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A Markov Random Field Groupwise Framework for Face Recognition

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***Abstract*—** One of the important research area in image processing is face recognition. We introduce a new framework for tackling face recognition problem. Here propose a new way technique of face recognition problem, which is formulated as group wise deformable image registration and feature matching. The main contributions of the proposed method is to suppresses image noise without reducing the image sharpness we will use Median filtering , Each pixel in a facial image is represented by an anatomical signature obtained from its corresponding most salient scale local region Based on the anatomical signature calculated from each pixel, a novel Markov random field based group wise registration framework is proposed to formulate the face recognition problem.

***Keywords* -** Face recognition, group wise registration , Markov random field , Local binary pattern.

I. INTRODUCTION

Automatic face recognition (AFR) plays an important role in computer vision. Its application includes, but not limited to financial security, human-computer interaction, and law enforcement. AFR remains an active yet challenging research topic mainly due to three issues. First, facial expressions of the same person can cause large and deformable motions across different facial images [1], [2].

Second, the image appearances can be significantly altered due to illumination changes [3], [4]. Third, facial images taken under different poses also bring additional difficulty in achieving high recognition rates [5], [6]. Many novel methods have been proposed in the literature for AFR, and they can be broadly classified into two main categories: holistic methods [7], [8], [9], [10] and local feature matching methods [11], [12], [13], [14]. Holistic methods use the whole facial regions as input and derive a salient subspace to analyze the similarity between different facial images. Therefore, the core problem of holistic methods is about how to define the principles and optimization criteria to construct the subspace such that the facial images can be projected to the subspace and their similarity can be measured. For instance, Turk and Pentland [7] used the principle component analysis (PCA), which is also known as ”eigenface” to project the facial images to the subspace with minimum least square reconstruction error. Belhumeur et al. [8] proposed the use of linear discriminant analysis (LDA) to project facial images to the subspace which simultaneously maximizes the inter-class distances while minimizing the intra-class variations. Bartlett et al. [15] proposed the independent component analysis (ICA) to construct the subspace such that higher order pixel-wise relationship can be captured. In order to analyze facial images in the nonlinear high dimensional feature space, kernel based methods were also proposed [16], [17]. In [18], Yan et al. proposed a general graph embedding framework, where different dimensionality reduction and subspace learning methods such as PCA [7], LDA [8],

LPP [19], ISOMAP [20], and LLE [21] can all be reformulated within this framework. Recently, Wright et al. [22] proposed a sparse representation framework for face recognition in the original facial space, and Naseem et al. [23] proposed a linear regression approach for face recognition. Local feature matching methods extract image appearance features from different local regions of facial images, and the extracted features are combined and served as the input to a classifier. It is shown that local feature matching methods generally are more robust to local illumination changes and expression variations [13], [14], [24]. Two representative features used in local feature matching methods are Gabor wavelet [25] and local binary patterns (LBP) [11]. Gabor wavelet can be viewed as bandpass filters which analyze facial images in different frequency bands, with different orientations and scales. LBP is a powerful yet efficient local image descriptor which is originally proposed for texture classification [26] and has been widely extended to other classification problems by different researchers [11], [27]. In recent years, many local feature matching methods were developed based on Gabor wavelet and LBP. For instance, Zhang et al. [12] extracts LBP features from the Gabor filtered responses for face recognition. In [13] and [14], magnitudes and phases of the Gabor filtered responses are integrated with microscopic local pattern features to conduct face recognition. A comprehensive study about the comparison between holistic methods and local feature matching methods for face recognition can be found in [24]. In recent years, there are new methods proposed to model the facial expression process as diffeomorphic transformations [28], [29], [30] to aim the recognition task. For instance, Guo et al. [29] proposed a generative method to model the dynamic facial expression with the diffeomorphic growth model. Moreover, image registration is also served as a possible solution for pose-invariant face recognition problems [31], [32]. In this paper, we propose a new way to tackle face recognition problem, which is formulated as groupwise deformable image registration and feature matching. The basic principle of the

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proposed method is to first construct the common group mean facial image space on the Riemannian manifold, and the similarity among different facial images is compared by warping facial images to the common group mean space. The main contributions of the proposed method are summarized as follows. First, instead of using pixel intensity alone, anatomical features are extracted from each pixel position of the facial images from its corresponding most salient scale local regions. A new salient region detector is proposed based on the survival exponential entropy (SEE) theoretical measure. Second, based on the anatomical signature calculated from each pixel position, a feature guided Markov random field (MRF) groupwise registration framework is proposed to construct the group mean facial image space on the Riemannian manifold in hierarchical manner. Finally, the proposed method is an unsupervised learning method. A preliminary version of this work appeared in [33].

