International Journal of Pure and Applied Mathematics
Volume 116 No. 8 2017, 327-333
ISSN: 1311-8080 (printed version); ISSN: 1314-3395 (on-line version)
url: http://www.ijpam.eu
Special Issue

ijpam.eu

A COMPARATIVE STUDY ON DIFFERENT TECHNIQUES USED FOR FINGER – VEIN AUTHENTICATION

[1]C.Nalini, [2]Shwetambari kharabe
[1]professor, BIST,BIHER,Bharath Univesity , Chennai
Phd Scholar, BIST,BIHER,Bharath Univesity , Chennai
[1]drnalinichidambaram@gmail.com, [2]srkharabe16@gmail.com

Abstract: In today's society the biometric authentication has gaining popularity because it provides a high security and reliable approach for personal authentication. Vein biometrics is one of the emerging techniques over other types of biometric systems due to its strengths of low forgery risk, aliveness detection as well as stable over long period of time. The rapid growth in the field of electronic information technology and its simultaneous deployment in every field, the personal or identity verification is a critical key problem. This paper compares various techniques used for different processes for authentication is described. And also this paper proposed Gradient technique is used in the feature extraction, RANSAC method is used for edge detection. This technique attains higher accuracy in feature matching even with the presence of outliers.
conclude in section 5 and section 6 will provide the references.

1. Introduction

Finger vein authentication is an authentication method using a biometrics technique to identify individuals based on their biological characteristics, and utilizes vein patterns in fingers for the on identification. The method extracts vein patterns from camera images of finger veins that are photographed by having near infrared light beamed onto fingers. Identification is conducted by matching the extracted vein patterns with pre-registered vein patterns[1-2].Vein patterns are complicated, and no one shares identical patterns. Because of this, the method can identify individuals with high accuracy, and so it is increasingly being used in a variety of fields. Moreover[3-4], as veins inside fingers are used for identification, it is extremely difficult to counterfeit or tamper such veins or fraud identification by any third party. As such, the method is expected to realize a high-level of security.

To be identified[5-6], one only needs to hold his or her hand over the equipment. Due to such ease of operation, finger vein authentication is becoming increasingly popular for such applications as room access control and personal identification of automatic teller machines (ATMs) at banks.

The layout of the paper is as follows. In section 2[7-8], we address the above mentioned techniques and also give a brief on the literatures being reviewed for the Section 3, presents a comparative study of the various research works explored in the previous section. In section 4 we explain the proposed system. Lastly, we

2. Literature Survey

[1] The author presented a finger vein recognition algorithm based on gradient-correlation which woks in two parts.
(a) a method based on histogram statistics is given to recognize whether finger vein images or not.
(b) matched filter based on maximum curvature model is adopted to extract the gradient image of finger vein.
(c)then, cross-correlation between two gradient images is figured out to estimate their similarity.

All experimental results show that False Rejection rate (FRR) and False Acception Rate (FAR) are 0.375% and 1.20% respectively. The work presents an algorithm for finger vein authentication. Some steps improve the processing speed, especially suitable for the finger vein authentication system based on DSP. In the later product research and development, we will be dedicated to optimize the pre-processing algorithm, especially reduce the noises caused by light source.

[2]The author proposed a method which is a new texture descriptor called local line binary pattern (LLBP) is utilized as feature extraction technique. The neighborhood shape in LLBP is a straight line, unlike in local binary pattern (LBP) which is a square shape. Experimental results show that the proposed method using LLBP has better performance than the previous methods using LBP and local derivative pattern (LDP).

