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Human Identification Using Palm-Vein Images Using Gabor Filter and Lalplacian Palm

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Abstract

Palm vein authentication is one of the modern biometric techniques, which employs the vein pattern in the human palm to verify the person. The merits of palm vein on classical biometric (e.g. fingerprint, iris, face) are a low risk of falsification, difficulty of duplicated and stability. This paper presents two new approaches to improve the performance of palm-vein-based identification systems using the Gabor filter. The proposed approach attempts to more effectively accommodate the potential deformations, rotational and translational changes by encoding the orientation preserving features and utilizing a novel region-based matching scheme. We systematically compare the previously proposed palm-vein identification approaches with our proposed ones on two different databases that are acquired with the contactless and touch-based imaging setup. We evaluate the performance improvement in both verification and recognition scenarios and analyze the influence of enrollment size on the performance. In this context, the proposed approaches are also compared for its superiority using single image enrollment on two different databases. For the implementation of this proposed work we use the Image Processing Toolbox under Matlab software.

Keyword: Biometrics, hand biometrics, multispectral palm print, palm-vein recognition, personal identification, vascular biometrics, Gabor filter, Normalization and Image Processing.

Introduction

Biometric technology refers to a pattern recognition system which depends on physical or behavioral features for the person identification. Many biometric systems exist today by using fingerprint, face, iris, etc. Palm vein is a new member of biometric family. Palm vein is defined as vascular patterns under the skin of the palm. Like the fingerprint, the pattern of vain very state in the life and different in each part in same body. Because the vein pattern is hidden underneath the skin and invisible directly by the eye, the vein pattern is difficult to copy compared with other biometric types. Besides, the palm vein is impossible to fake. The researcher and the communities are increasingly interested in vein pattern recognition. In the researchers take the shape and texture of the hand vein for person authentication. They used Hausdorff distance and like edge mapping for shape authentication and Gabor filter for feature vein extraction. Palm vein authentication uses the vascular patterns of an individual's palm as personal identification data. Compared with a finger or the back of a hand, a palm has a broader and more complicated vascular pattern and thus contains a wealth of differentiating features for personal identification. The palm is an ideal part of the body for this technology; it normally does not have hair which can be an obstacle for photographing the blood vessel pattern, and it is less susceptible to a change in skin color, unlike a finger or the back of a hand.

In this context, palm-vein recognition has emerged as a promising alternative for personal identification. It has the advantage of the high agility but at the same time also ensures that the crucial identity information is unrevealed, therefore providing higher security and privacy for the user. The palm-vein images in contactless imaging present a lot of translational and rotational variations. Therefore, more stringent preprocessing steps are required to extract a stable and aligned ROI. The preprocessing steps essentially recover a fixed-size ROI from the acquired images which have been normalized to minimize the rotational, translational, and scale changes. This is followed by the nonlinear enhancement so that the vein patterns from ROI images can be observed more clearly. In order to improve the effectiveness of human identification using palm vein images is proposed.

Lakhwinder Kaur, Savita Gupta, R.C. Chauhan Deptt. of CSE SLIET,[8] Longowal Punjab (148106), India ,"Image Denoising using Wavelet Thresholding", In This paper proposes an adaptive threshold estimation method for image denoising in the wavelet domain based on the generalized Gaussian distribution (GGD)

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modeling of sub-band coefficients. The proposed method called Normal Shrink is computationally more efficient and adaptive because the parameters required for estimating the threshold depend on sub-band data. Palm Vein substantiation is getting higher and contentious development work in which self-determination groups communicate anxiety in excess of confidentiality and uniqueness concerns. Today [3], biometric acts and policies are being progressed and some other production principles are performed very well. Identification of a human being through his body involving that the human being body is superficially well-known personality structures of an extraordinarily influential tool for personality administration of Biometric appreciation [4]. Palm vein verification system established as a fresh biometric techniques employing the vein prototypes surrounded by one‘s palms for delicate recognition. Vein prototypes are dissimilar for each palm vein and for each human being [6] is concealed bottom of the skins exterior position, falsification is tremendously not easy. These exclusive characteristics of palm vein model detection set is separately from preceding appearances of some other methods and enclose led to its embracing the foreign country economical associations as their most recent protection knowledge.

The remainder of this paper is organized as the following. At first, in Section II we illustrate the various components of our proposed technique to identification of human using palm images. Further, in Section III we present some key experimental results and evaluate the performance of the proposed system. At the end we provide conclusion of the paper in Section IV and state some possible future work directions.