II. RELATED WORK

The major motivation of automatic face recognition work is done by T. Tian, T. Kanade, and J. Cohn,Ying-li Tian, and Jeffrey F. Cohn[2] . Automatic face recognition (AFR) plays an important role in computer vision. AFR is challenging research topic mainly due to three issues. First, facial expressions of the same person can cause large and deformable motions across different facial images [2]. Second, the image appearances can be significantly altered due to illumination changes. Third, facial images taken under different poses also bring additional difficulty in achieving high recognition rates [3], [4]. Turk and Pentland [7] used the principle component analysis (PCA), which is also known as ”eigenface” to project .

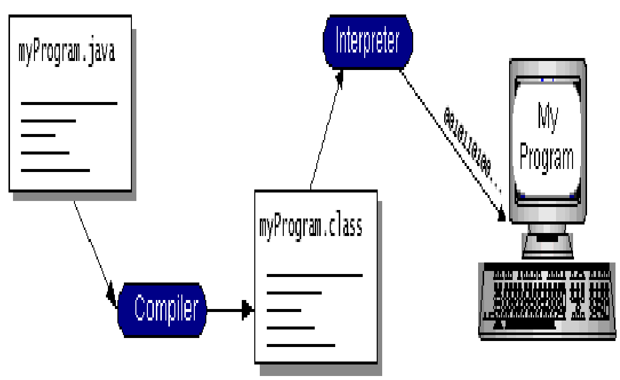

Fig.1 pair wise registration process

In above image first features are extracted then similarity will be compared. Following are some important stages of the proposed work.

III. PROBLEM DEFINATION

We have studied some proposed algorithms in related work. But all these algorithms incur the problem of producing a low face recognition rate. So, recognition rate degrades the performance in terms of execution time and space.

Virtual Machine (Java VM). Every Java interpreter, whether it's a development tool or a Web browser that can run applets, is an implementation of the Java VM. Java byte codes help make "write once, run anywhere" possible. You can compile your program into byte codes on any platform that has a Java compiler. The byte codes can then be run on any implementation of the Java VM. That means that as long as a computer has a Java VM, the same program written in the Java programming language can run on Windows 2000, a Solaris workstation, or on an iMac.

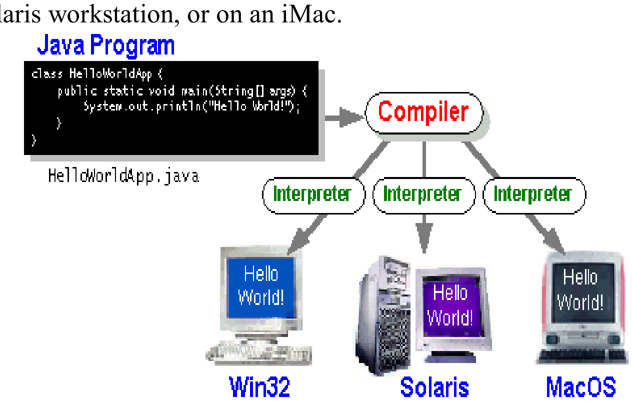

Fig.2 Compiler Design

Native code is code that after you compile it, the compiled code runs on a specific hardware platform. As a platform-independent environment, the Java platform can be a bit slower than native code. However, smart compilers, well-tuned interpreters, and just-in-time byte code compilers can bring performance close to that of native code without threatening portability.

The Java API is a large collection of ready-made software components that provide many useful capabilities, such as graphical user interface (GUI) widgets. The Java API is grouped into libraries of related classes and interfaces; these libraries are known as *packages*.

IV. THE JAVA PLATFORM

A *platform* is the hardware or software environment in which a program runs. We've already mentioned some of the most popular platforms like Windows 2000, Linux, Solaris, and MacOS. Most platforms can be described as a combination of the operating system and hardware. The Java platform differs from most other platforms in that it's a software-only platform that runs on top of other hardware-based platforms.