2.1 Parameters

i) **PHG Feature Extraction**
(a) Partition each image into a sequence of increasingly finer spatial grids by repeatedly doubling
the number of divisions in each axis direction at each pyramid resolution level.
(b) Calculate gray histograms for each grid cell at each pyramid resolution level.
(c) Concatenate all the histogram vectors of all resolution levels to obtain the final feature for the
Image[11-12]. The final feature is normalized to sum to unity.)
ii) **PHT Feature Extraction**
(a) Partition each image into a sequence of increasingly finer spatial grids by repeatedly doubling the number of divisions in each axis direction at each pyramid resolution level.
(b) Calculate LBP for the pixels in each grid cell at each pyramid resolution level. Based on the LBP code, each pixel can be represented by an 8 dimension vector whose values contain 0 and
1. The summation of all the 8 dimension vectors in the grid cell is the corresponding LBP
histograms for this grid cell. For example, a grid cell contains four pixels. The LBP codes of
the pixels are [0,1,1,1,0,1,0,0], [1,1,0,1,0,1,0,1], [0,1,1,1,0,1,0,1], [0,1,0,1,1,1,0,0], respectively.
The LBP histogram of this grid cell is [1,4,2,4,1,4,0,2].
iii) **PHOG Feature Extraction**
(a) Partition each image into a sequence of increasingly finer spatial grids by repeatedly doubling
the number of divisions in each axis direction.
(b) Calculate Histograms of Orientation Gradients (HOG) [32] for each grid cell at each pyramid
resolution level.
(c) The final PHOG descriptor for the image is a weighted concatenation of all the HOG vectors.
The PHOG is normalized to sum to unity.
The author proposed two block selection methods which are based on the estimate of the amount of information in each block and the contribution of block location by looking at recognition rate of each block position to reduce feature extraction time and matching time. The specific approach is to find out some local finger vein areas with low-quality and noise[13-14, which will be useless for feature description. Local binary pattern (LBP) descriptors are proposed to extract the finger vein pattern feature. Two finger vein databases are taken to test our algorithm performance. Experimental results show that proposed block selection algorithms can reduce the feature vector dimensionality in a large extent.

They proposed two block selection methods based on the estimate of the amount of information in each block and the contribution of block location by looking at recognition rate of each block position to reduce the feature dimensionality at the same time keeping the best recognition rate based on two finger vein image databases. According to the experimental results shown, feature vector dimensionality is greatly reduced compared with original feature vector.

[5] In this paper, we first introduces a new and robust approach for finger–vein ROI Localization[15-16], and then proposes a new scheme for effectively improving the visibility of finger–vein imageries. Extensive experiments are finally conducted to validate the proposed method.

The experimental results illustrated that the proposed scheme had a good performance in finger–vein ROI localization and vein enhancement. Moreover, the finger–vein matching results also demonstrated that the proposed method was powerful in improving finger–vein recognition performance.

The eighteen CEs yield an increase in the number of SIFT keypoints that can be automatically detected in a vein image, but also a performance decrease in the case of NN matching of generated SIFT keypoint descriptors in respect to PR and EER.

A new authentication method was proposed, that is based on feature-point matching and is robust against both irregular shading and deformation of vein patterns. Matching of finger-vein images with irregular shading and deformation of vein patterns by the proposed method attained higher accuracy than the SIFT method [19-20]. Experimental results acquired with a database of 676 subjects demonstrate that accuracy of the proposed method significantly improves on that of conventional finger-vein identification methods.extracted patterns robustly when vein width and brightness fluctuated, and that the equal error rate for personal identification was 0.0009%, which is much better than that of conventional methods.

To precisely extract patterns from vein images with various widths and brightnesses, the centerlines of the veins are extracted by calculating the curvature of the cross-sectional profile of the image. An evaluation of the robustness of our method against fluctuations in widths and brightnesses of veins showed that it is far superior to the conventional methods. A further experiment showed that the EER is 0.0009%, which means that the method is very effective for personal identification.

[10] With increase in globalization and standard of living, there has been a steady increase in the use and development of consumer electronics. This calls for the need of convenient, simple, high security authentication systems to protect personal information stored in mobile

devices. With increasing emphasis on security and high complexity of existing biometric systems in time or space or both, automated personal identification using finger-vein biometric is becoming a very
active topic in both research and practical applications. In this paper, we have described and implemented an algorithm for finger-vein recognition system using image processing.

