Because of this infrared face recognition is an important research area during few years. The main problem of infrared face recognition comes from the outer environment low resolution, temperature. Lots of feature extraction methods are planned for infrared face recognition. Those methods are holistic extraction and local extraction.

The main plan is that mission of face representation and recognition has different criterions. For the full use of the space locations information, the partitioning and LBP histogram are useful to get final features. Based on the principle of separability discriminant, algorithm is proposed, pattern selection (PS) to get the LBP patterns, suitable for infrared face recognition method outperforms the traditional LBP+uniform and PCA+LDA methods.

Zhen Lei,Shengcai Liao, Anil K. Jain [2], proposed a novel for coupled discriminant analysis method to improve the heterogeneous face recognition performance. In this first, for the adequate discriminative information extraction, total samples from different modalities are used to symbolize the coupled projections. And secondly, to improve the generalization ability the locality information in kernel space is included into the coupled discriminant analysis as a constraint.

In the input space, structures of the data transformed kernel space are utilized, provide more result discriminative information for heterogeneous face recognition. Locality constraint in kernel space (LCKS)-based coupled discriminant analysis methods, namely LCKS-coupled discriminant analysis (LCKS-CDA) and LCKS-coupled spectral regression (LCKS-CSR), are offered.

AlirezaTofighi, S. Amirhassan Monadjemi [5], proposed a method to increase the presentation of face detection and recognition systems. First it detects faces after that it recognizes the detected faces. In detection process it used the Gaussian skin color model with skin color segmentation, which is combined with AdaBoost algorithm. To create a rational trade off, between the time complexity and accuracy and extend a high performance face detectio algorithm. It is fast and more accurate. Above algorithms to make an efficient face recognition system with a high recognition rate. For improve the face detection performance, a series of morphological operators used. In the recognition part, first Gabor features extraction is done, then dimension reduction by using PCA, after that feature selection by using LDA, at last SVM based classification. PCA selects features useful in class representation, while LDA algorithm selects features that are efficient for class separability. Combination of PCA and LDA is used for improving the ability of LDA when a few samples of images are offered**.**

It tests the scheme on the face databases. Results of the experiment confirm that system is robust well enough to detect faces in different scales, poses, lighting conditions and skin colors from various races. Also, system is capable to recognize face with less misclassification compared to the earlier methods. Simulation marks explain that system is capable to discover human faces in different lighting conditions, scales, poses, and various skin colors. It has the capability of optimal feature extraction and efficient face classification.

PROPOSED SYSTEM

The proposed system common feature discriminant analysis (CFDA) is used for matching infrared image and optical image. To recognize a face image flow of processes is shown in Fig. 2.

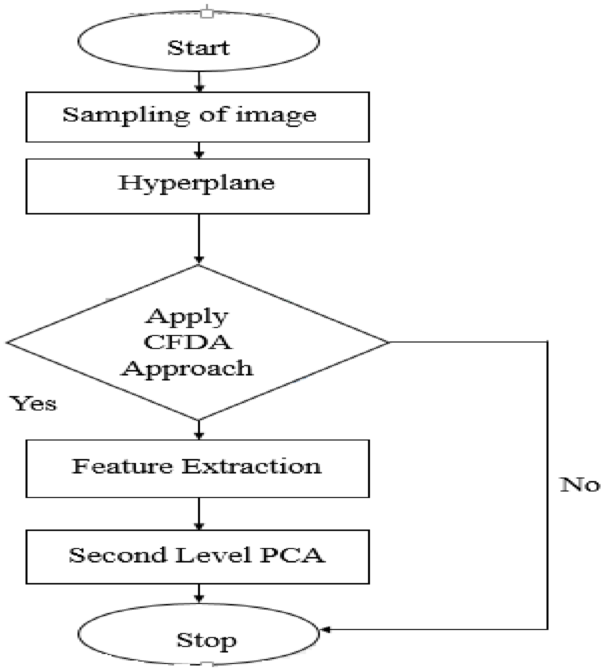

Fig.2 Flow of proposed system

First step is to input the optical and infrared face images, then sampling is done on the images. Sampling provide the quality result because whole image is divided into small samples. Hyperplane based encoding technique is applied on the samples, which provide the encoded images of respective images. Encoded images are important for the purpose of feature extraction. The code of the encoding is very much important for the extraction of features. Once the extraction is over, the next step is to apply second level PCA. It will provide the component analysis. Desire output will be provided by the second level PCA. For the recognition of image, one condition must be follow. If encoding of image is not there then it will stop the process.

