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An Identity Authentification Using Finger Vein and Texture Images Using NN

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Abstract*— Identity authentification is necessary for security purposes. Therefore Finger vein and texture image are physiological biometric for identification of individuals depend upon the physical characteristics and parameters of the vein patterns in the human. This technology is at present in use or development for a wide range of applications; this contain credit card authentication; security in automobile; employee time and tracking attendance; computer and network authentication; security; signature verification and automated teller machines [1]. The proposed work simultaneously acquires the finger-vein and low-resolution finger image images and combines these two techniques using a better score-level combination strategy. Analyse the previously proposed finger-vein and texture image identification approaches and develop a new approach that describes it superiority over prior published efforts. In this thesis developed and analyzed three new score-level combinations such as Repeated Line Tracking; Gabor Filter and NN evaluate them with more popular score-level fusion approaches to ascertain their effectiveness in the proposed system.

Keywords:-Finger vein; Repeated line Tracking; Gabor Filter; Image enhancement and NN

I. INTRODUCTION

Biometric systems make use of physiological and/or behavioural traits of individuals, for recognition purposes. The physiological traits include fingerprint; face; finger vein; iris; hand geometry; palm print; retina; etc and the behavioural traits include gait; voice; signature; etc. Then compared with the trend of authentication such as key; password; IC card; biometric systems have more scientific value and wider application prospects; which have advantages in the following aspects: will not be forgotten to carry, will not be lost and will be more secure. Biometrics such as fingerprints, faces and irises recognition have been widely used in many applications including door access control; personal authentication for computers; internet banking; automatic teller machines and border-crossing controls. Smart recognition of human identity for security and control is a global issue of concern in our world today. Then automatic authentication systems for control have found application in criminal identification; autonomous vending and automated banking among others. Therefore among many authentication systems that have been proposed and implemented; finger vein biometrics is emerging as the foolproof method of automated personal identification. At last finger vein is a single physiological biometric for identifying individuals depended on the physical characteristics and attributes of the vein patterns in the human finger. This is a fairly recent technological advance in the field of biometrics that is being applied to different fields such as medical; financial; law enforcement facilities and other applications where high levels of security or privacy is very important. These technologies is impressive because it requires only small; relatively cheap single-chip design; and has identification process that is contact-less and of more accuracy when compared with other identification biometrics like fingerprint; iris; facial and others. The higher accuracy rate of finger vein is not unconnected with the fact that finger vein patterns are virtually impossible to forge thus it has become one of the fastest growing new biometric technology that is quickly finding its way from research labs to commercial development. The reasons being: the ease of acquiring fingerprints; the availability of inexpensive fingerprint sensors and a long history of its use. The limitations like the deterioration of the epidermis of the fingers; finger surface particles etc result in inaccuracies that call for more accurate and robust methods of authentication. The Vein identifications technology however offers a promising solution to these challenges due the following characteristics:

(1) Its universality and uniqueness. Therefore individuals have unique fingerprints; so also they do have unique finger vein images. Therefore vein figures of most people remain unchanged despite ageing.
(2) Therefore Hand and finger vein detection methods do not have any known negative effects on body health.
(3) Then the condition of the epidermis has no effect on the result of vein detection.
(4) At last Vein features are difficult to be forged and changed even by surgery.

These desirable properties make vein recognition a highly reliable authentication method. Compared with traditional authentication techniques based on passwords, the biometric techniques are more convenient and secure. Therefore, biometric techniques are widely used in authentication systems nowadays. Among all the biometric techniques, most of the extrinsic biometric traits(e.g., finger vein and face) are susceptible to spoof attacks on the sensor level. For example,

an attacker can manufacture a fake finger according to a stolen finger vein template. By scanning the fake finger, the attacker may be able to break into some finger vein recognition systems which store the original finger vein. On the contrast, the intrinsic biometrics traits (eg., finger-vein and palm-vein) are beneath the surface of the human body, which are more difficult to be forged. Among the intrinsic traits, capturing finger-vein is very convenient, which can be easily adopted in various applications. In a finger-vein recognition system, the finger-vein image acquisition process is affected by many factors such as environmental illumination, ambient temperature physiological changes and user behavior

The paper can be describe as follows in section II discuss finger vein and texture image preprocessing and section III presents ROI extraction. In section IV tells about repeated line tracking and Gabor filter and in section V give ideas about NN. At last present conclusion in section VI.

II. FINGER-VEIN AND TEXTURE IMAGE PREPROCESSING

The acquired finger images are noisy with rotational and translational variations resulting from unconstrained imaging. The acquired images are first subjected to preprocessing steps that include:

1. Segmentation of ROI,
2. Translation and orientation alignment and
3. Image enhancement to extract stable/reliable vascular patterns.