Proposed technique

This section illustrates the overall technique of our proposed human identification using palm vein images. In this paper, we proposed ‘Report on Human Identification Using Palm-Vein Images Using Gabor Filter’. This paper investigated a novel approach for human identification using palm-vein images. We propose a novel feature extraction and matching approach that can effectively accommodate the potential image deformations, translational, and rotational variations by matching to the neighborhood of the corresponding regions and generating more reliable matching scores. This approach performs very well even with the minimum number of enrollment images (one sample for training). The performance was rigorously evaluated and compared to the existing method on two different databases with a different imaging setup, and evaluated with all possible numbers of training samples. Our proposed method shows its robustness and superiority in both cases. We propose a novel preprocessing, enhancement and feature extraction techniques that can effectively accommodate the potential image deformations, translational, and rotational variations. This approach performs very well even with the minimum number of enrollment images (one sample for training). The palm vein identification method shows its robustness and superiority. The junction point approach extracts palm-vein features by analyzing the junction point of the palm image also achieves reasonably superior performance, and at the same time provides a smaller template size as compared to other methods.

A. Image Segmentation and Normalization

The key objective while segmenting the ROI is to automatically normalize the region in such a way that the image variations, caused by the interaction of the user with the imaging device, can be minimized. In order to make the identification process more effective and efficient, it is necessary to construct a coordinate system that is invariant/robust (or nearly) to such variations. It is judicious to associate the coordinate system with the palm itself since we are seeking the invariance corresponding to it. Therefore, two webs are utilized as the reference points/line to build up the coordinate system, i.e., the web between the index finger and middle finger together with the web between the ring finger and little finger. These web points are easily identified in touch-based imaging (using pegs) but should be automatically generated for contactless imaging.

B. Image Enhancement

The palm-vein images employed in our work were acquired under near-infrared illumination (NIR); the images generally appear darker with low contrast. Therefore, image enhancement to more clearly illustrate the vein and texture patterns is required. We first estimate the background intensity profiles by dividing the image into slightly overlapping 32 blocks (three pixels overlapping between two blocks to address the blocky effect), and the average gray-level pixels in each block are computed. Subsequently, the estimated background intensity profile is resized to the same size as the original image using bicubic interpolation and the resulting image is subtracted from the original ROI image. Finally, histogram equalization is employed to obtain the normalized and enhanced palm-vein image.

C. Feature Extraction

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The normalized and enhanced palm-vein images depict curved vascular network/patterns, and these vessels can be approximated by small line segments which are rather curved. Therefore, in this paper, we propose to use two new approaches to extract such line-like palm-vein features. In addition, a neighborhood matching scheme that can effectively account for more frequent rotational, translational variations, and also to some image deformations in the acquired image.

D. Gabor filter

In image processing, a Gabor filter, named after Dennis Gabor, is a linear filter used for edge detection. Frequency and orientation representations of Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate for texture representation and discrimination. In the spatial domain, a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave. J. G. Daugman discovered that simple cells in the visual cortex of mammalian brains can be modeled by Gabor functions. Thus, image analysis by the Gabor functions is similar to perception in the human visual system. Its impulse response is defined by a sinusoidal wave (a plane wave for 2D Gabor filters) multiplied by a Gaussian function. Because of the multiplication-convolution property (Convolution theorem), the Fourier transform of a Gabor filter's impulse response is the convolution of the Fourier transform of the harmonic function and the Fourier transform of the Gaussian function. The filter has a real and an imaginary component representing orthogonal directions. The two components may be formed into a complex number or used individually.

Complex

$$g(x,y;\lambda,\theta,\psi,\sigma,\gamma) = \exp\left(-\frac{x'^2+\gamma^2y'^2}{2\sigma^2}\right)\exp\left(i\left(2\pi\frac{x'}{\lambda} \cdots\right.\right.$$

Real

$$g(x,y;\lambda,\theta,\psi,\sigma,\gamma) = \exp\left(-\frac{x'^2+\gamma^2y'^2}{2\sigma^2}\right)\cos\left(2\pi\frac{x'}{\lambda} \cdots\right.$$

Imaginary

$$g(x,y;\lambda,\theta,\psi,\sigma,\gamma) = \exp\left(-\frac{x'^2+\gamma^2y'^2}{2\sigma^2}\right)\sin\left(2\pi\frac{x'}{\lambda}+\psi\right)$$