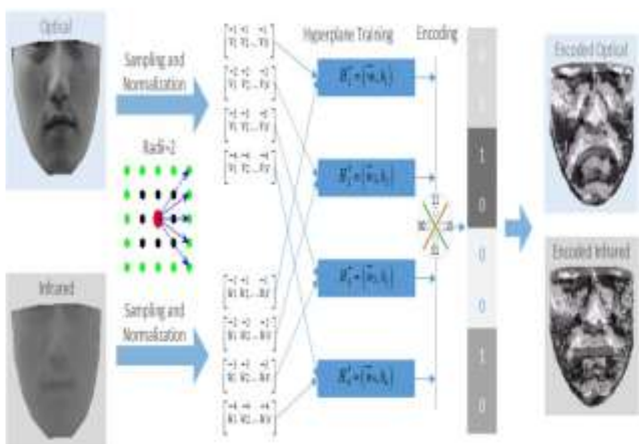

Fig. 3 The Guideline for Extracting Featurs

EXPERIMENTAL RESULTS

Following are the experimental results expected from the proposed system:

Sampling:

For matching infrared image with optical image sampling of both images is done. Because it is not possible to encode the whole image. So first image is divided into pixels and then encoding is done pixel wise. For matching

infrared and optical images provide the parameters such as radii to the images, patch size and step. It is not possible to sampling the whole image or encoding the whole image. For that purpose patches of the images is done.
While computation, by giving radius, patch size and step computation is getting simple.

Fig. 4 Sampling of the Images

Whole image is divided into patches and the patch size is 16.Radii is 5 and step is given as 8 because some main feature should not be left.
First divide the whole image into a set of patches with size 16. Calculate the histogram, of each patch.

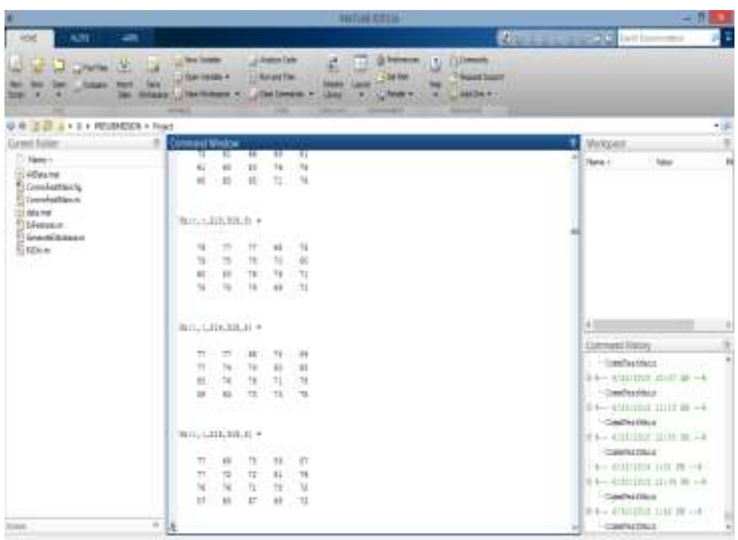

Fig. 5 Histogram of the images.

Histogram of optical image indicate as Ho, which provide the histogram of the optical image. Histogram of infrared image is indicate as Hi.

Hyperplane:

Fig.6 Encoded Images of Infrared and Optical Images.

Design a hyper plane-based encoding method for feature representation for heterogeneous face images. Statistically, a hyper plane divides a feature space into two parts. One is positive part and the other is negative part.

Encoding of the optical and infrared images is done because of the modality gap is reduce. Vector quantization technique is the vector mapping. Encoding is the important in the matching. An image can convert into an encoded image by changing each pixel into a special code.

Encoding of face images by turning each of the pixel into a decimal code.

Feature Extraction:

Fig.7 Extraction of Features

1) Divide the complete encoded image into a set of overlapping patches with size of 16x16 and the step between adjacent patches is 8. This is done because of it is not possible to work on whole encoded image. To convert into a small patches it is provide less chance of mistake. It is provide good results by sampling complete images (optical and infrared).

2) After the patching of complete images the next step is to calculate the histogram. Over each patch of the images. Once the process of calculating of histogram is over, it will produce some code which is frequency of each patch. That code (frequency of patch) which then gives feature vector foe each and every patch.
3) Each patch consist of corresponding feature vector. To obtain final feature vector, concatenate the all feature vectors of all the patches. Long vector will produce desire (final) feature vectors consist of only required or important or desire extracted feature of the encoded images.