3. Comparison of various techniques

Author Name	Paper Title	Problem Identified	Parameters Compared	Techniques Applied	Result
[1]Lin Chunyi1, Li Mingzhong2, Sun Xiao2	A Finger Vein Recognition Algorithm Based on Gradient Correlation	Finger Vein Recognition	Image Acquisition, Image Discrimination, Gradient Image Extraction, Matching Algorithm	Optical filter , histogram statistics, image grey distribution corresponds with the maximum curvature model	The work presents an algorithm for finger vein authentication. Some steps improve the processing speed, especially suitable for the finger vein authentication system based on DSP
[2] Bakhtiar Affendi Rosdi , Chai Wuh Shing and Shahrel Azmin Suandi	Finger Vein Recognition Using Local Line Binary Pattern	Finger Vein Recognition	Finger Vein Image Acquisition, Preprocessing, Feature Extraction, Matching	A special imaging device, local binary pattern (LBP), local derivative pattern (LDP), Hamming Distance	prototype device indicate that the equal error rate (EER) for the LLBP is significantly lower than the LBP and LDP.
[3]Xiaoming Xi, Gongping Yang , Yilong Yin and Xianjing Meng	Finger Vein Recognition with Personalized Feature Selection	Finger Vein Recognition	Preprocessing, Class Center Construction, Matching	Image gray processing, Averaging of corresponding feature values, Euclidean distances	Compared with PHGTOG, PFS-PHGTOG is not only more effective but also has a lower computational complexity.
[4]Bang Chao Liu,1 Shan Juan Xie,2 and Dong Sun Park1	Finger Vein Recognition Using Optimal Partitioning Uniform Rotation Invariant LBP Descriptor	Finger Vein Recognition	Image Acquisition, Preprocessing, Feature Extraction, Matching	Experimental image database, ROI localization, Denoising, Alignment, Enhancement	feature vector dimensionality is greatly reduced compared with original feature vector.

[5]Jinfeng Yang , Yihua Shi	Finger–vein ROI localization and vein ridge enhancement	Finger–vein ROI localization	ROI localization , Image restoration, Even-symmetric Gabor filter dictionary design, Finger–vein enhancement	Scattering removal, Even symmetric Gabor filter, 2D convolution operation	finger–vein matching results also demonstrated that the proposed method was powerful in improving finger–vein recognition performance.
[6]Naoto Miura, Akio Nagasaka, Takafumi Miyatake ,	Feature extraction of finger-vein patterns based on repeated line tracking and its application to personal identification	Feature extraction of finger-vein	Finger-vein patterns, Matching	Line tracking, Normalization	Evaluation of its robustness against image darkness showed that it is far superior to the conventional method based on a matched filter.
[7]Guoqing Wang and Jun Wang,	SIFT Based Vein Recognition Models: Analysis and Improvement	Finger Vein Recognition	Evaluated Contrast Enhancement Models, Experimental Image Set	Scale-Invariant Feature Transform (SIFT) descriptor, a comprehensive hand-dorsa vein database	The eighteen CEs yield an increase in the number of SIFT keypoints that can be automatically detected in a vein image, but also a performance decrease in the case of NN matching of generated SIFT keypoint descriptors in respect to PR and EER.
[8]Yusuke Matsuda1 · Naoto Miura1 · Akio Nagasaka1 · Harumi Kiyomizu1 · Takafumi Miyatake1,	Finger-vein authentication based on deformation-tolerant feature-point matching	Finger-vein authentication	Acquisition of image, Normalization of image, Pre-processing, Feature extraction, Matching	A camera with infrared light, Gabor Filtering, feature-point position and descriptors	Matching of finger-vein images with irregular shading and deformation of vein patterns by the proposed method attained higher accuracy than the SIFT method.
[9]Naoto Miura, Akio Nagasaka, Takafumi Miyatake,	Extraction of Finger-Vein Patterns Using Maximum Curvature Points in Image Profiles	Extraction of Finger-Vein Patterns	Extraction of the center positions of veins, Connection of the center positions, Labeling of the image	Cross-sectional profile of a vein, Filtering Operation, Threshold value	An evaluation of the robustness of our method against fluctuations in widths and brightnesses of veins showed that it is far superior to the conventional methods

[10]Rashmi R. Tallam, Supriya S. Temgire, Rinku M. Zirange,	finger vein recognition system using image processing	Finger vein recognition	Image acquisition, Image pre-processing, Segmentation, Matching	On-line and Off-line Images, RGB To Gray Conversion, Image enhancement, Normalization , Resizing, Euclidian distance	There are two types of errors in matching results in biometric verification. The first is false rejection, which claims a genuine pair as impostor, and the second is false acceptance, which claims an impostor pair as genuine. The system proposed in this paper achieves a FRR of 20.0% and FAR of 0.0% for database containing 150 images.