Where

$$x' = x\cos\theta + y\sin\theta$$

And

$$y' = -x\sin\theta + y\cos\theta$$

In this equation, λ represents the wavelength of the sinusoidal factor, θ represents the orientation of the normal to the parallel stripes of a Gabor function, ψ is the phase offset, σ is the sigma/standard deviation of the Gaussian envelope and γ is the spatial aspect ratio, and specifies the ellipticity of the support of the Gabor function. Gabor filters are directly related to Gabor wavelets, since they can be designed for a number of dilations and rotations. However, in general, expansion is not applied for Gabor wavelets, since this requires computation of bi-orthogonal wavelets, which may be very time-consuming. Therefore, usually, a filter bank consisting of Gabor filters with various scales and rotations is created. The filters are convolved with the signal, resulting in a so-called Gabor space. This process is closely related to processes in the primary visual cortex. Jones and Palmer showed that the real part of the complex Gabor function is a good fit to the receptive field weight functions found in simple cells in a cat's striate cortex. The Gabor space is very useful in image processing applications such as optical character recognition, iris recognition and fingerprint recognition. Relations between activations for a specific spatial location are very distinctive between objects in an image. Furthermore, important activations can be extracted from the Gabor space in order to create a sparse object representation.

Evaluation and results

To verify the effectiveness (qualities and robustness) of the proposed brain tumor detection technique, we conduct several experiments with this procedure on several images. There are some steps of our proposed technique are given below:

Phase 1: Firstly we develop a particular GUI for this implementation. After that we develop a code for the loading the palm vein image file in the Matlab database.

Phase 2: Develop a code for extracting the inner layer of the palm vein by using segmentation process.

Phase 3: Develop a code for removing the noise by using Gabor filter.

Phase 4: Develop a code for identifying the junction points in the palm vein images by using the correlation method

Phase 5: Develop a code for Palm vein authentication, whether to finding the person is matching person or non-matching person based junction points.

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Flow Chart of proposed method