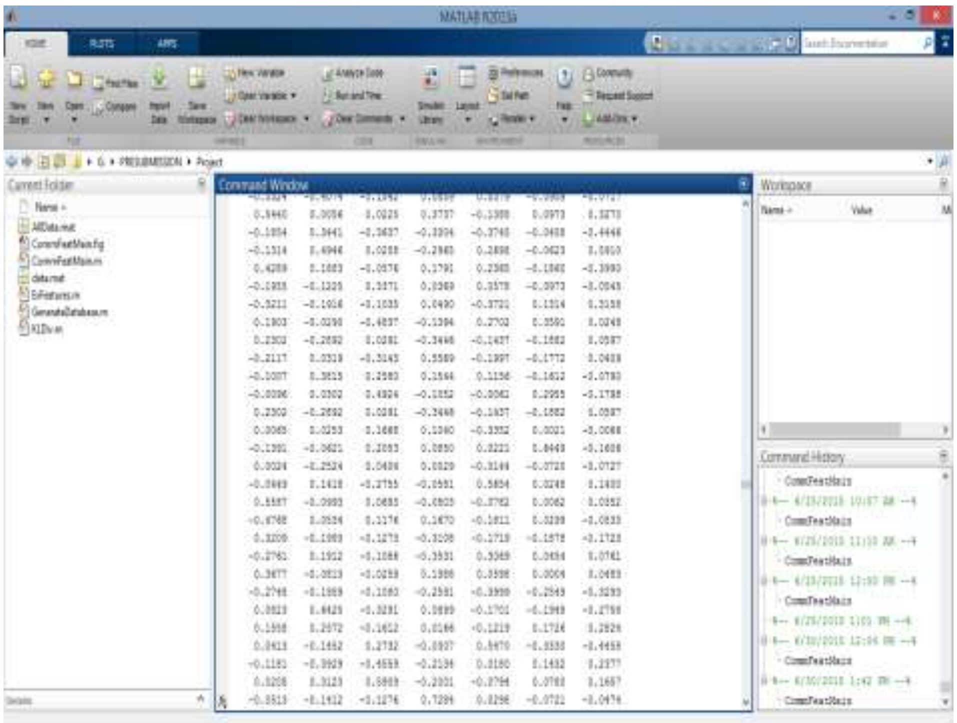

Fig.8 Extracted features in the form of coefficient

Second Level PCA:

Fig. 9 Application of PCA on the images

It involves into two levels of subspace analysis. In the first level, the large feature vector is first divided into multiple segments of smaller feature vectors. To extract the discriminant feature, discriminant analysis is performed individually on each segment to extract the discriminant features.

Bsically two major problems are there:

1) High dimensionality places a huge demand on computer memory.

2) A more serious problem is the lack of sufficiently large datasets to train the high dimensional feature, which leads to over fitting.

In the first level subspace analysis: Divide the feature vector equally into small segments. Project each segment to its PCA subspace using transform matrix that is computed from the corresponding segments in the training set.

In the second level subspace analysis: combine the extracted feature vectors from each segment to form a new feature vector. For the good result redundant information is removed. Redundant information means repeated features which are not require further. It is better to remove, to unload the process. Apply PCA on the final feature vector which is obtained from calculation for the classification.

