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Review on Image Recognition

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Abstract— Face recognition presents a challenging problem in the field of image analysis and computer vision, and as such has received a great deal of attention over the last few years because of its many applications in various domains. This article surveys forensic face-recognition approaches and the challenges face in improving matching and retrieval results as well as processing low-quality images. Here we propose the novel method to recognize the heterogeneous face recognition. it gives a new way to explore with an image Initially we remove the noise from the image. To remove the noise present in the image we use median filter. The system involves using a relational feature representation for face images by using kernel similarities between a novel face pattern and a set of prototypes. Finally the identified image will be retrieved from the database.

Keywords— Face Recognition, Heterogeneous Face Recognition, Kernel LDA, Kernel PCA, prototype image.

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.

From face recognition surveys it implies that they have face recognition of face images which are of same type. This restricts the face recognition for specific datatype. Such situation can be tackle by using face images of different modality, it refer as heterogeneous faces.

When designing a face detection and face recognition system, in addition to considering the aspects from psychophysics and neuroscience and the factors of human appearance variations, there are still some design issues to be taken into account.

First, the execution speed of the system reveals the possibility of on-line service and the ability to handle large amounts of data. Heterogeneous face recognition using kernel methods concentrate their works on how to speed-up the existing algorithms and how to handle large amounts of data simultaneously.

Second, the training data size is another important issue in algorithm design. It is trivial that more data are included, more information we can exploit and better performance we can achieve. While in practical cases, the database size is usually limited due to the difficulty in data acquisition and the human privacy. In propose technique we can have high dimensional data with increased data size also include some prior knowledge or try to predict and interpolate the missing and unseen data.

In previous technique had problem that how to bring the algorithms into uncontrolled conditions technique. In this research we'll try to combine the existing algorithms and modify the weights and relationship among them to see if face detection and recognition could be extended into uncontrolled conditions.

So, the propose technique refer as heterogeneous face recognition, in which we are matching the two face images from alternate imaging modalities, such as an infrared image to a photograph or a sketch to a photograph. While heterogeneous face

recognition can involve matching between any two imaging modalities, the majority of scenarios involve a gallery dataset consisting of visible light photographs. Probe images can be of any other modality, though the practical scenarios of interest to us are infrared images (NIR and thermal) and hand-drawn facial sketches. The core of the proposed approach involves using a relational feature representation for face images. The fig 1.shows the face images capture by different equipment under different illumination.

Fig 1: Examples of Images for Heterogeneous Face Scenario

Face recognition is mainly use for two primary tasks:

- Verification(one-to-one matching)
- Identification(one-to-many matching)

There are numerous areas in which face recognition can be exploited for these two purposes; some of them are given as follows

- Security (access control to buildings, airports/seaports, ATM machines and border checkpoints; computer/ network security; email authentication on multimedia workstations).
- Surveillance (a large number of CCTVs can be monitored to look for known criminals, drug offenders, etc.
- General identity verification (electoral registration, banking, electronic commerce, identifying newborns, national IDs, passports, drivers' licenses, employee IDs).
- Criminal justice systems (mug-shot/booking systems, post-event analysis, forensics).
- Image database investigations (searching image databases of licensed drivers, benefit recipients, missing children, immigrants and police bookings).

A. Kernel similarity

By using kernel similarities between a novel face pattern and a set of prototypes, 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. The use of a nonlinear similarities representation is found to best suited for the HFR problem because the set of training image from each modality can be used as the prototype, depending on modality of new image, the image from the each prototype is selected from the corresponding modality. In earlier method they needed a two feature descriptor for two HFR, But the propose method need descriptors that are effective in each domain. Therefore matching process of face recognition for heterogeneous face images will minimum with high accuracy. [9] This book provides evidence of practical applications that have made a kernel method a fundamental part of the toolbox for machine learning, statistics, and signal processing practitioners. There had a major revolution taken place in pattern recognition technology with introduction of rigorous and powerful mathematical approaches in problem domain. Kernel method is combination of convex optimization and statistical learning theory with ideas from functional analysis and classical statistics to produce class of algorithms.

FACE RECOGNITION TECHNIQUES

A. Face Recognition from Intensity Images

a. Featured-based-

Feature-based approaches first process the input image to identify and extract (and measure) distinctive facial features such as the eyes, mouth, nose, etc., as well as other fiducial marks, and then compute the geometric relationships among those facial points, thus reducing the input facial image to a vector of geometric features[4]. Then employed standard statistical pattern recognition techniques to match faces using these measurements .

b. Advantages and Disadvantages

- The main advantage offered by the featured-based techniques is that such methods are relatively robust to position variations in the input image.
- The major disadvantage of these approaches is the difficulty of automatic feature detection and any of these techniques has to make arbitrary decisions about which features are important.