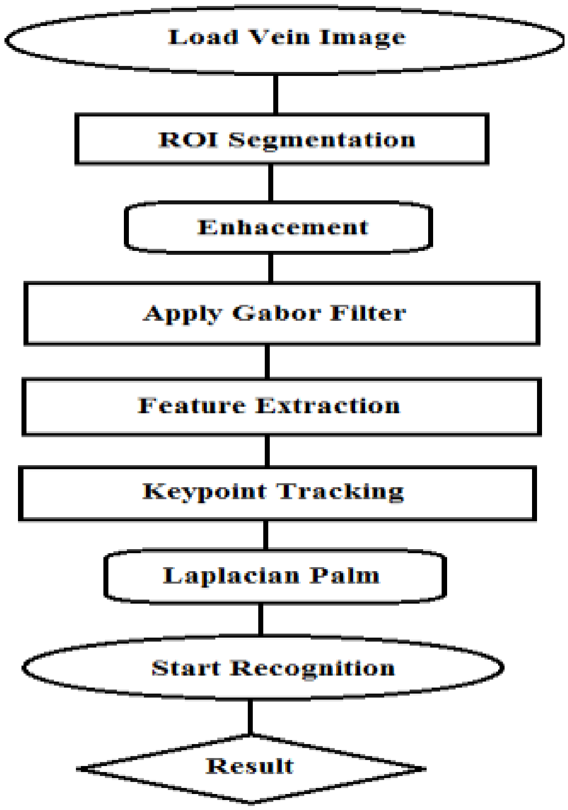

Figure: 1. Flow chart of proposed method

Evaluation & results

Figure: 2. Main window of model

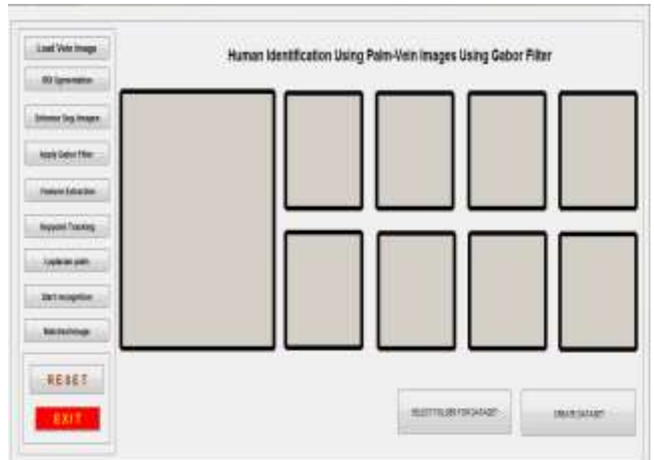

Figure: 3. Work window of model

Results

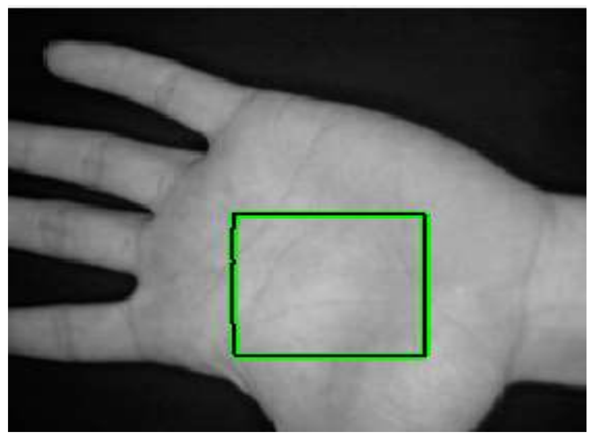

Figure: 4. Load palm image with ROI

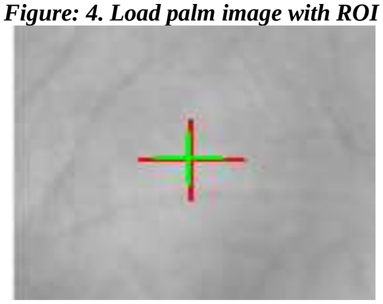

Figure: 5. Cropped image

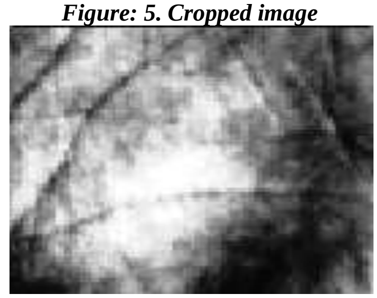

Figure: 6. Enhanced image

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Figure: 7. Edge of enhanced image

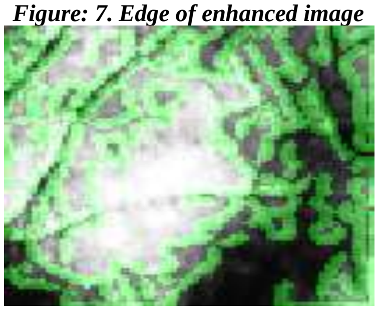

Figure: 8. Key point of enhanced image

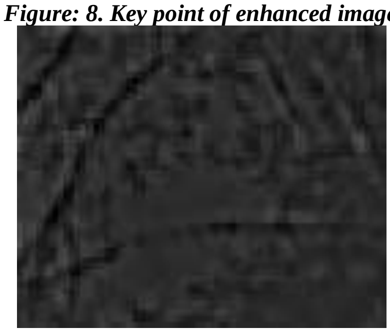

Figure: 9. Laplacian palm image

Conclusion

In this paper, we proposed 'Human Identification Using Palm-Vein Images Using Gabor Filter'. A new method of personal authentication based on palm vein has been discussed in detail. First, the palm vein images are enhancement using histogram equalization. Then a bank of Gabor filter is created and convolution on the enhanced images and used the convolution images as feature vectors. The dimensional reduction is implemented using palm-vein recognition to get best features for verification. Finally, the palm vein verification was implemented using Nearest Neighbor classifier. Our proposed method shows its robustness and superiority in both cases. The Hessian phase approach extracts palm-vein features by analyzing the Eigen values of the local image instead of filtering the image by predefined filters in different orientations, also achieves reasonably superior performance, and at the same time provides a smaller template size as compared to other methods. Therefore, it offers a computationally simpler and compact storage (template size) alternative for the palm-vein identification applications. This approach performs very well even with the minimum number of enrollment images (one sample for training). The performance was rigorously evaluated and compared to the existing method on two different databases with a different imaging setup, and evaluated with all possible numbers of training samples.