The Java platform has two components:

- The *Java Virtual Machine* (Java VM)
- The *Java Application Programming Interface* (Java API)

You've already been introduced to the Java VM. It's the base for the Java platform and is ported onto various hardware-based platforms.

The Java API is a large collection of ready-made software components that provide many useful capabilities, such as graphical user interface (GUI) widgets. The Java API is grouped into libraries of related classes and interfaces; these libraries are known as *packages*. The next section, What Can Java Technology Do? Highlights what functionality some of the packages in the Java API provide.

In our software, the active learning algorithm first learns from the Stanford smiley labeled data set as an initial labeled data set. According to this initial model, the algorithm classifies new incoming tweets from the data stream as positive or negative. Tweets, which come from the data stream, are split into batches. The algorithm selects most suitable tweets from a first batch for hand-labeling and puts them in a pool of query tweets. The process is repeated for every following batch and every time the pool of query tweets is updated and the tweets in the pool are reordered according to how suitable they are for hand-labeling. When the user decides to conduct manual labeling, she is given a selected number of top tweets from the pool of query tweets for hand-labeling. The user can label a tweet as positive, negative or neutral. After the labeling, labeled tweets are placed in the pool of labeled tweets and removed from the pool of query tweets. Periodically, using the initial and manually positively and negatively labeled tweets from the pool of labeled tweets, the model is retrained. This process is repeated until it is terminated by the user.

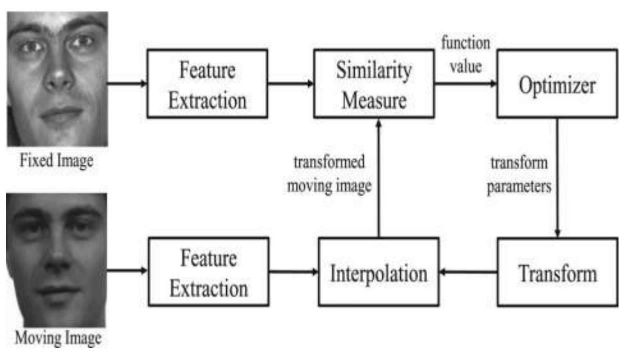

Fig.3 System Architecture

As a result, the exposure of one user's secret key renders all previously obtained ring signatures invalid (if that user is one of the ring members), since one cannot distinguish whether a ring signature is generated prior to the key exposure or by which user. Therefore, forward security is a necessary requirement that a big data sharing system must meet. Otherwise, it will lead to a huge waste of time and resource.

V.ACTIVE LEARNING ANALYSIS WORKFLOW USING SQL SERVER

A database management, or DBMS, gives the user access to their data and helps them transform the data into information. Such database management systems include dBase, paradox, IMS, SQL Server and SQL Server. These systems allow users to create, update and extract information from their database.

A database is a structured collection of data. Data refers to the characteristics of people, things and events. SQL Server stores each data item in its own fields. In SQL Server, the fields relating to a particular person, thing or event are bundled together to form a single complete unit of data, called a record. Each record is made up of a number of fields. No two fields in a record can have the same field name.

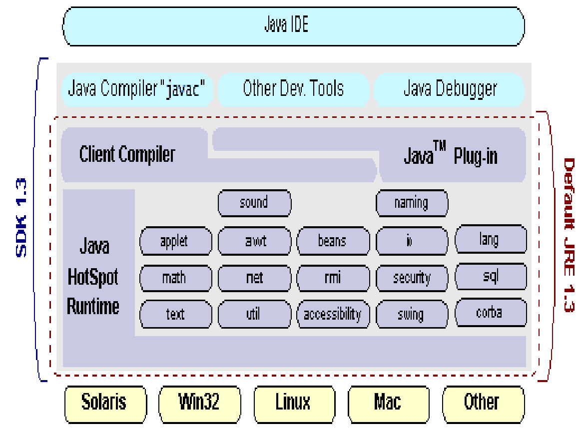

Fig. 4 Our secure and authenticated cloud storage model

TCP/IP stack

IP datagram's

The IP layer provides a connectionless and unreliable delivery system. It considers each datagram independently of the others. Any association between datagram must be supplied by the higher layers. The IP layer supplies a checksum that includes its own header. The header includes the source and destination addresses. The IP layer handles routing through an Internet. It is also responsible for breaking up large datagram into smaller ones for transmission and reassembling them at the other end.