B. Holistic

Holistic approaches attempt to identify faces using global representations, i.e., descriptions based on the entire image rather than on local features of the face. These schemes can be subdivided into two groups: statistical and AI approaches.

The simple version of Holistic it represents image as 2D array of intensity value recognition is performed by direct correlation comparisons between the input face and all the other faces in the database. But it is computationally very expensive and sensitivity to face orientation, size, variable lighting conditions, background clutter, and noise. The major part of direct matching methods' recognition performance is that they attempt to perform classification in a space of very high dimensionality. Several other schemes have been proposed to counter this curse of dimensionality, that employ statistical dimensionality reduction methods to obtain and retain the most meaningful feature dimensions before performing recognition. Ex. PCA, LDA.

AI approaches utilize tools such as neural networks and machine learning techniques to recognize faces. In 50 principal components were extracted and an auto-associative neural network was used to reduce those components to five dimensions. In both PCA and Wavelet Transform face extraction scheme, SVM (Support Vector Machine) is used.SVM employed as binary classifiers and the SVM outputs were mapped to probabilities.

These schemes have reportedly yielded promising results for various difficult face recognition scenarios.

C. Multiple Classifier Systems

Since the performance of any classifier is more sensitive to some factors and relatively invariant to others, a recent trend has been to combine individual classifiers in order to integrate their complementary information and thereby create a system that is more robust than any individual classifier to variables that complicate the recognition task. Such systems have been termed as multiple classifier systems (MCSs)[4].

The main advantage of the holistic approaches is that they do not destroy any of the information in the images by concentrating on only limited regions or points of interest. Consequently, these techniques are not only computationally expensive but require a high degree of correlation between the test and training images, and do not perform effectively under large variations in pose, scale and illumination, etc. result of which these approaches appear to produce better recognition results than the feature-based ones in general.

D. Face Recognition from Video Sequences

Face recognition system based on video typically consists of three modules: one for detecting the face; a second one for tracking it; and a third one for recognizing it .Most of these systems choose a few good frames and then apply one of the recognition techniques for intensity images to those frames in order to identify the individual. Ex. Howell and Buxton employed a two-layer RBF network for learning/training and used Difference of Gaussian (DoG) filtering and Gabor wavelet analysis for the feature representation, while the scheme from was utilized for face detection and tracking[4].

The advantage of this scheme is, it provides temporal continuity, so classification information from several frames can be combined to improve recognition performance. Moreover, video allows the tracking of face images such that variations in facial expressions and poses can be compensated for, resulting in improved recognition.

Dynamic face recognition scheme appears to be disadvantages due to low quality image, clutter background, the presence of more than one face in the picture; and a large amount of data to process.

E. Face Recognition from Other Sensory Inputs

The research on face recognition has been focused on identifying individuals from 2D intensity images, in recent years some attention has nevertheless been directed towards exploiting other sensing modalities, such as 3D or range data and infra-red imagery[4].

a. 3D Model-based-

3D Model based recognition system allows us to exploit features based on the shape and the curvature of the face (such as the shape of the forehead, jaw line, and cheeks) without being plagued by the variances caused by lighting, orientation and background clutter that affect 2D systems.

b. Infra-red-

For detecting and recognizing faces thermal infra-red imagery of faces is use because it is insensitive to variations in lighting. Since infra-red facial images reveal the vein and tissue structure of the face which is unique to each individual (like a fingerprint), some of the face recognition techniques for the visible spectrum should therefore yield favorable results when applied to these images.

FACE IMAGE REPRESENTATION

Many methods use vector space structure to represent images. Appearance- based approaches are used to represent an object in terms of several raw intensity images. Feature space is used to project similarity between test view and stored prototypes. Image is represented by using vectors. In some methods of face recognition each face images represents as weighted sum (feature vector) of the eignfaces, which store in 1D array. In the propose work will replace this feature vector representation by kernel similarities.