References

1. Anil K. Jain & Arun Ross Sharath Pankanti, ―A Prototype Hand Geometry-based Verification System‖, Washington D.C., pp.166-171, March 22-24, 1999.
2. Chin-Chuan Hana; Hsu-Liang Chengb, Chih-Lung Linb and Kuo-Chin Fanb, ―Personal authentication using palm-vein features‖, aiwan, Republic of China Received 21 December 2001.
3. Chih-Lung Lin and Kuo-Chin Fan, Member, ―Biometric Verification Using Thermal Images of Palm-Dorsa Vein Patterns‖, no. 2, February 2004.
4. Ying-Han Pang, Andrew Teoh Beng Jin, and David Ngo Chek Ling, ―Palmprint based Cancelable Biometric Authentication System‖, World Academy of Science, Engineering and Technology, 9th June, 2005.
5. Masaki Watanabe, Toshio Endoh, Morito Shiohara, and Shigeru Sasaki, ―Palm vein authentication technology and its applications‖, sept 19-21st, 2005 hyatt Regency crystal-USA.
6. Ajay Kumar1, David C. M. Wong1, Helen C. Shen1 and Anil K. Jain 2, ―Personal Verification using Palmprint and Hand Geometry Biometric‖, Engineering, Michigan State University, East Lansing, MI 48824.(2007).
7. Shinichiro Watanabe, Toshiyuki Tanaka and Eizaburo Iwata, ―Vein emphasis filters for Biometric Authentication‖, Sept. 17-20, 2007, Kagawa University, Japan.
8. Jian-Gang Wang and Wei-Yun Yau, ―Andy Suwandy Fusion of Palmprint and Palm Vein Images for Person Recognition Based on ―Laplacianpalm‖ Feature‖, 1-4244-1180-7/07/$25.00, 2007.
9. shi zhao, yi-ding wang and yun-hong wang, ―biometric, Identification based on low-quality hand vein pattern images‖, Proceedings of the Seventh International

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(ISRA), Impact Factor: 1.852

Conference on Machine Learning and Cybernetics, Kunming, 12-15 July 2008.

10. M.Deepamalar and M.Madheswaran. ―An Improved Multimodal Palm Vein Recognition System Using Shape and Texture Features‖, Vol. 2, No. 3, June, 2010 (1793-8201).
11. Jiansheng Chen, Yiu-Sang Moon, Ming-Fai Wong and Guangda Su, ―Palmprint authentication using a symbolic representation of images‖, Image and Vision Computing ,28Jan (2010) 343–351.
12. Ishani Sarkar, Farkhod Alisherov, Tai-hoon Kim, and Debnath Bhattacharyya, ―Palm Vein Authentication System: A Review‖, International Journal of Control and Automation Vol. 3, No. 1, March, 2010.
13. A. K. Jain and J. Feng, "Latent palm print matching," IEEE Trans. Pattern Anal. Mach. Intell., vol. 31, no. 6, pp. 1032–1047, Jun. 2009.
14. R. Singh, M. Vatsa, H. S. Bhatt, S. Bharadwaj, A. Noore, and S. S. Nooreyezdan, "Plastic surgery: A new dimension to face recognition," IEEE Trans. Inf. Forensics Security, vol. 5, no. 3, pp. 411–418, Sep. 2010.
15. T. Matsumoto, H. Matsumoto, K. Yamada, and S. Hoshino, "Impact of artificial "gummy" fingers on fingerprint systems," Proc. SPIE, pp. 275–289, 2002.
16. S. Z. Li, Encyclopedia of Biometrics. New York: Springer, 2009.
17. G. Pan, L. Sun, Z. Wu, and S. Lao, "Eyeblink-based anti-spoofing in face recognition from a generic web camera," in Proc. Int. Conf. Computer Vision, Rio de Janeiro, 2007, pp. 1–8.
18. T. B. Habif, Clinical Dermatology. St. Louis: Mosby-Year Book, Inc., 1996.
19. V. P. Zharov, S. Ferguson, J. F. Eidt, P. C. Howard, L. M. Fink, and M. Waner, "Infrared imaging of subcutaneous veins," Lasers Surgery Medicine, vol. 34, no. 1, pp. 56–61, Jan. 2004.
20. D. Zhang, Z. Guo, G. Lu, L. Zhang, and W. Zuo, "An online system of multispectral palm print verification," IEEE Trans. Instrum. Meas., vol. 59, no. 2, pp. 480–490, Feb. 2010.