UDP

UDP is also connectionless and unreliable. What it adds to IP is a checksum for the contents of the datagram and port numbers. These are used to give a client/server model - see later.

TCP

TCP supplies logic to give a reliable connection-oriented protocol above IP. It provides a virtual circuit that two processes can use to communicate.

Internet addresses

In order to use a service, you must be able to find it. The Internet uses an address scheme for machines so that they can be located. The address is a 32 bit integer which gives the IP address. This encodes a network ID and more addressing. The network ID falls into various classes according to the size of the network address.

Network address

Class A uses 8 bits for the network address with 24 bits left over for other addressing. Class B uses 16 bit network addressing. Class C uses 24 bit network addressing and class D uses all 32.

Subnet address

Internally, the UNIX network is divided into sub networks. Building 11 is currently on one sub network and uses 10-bit addressing, allowing 1024 different hosts.

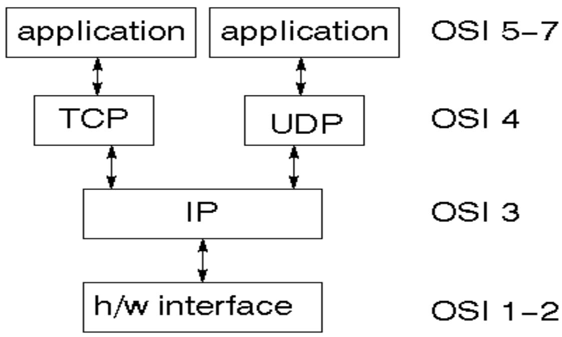

Fig.5 Subnet Address

VI. RESULTS AND DISCUSSIONS

1) Social Cloud Computing

A Social Compute Cloud is designed to enable access to elastic compute capabilities provided through a cloud fabric constructed over resources contributed by socially connected peers. A Social Cloud is a form of Community Cloud

As the resources are owned, provided and consumed by members of a social com-munity. Through this cloud infrastructure consumers are able to execute programs on virtualized resources that expose (secure) access to contributed resources, and disk/storage. I, providers host sandboxed lightweight virtual machines on which consumers can execute applications, potentially in parallel, on their computing resources. While the concept of a Social Compute Cloud can be applied to any type of virtualization environment in this paper we focus on lightweight programming (application level) virtualization as this considerably reduces overhead and the burden on providers; , however the time to create and contextualize VMs was shown to be considerable.

2) Preference based Resource Allocation.

Output Design

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.

2. Select methods for presenting information.

3. Create document, report, or other formats that contain information produced by the system.

3) Input Design

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy.

After getting a siganature ,they can upload our files. The file can be stored in the data center.

VII. CONCLUSION

In this paper, we formulate the face recognition problem as a group wise registration and feature matching problem. A robust salient scale detector based on the survival exponential entropy is proposed to extract the anatomical features from the most salient scales. The deformable transformation space is discredited and represented by the Markov random field labeling framework, which is integrated with the salient anatomical signature of each pixel to drive the registration process. In order to deal with possible large variations between different facial images, a hierarchical group wise registration strategy is proposed. During the recognition phase, each query image is transformed to the template space and compared with the existing training images. Our method has been extensively evaluated on four benchmark databases: FERET, CAS-PEAL-R1, FRGC ver 2.0, and the LFW databases. It is also compared with several state-of-the art face recognition methods. Experimental results demonstrate that our method achieves the highest recognition and verification rates among other methods under comparison, which demonstrates the effectiveness of our method.

REFERENCES

[1] T. Tian, T. Kanade, and J. Cohn, "Recognizing Action Units for Facial Expression Analysis," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 23, no. 2, pp. 97-115, Feb. 2001.
[2] B. Fasel and J. Luettin, "Automatic Facial Expression Analysis: A Survey," Pattern Recognition, vol. 36, no. 1, pp. 259-275, 2003.
[3] A. Shashua and T. Riklin-Raviv, "The Quotient Image: Class Based Re-Rendering and Recognition with Varying Illuminations," IEEE Trans. Pattern Analysis and Machine Intelligence,vol. 23, no. 2, pp. 129-139, Feb. 2001.
[4] X. Xie and K. Lam, "Face Recognition under Varying Illumination Based on a 2D Face Shape Model," Pattern Recognition, vol. 38, no. 2, pp. 221-230, 2005.
[5] Z. Pan, G. Healey, M. Prasad, and B. Tromberg, "Face Recognition in Hyperspectral Images," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 25, no. 12, pp. 1552-1560, Dec. 2003.
[6] V. Blanz and T. Vetter, "Face Recognition Based on Fitting a 3D Morphable Model," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 25, no. 9, pp. 1063-1074, Sept. 2003.
[7] M. Turk and A. Pentland, "Eigenfaces for Recognition," J. Cognitive Neuroscience, vol. 3, pp. 71-86, 1991.