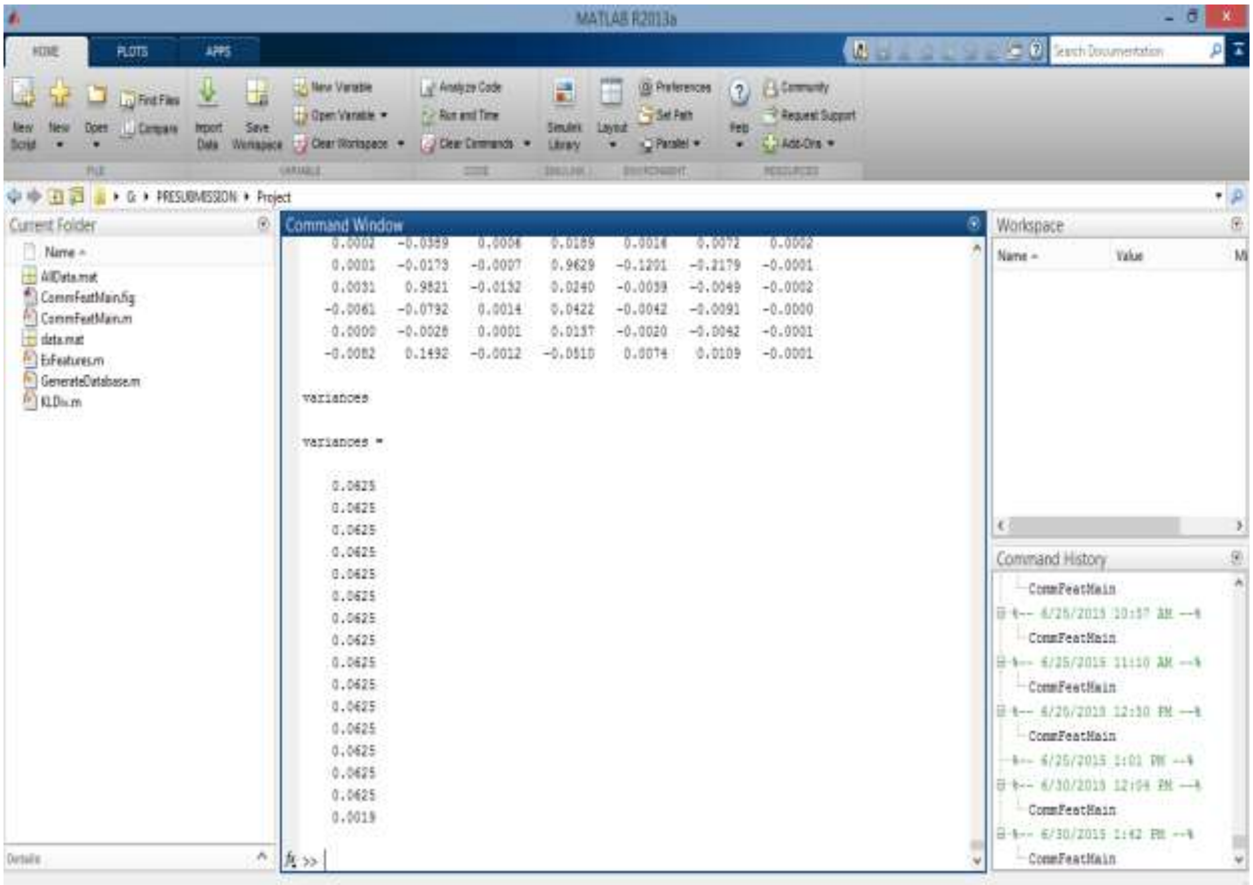

Fig. 10 Component Features in the form of variance

Recognition:

Fig.11 Recognition of the images

In the recognition, it tells about the recognition of the images (optical and infrared) means it indicates the class of the image and similarity between the two images. It is the last step in the proposed system. Once who process is followed i.e. sampling, hyperplane, feature extraction, second level PCA last is recognition.

Generate Database:

To get the result means recognition of images first of all database is load into the generate database to provide the desirable results. Once all the database is store into the generate database, then only it shows the recognition. If database is not load into the generate database it will not perform recognition of images.

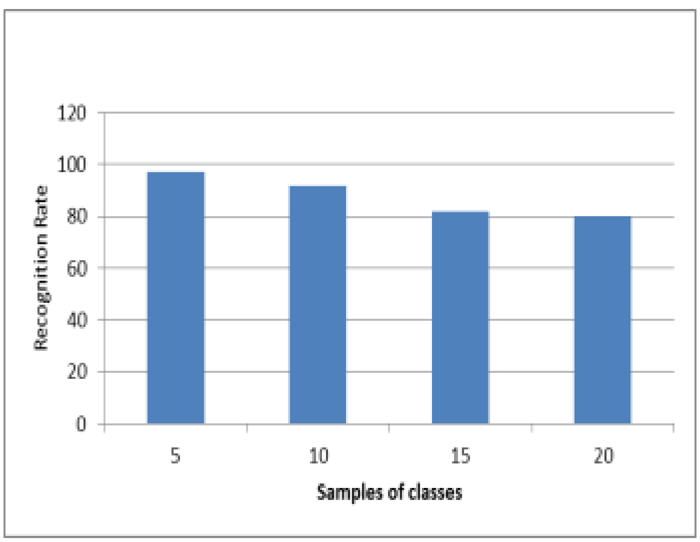

Fig no 12. illustrates the recognition rate

Sr No.	Classes	Recognition Rate
1	Class of 5	97
2	Class of 10	92
3	Class of 15	82
4	Class of 20	80

Table No. 1 illustration of Accuracy of each class.

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