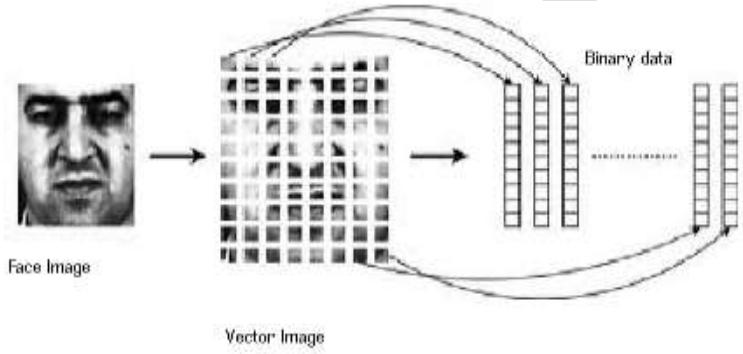

Fig.2. Image Representation

RELATED WORK

Tang et al. spearheaded the work in heterogeneous face recognition with several approaches to synthesize a photograph from a sketch (or vice versa)[1]. Wang initially proposed an eigen-transformation method. Later, Liu et al. performed the transformation using local linear embedding to estimate the corresponding photo patch from a sketch patch. Wang and Tang proposed a Markov random field model for converting a sketch into a photograph. Other synthesis methods have been proposed as well[1][7][9]. In discriminative feature based approach is that once the sketch has been converted into photograph, matching can be performed using exiting face recognition algorithm. So we present the prototype in which no direct comparison between face images in probe and gallery image modality is needed. [1], have been proposed different approaches to HFR.In the prior works used only a single prototype is used per training subject. By contrast, we will presenting the designed for heterogeneous face recognition, which uses two prototype images per subject (one per modality). In earlier work utilized a similar approach that did not exploit the benefit of nonlinear kernels, but did use a separate pattern from each image modality (sketch and photo) for each prototype. The kernel coupled spectral regression by Lei and Li used a similar approach of representing heterogeneous face images as nonlinear similarities to a set of prototypes.

Brendan F. KlareZhifeng Li, and Anil K. Jain, addressed the problem of matching a forensic sketch to a gallery of mug shot images [2].Previous research in sketch matching only offered solutions to matching highly accurate sketches that were drawn while looking at the subject (viewed sketches).A new framework called local feature-based discriminent analysis (LFDA) had been given for identifying forensic sketch. These approaches first represent face images using local feature descriptors, such as variants of local binary patterns (LBPs) [2] and SIFTS descriptors [2].This approach is first used by the Liao et al on NIR to VIS face recognition by processing face images with a difference of Gaussian (DoG) filter, and encoding them using multiblock local binary patterns (MB-LBPs).DoG is use for filtering the large different variable facial features to obtained normalized appearance for all heterogeneous faces.

One of the HFR scenario is matching of forensic to mug shot photos[2].This paper propped feature based approach, which will be successfully give good result for other heterogeneous face recognition scenario.

A. Kernel LDA

One of the traditional method were use for feature extraction is LDA (Linear Discriminent Analysis).

It aims to maximize between class variance and minimize within class variance. On other hand it has problem of sample size with high dimensional face data. So,[6]had been proposed kernel based approach to solve face recognition problem under complex distribution by mapping the input space to high-dimensional feature space.

Jieping Ye, Qi Li, were describes, the most well known technique for feature extraction i.e. LDA (Linear discriminator analysis)[7]. They had been review four important extensions of classical discriminate analysis, including pseudo inverse LDA ,Regularized LDA , PCA+LDA , and LDA/GSVD, which are Preferred for high-dimensional approach.

B. Kernel Principal Component Analysis (PCA)

The second well known method for feature extraction is principal component analysis. In this probe and gallery image must be of same size and must first normalized to line up the eyes and mouth of subjects. The advantage is that, it can reduce the data needed to identify the individuals to 1/100th of the data presented. Although it has disadvantage, that it requires full frontal face to be presented each time.[8]proposed kernel PCA as extension of a PCA. The basic idea of this is to map the input spaces into feature space via nonlinear mapping .Kernel PCA based on principle that since PCA in feature space can be formulated in terms of dot products in same space.

C. SIFT(Scale Invariant Feature Transform)

Scale-Invariant Feature Transform (SIFT) descriptor to form a rejection classifier, which quickly eliminates a large number of ineligible candidate faces from the gallery at an early stage. SIFTs are 2D local descriptors [5] and have been successfully used for object recognition under occlusions. [5], the utility of SIFT for face recognition under illumination and expression variations has been explored. In SIFT feature descriptors, the interpersonal variations between the sketch and photos modality were dimension will still maintaining sufficient information for interclass discrimination.

CONCLUSION

Heterogeneous Face Recognition (HFR) refers recognition of face images captured in different modalities, e.g. Visual (VIS), near infrared (NIR) and thermal infrared (TIR) the concept of prototype images and kernel similarities makes the process effective and efficient to explore a probe image in high dimensional data.

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