[8] P. Belhumeur, J. Hespanha, and D. Kriegman, "Eigenfaces vs. Fisherfaces: Recognition Using Class Specific Linear Projection," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 19, no. 7, pp. 711-720, July 1997.
[9] M. Zhu and A. Martinez, "Selecting Principal Components in a Two-Stage LDA Algorithm," Proc. IEEE Conf. Computer Vision and Pattern Recognition, pp. 132-137, 2006.
[10] M. Zhu and A. Martinez, "Subclass Discriminant Analysis," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 28, no. 8, pp. 1274-1286, Aug. 2006.
[11] T. Ahonen, A. Hadid, and M. Pietikainen, "Face Description with Local Binary Patterns: Application to Face Recognition," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 28, no. 12, pp. 2037-2041, Dec. 2006.
[12] W. Zhang, S. Shan, W. Gao, X. Chen, and H. Zhang, "Local Gabor Binary Pattern Histogram Sequence (LGBPHS): A Novel Non-Statistical Model for Face Representation and Recognition," Proc. IEEE Conf. Computer Vision, pp. 786-791, 2005.
[13] Z. Lei, S. Liao, M. Pietikainen, and S. Li, "Face Recognition by Exploring Information Jointly in Space, Scale and Orientation," IEEE Trans. Image Processing, vol. 20, no. 1, pp. 247-256, Jan. 2011.
[14] S. Xie, S. Shan, X. Chen, and J. Chen, "Fusing Local Binary Patterns of Gabor Magnitude and Phase for Face Recognition," IEEE Trans. Image Processing, vol. 19, no. 5, pp. 1349-1361, May 2010.
[15] M. Bartlett, J. Movellan, and T. Sejnowski, "Face Recognition by Independent Component Analysis," IEEE Trans. Neural Network, vol. 13, no. 6, pp. 1450-1464, Nov. 2002.
[16] B. Scholkopf, A. Smola, and K. Muller, "Nonlinear Component Analysis as a Kernel Eigenvalue Problem," Neural Computing, vol. 10, pp. 1299-1319, 1999.
[17] C. Liu, "Capitalize on Dimensionality Increasing Techniques for Improving Face Recognition Grand Challenge Performance," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 28, no. 5, pp. 725-737, May 2006.
[18] S. Yan, D. Xu, B. Zhang, H. Zhang, Q. Yang, and S. Lin, "Graph Embedding and Extensions: A General Framework for Dimensionality Reduction," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 29, no. 1, pp. 40-51, Jan. 2007.
[19] X. He, S. Yan, Y. Hu, P. Niyogi, and H. Zhang, "Face Recognition Using Laplacianfaces," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 27, no. 3, pp. 328-340, Mar. 2005.
[20] J. Tenenbaum, V. Silva, and J. Langford, "A Global Geometric Framework for Nonlinear Dimensionality Reduction," Science, vol. 290, no. 22, pp. 2319-2323, 2000.
[21] S. Roweis and L. Saul, "Nonlinear Dimensionality Reduction by Locally Linear Embedding," Science, vol. 290, no. 22, pp. 2323- 2326, 2000.
[22] J. Wright, A. Yang, A. Ganesh, S. Sastry, and Y. Ma, "Robust Face Recognition via Sparse Representation," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 31, no. 2, pp. 210-227, Feb. 2009.
[23] I. Naseem, R. Togneri, and M. Bennamoun, "Linear Regression for Face Recognition," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 32, no. 11, pp. 2106-2112, Nov. 2010.
[24] J. Zou, Q. Ji, and G. Nagy, "A Comparative Study of Local Matching Approach for Face Recognition," IEEE Trans. Image Processing, vol. 16, no. 10, pp. 2617-2628, Oct. 2007.