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Review on Common Feature Discriminant Analysis for Matching Infrared Face Images To Optical Face Images

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***Abstract*—In the industry the major challenge is to match the infrared face images to the optical face images. The problem arises of the variation between two images (modality gap). This is because of the infrared image captured by inferred imaging device and optical image captured by optical imaging device. To reduce the modality gap between infrared and optical images one method is use. Common feature discriminant analysis this method improves infrared-optical face recognition performance. This method provides extract the common features from heterogeneous face images, (infrared face image and optical face images). Second matching method is applied to resulting features to obtain final decision.**

***Keywords*— Face recognition, infrared face, face descriptor.**

I. INTRODUCTION

Human often use faces to recognize individual and advancement in computing ability over the past few decades now enable similar recognition automatically. Infrared photos are usually blurred, low contrast and have different gray distribution. Optical photos are cleared than the infrared photos. An IR image can be used for recognition and the human face presents its unique heat-signature. The characteristics of IR images maintain advantages over visible light images, and it is used to improve algorithms of human face recognition in some aspects. IR images are noticeably invariant under extreme lighting conditions (counting complete darkness). The key findings of this research are that IR face images are less precious by changes of facial expression or pose and enable a simple method for detection of facial features Early face recognition algorithms used basic geometric models, but the recognition process has now developed into mathematical representations and matching processes. Due to increasing demands, application areas such as banking, law enforcement, video surveillance and security system access authentication, automatic face recognition has attracted more attention in recent years. Face recognition systems are more effective to use since recognition results can be corrected in uncertain cases by people without extensive training. Face recognition helps for the security purpose. Matching face images of different modalities is referred to as heterogeneous face recognition. Heterogeneous face recognition is the infrared face images and optical face images.

The important application of heterogeneous face recognition is to match a probe face image to a gallery of face image by infrared-based ARF system. In which a probe face image taken by infrared imaging device and a gallery of face images taken by optical imaging device. The big issue in heterogeneous face recognition, the face images associated with the same person but taken with the different devices might be mismatched because of discrepancy between the images which is referred as modality gap. The challenging issue is the modality gap between the infrared images and optical images. Human face recognition plays an important role in application, such as criminal identification, credit card verification, security system, scene surveillance etc.

Fig. 1. Infrared Image and corresponding Optical Image.

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

Face recognition can be used for verification as well as for identification. Face recognition technology is being used to combat identify missing children, passport fraud and minimize benefits, identify frauds. Traditional optical imaging devices have need of appropriate illumination conditions to work properly, which is difficult to attain satisfactorily in practical face recognition applications. To conflict low illumination at nights or indoors, infrared imaging devices have been widely apply to much automatic face recognition (ARF) systems.

II. RELATED WORK

A. Prototype Random Subspaces for heterogeneous face recognition

In this paper, 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 [3].

B. MRF model for photo-sketch synthesis and recognition

In this paper, 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 [7].

C. Infrared Face Recognition based on LBP

In this paper, 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 [6].

D .Coupled Discriminant Analysis for improvement of Hetrogeneous Face Recognition

In this paper, 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 [2].

E. Face Detection and Face Recognition System

In this paper, 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 coior 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 detection 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 [5].

III. PROPOSED METHODOLOGY

In this section, proposed a new method common feature discriminant analysis for matching optical to infrared face images. CFDA method has two techniques, Vector quantization and matching framework. In vector quantization technique,

1. First encode the image
2. Divide encoded image into the patches size c x c
3. Calculate the Histogram over a patch
4. To form final face feature concatenate the outputs of each patch.

CFDA approach, a new descriptor is developed to represent optical and infrared face images to reduce the modality gap. A two-level matching method is useful for fast and effective matching. CFDA method is used to reduce modality gap between two images.

IV. CONCLUSION

In this paper, proposed a method common feature descriminant analysis (CFDA) approach to reduce the great discrepancy between the infrared face images to optical face images. This method is also use for matching infrared face images to the optical face images.. A method will improve infrared to optical face recognition performance.

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