4. Proposed System

In the biometrics, finger vein authentication is a new method utilizing the vein pattern inside one's finger for personal identity verification. A finger vein captured by infrared light contains artifacts such as irregular shading and vein posture deformation that can degrade the accuracy of finger vein authentication. A novel method is proposed for extracting feature points from the vein patterns and for matching feature points that is robust when compared to the conventional methods. In the proposed system**, Gradient** technique is used in the feature extraction which is mainly used for edge detection. In the feature matching, **RANSAC** [RANdom SAmple Consensus] method is used. The Gradient boosted algorithm is used for feature point extraction. It is mainly used for edge detection. It is the directional change in the colour and the intensity of the image. Creation of gradient image is done from an original image using a Sobel Operator. It detects the edges with the lower error rate and does not create any false edges. This algorithm is very scalable, flexible, straight forward. The RANSAC method is used for feature matching. This technique is mainly used for panorama image matching. Here, random minimal points are chosen from both the input and the enrolled image. The points matched are mapped using straight lines. This technique attains higher accuracy in feature matching even with the presence of outliers.

5. Conclusion

This study presents the survey of finger vein recognition and authentication for personal identification for different applications. In this paper the different approaches of image acquisition module, pre-processing, Feature extraction, matching and also the authentication using different algorithms are studied. The paper presents the survey on various techniques available for finger vein technology. According to the literature available the finger vein biometric ensures high performance, spoofing resistance, fraud proof authentication. Thus finger vein recognition and authentication system is more reliable and secure than other conventional modalities.

References

[1] Lin Chunyi1, Li Mingzhong2, Sun Xiao2, "A Finger Vein Recognition Algorithm Based on Gradient Correlation" 2012 AASRI Conference on Computational Intelligence and Bioinformatics.

[2] Bakhtiar Affendi Rosdi , Chai Wuh Shing and Shahrel Azmin Suandi, "Finger Vein Recognition Using Local Line Binary Pattern", Sensors 2011, 11, 11357-11371; doi:10.3390/s111211357

[3] Xiaoming Xi, Gongping Yang , Yilong Yin and Xianjing Meng, " Finger Vein Recognition with Personalized Feature Selection", Sensors 2013, 13, 11243-11259; doi:10.3390/s130911243

[4]Bang Chao Liu,1 Shan Juan Xie,2 and Dong Sun Park1 , " Finger Vein Recognition Using Optimal Partitioning Uniform Rotation Invariant LBP Descriptor", Hindawi Publishing Corporation Journal of Electrical and Computer Engineering, Volume 2016, Article ID 7965936, 10 pages, http://dx.doi.org/10.1155/2016/7965936.

[5] Jinfeng Yang, Yihua Shi, "Finger–vein ROI localization and vein ridge enhancement", Pattern Recognition Letters 33 (2012) 1569–1579.

[6]Udayakumar R., Kaliyamurthie K.P., Khanaa, Thooyamani K.P., Data mining a boon: Predictive system

for university topper women in academia, World Applied Sciences Journal, v-29, i-14, pp-86-90, 2014.
[7]Kaliyamurthie K.P., Parameswari D., Udayakumar R., QOS aware privacy preserving location monitoring in wireless sensor network, Indian Journal of Science and Technology, v-6, i-SUPPL5, pp-4648-4652, 2013.
[8]Brintha Rajakumari S., Nalini C., An efficient cost model for data storage with horizontal layout in the cloud, Indian Journal of Science and Technology, v-7, i-, pp-45-46, 2014.
[9]Brintha Rajakumari S., Nalini C., An efficient data mining dataset preparation using aggregation in relational database, Indian Journal of Science and Technology, v-7, i-, pp-44-46, 2014.
[10]Khanna V., Mohanta K., Saravanan T., Recovery of link quality degradation in wireless mesh networks, Indian Journal of Science and Technology, v-6, i-SUPPL.6, pp-4837-4843, 2013.