Each of the acquired finger-vein images and texture image separately. After that first subjected to binarization; using a fixed threshold value; to coarsely localize the finger shape in the images. Therefore some portions of background still appear as connected to the bright finger regions; predominantly due to uneven illuminations. These isolated and loosely connected regions in the binarized images are eliminated in two steps: First; the Sobel edge detector is applied to the entire image; and the resulting edge map is subtracted from the binarized image. Subsequently; the isolated blobs (if any) in the resulting images are eliminated from the area thresholding, i.e., the eliminating number of connected white pixels being less than a threshold. Resulting binary mask is used to segment the ROI from the original finger-vein image [6]. And the block diagram of the proposed system is shown in Figure 1.

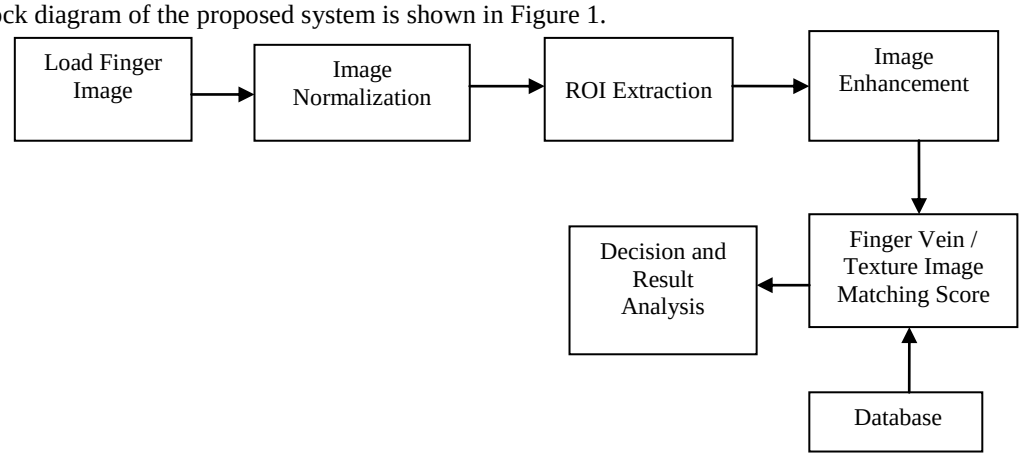

FIGURE 1: DIAGRAM OF PROPOSED SYSTEM

Figure.1 shows the block diagram of the proposed method for finger vein and texture image recognition. Biometric is the technology of verifying people using human physiological or behavioral features such as fingerprint, iris, face and voice. Due to the fact that a hand contains lots of information and the information is easy to be retrieved; hand based biometrics such as fingerprint and palm print are the most popular biometric technologies. As for finger knuckle print and palm print based biometric system; it is easy to replicate since the features are external to the human body. To overcome the limitations of current hand based biometric systems; finger vein and texture image recognition had been researched. And they proved that each finger has unique vein patterns so that it can be used in personal verification. The finger vein based biometric system has several benefits. First; the finger vein pattern is hard to replicate since it is an internal feature. The quality of the captured vein pattern is not easily influenced by skin conditions and external variations [3,11,13].

III. ROI EXTRACTION

The original image is captured with the black unwanted background. And including the background reduced the accuracy. A special algorithm is developed to extract the finger vein image from the background. Therefore three major steps involved in this algorithm. And first; edge detection is performed to highlight the finger edge points.

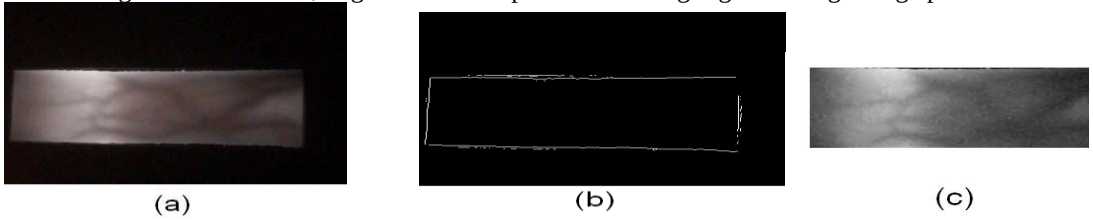

Figure 2: (a) Original finger vein image, 2(b) finger edges, and 2 (c) cropped image.

Therefore there are two major horizontal lines detected representing the finger edges as shown in Figure (b). Second, pairs of edge points are determined from each of the two major horizontal lines by scanning the lines horizontally. And the most appropriate cropping points are selected from the pairs of edge points, which must satisfy two conditions: (i) the range of the pair of the edge points is between 35% to 65% of the image height, and (ii) the pair of the edge points is the widest pair among all pairs. And finally; the image is cropped vertically at the cropping points and horizontally at 5% from left border and 15% from right border. Therefore for matching purpose; the size of both registered and input images are preserved to be at the same size. Therefore ROI of input image is depending on the ROI of registered image. And from the detected cropping points of the input image; the centre of the cropping points is calculated. Input image is cropped at the same height of the registered image origin from the calculated cropping points centre. Figure 2 shows an original finger vein image; finger edges; and the final cropped image [12].

IV. REPEATED LINE TRACKING AND GABOR FILTER

Therefore repeated line tracking method gives a promising result in finger-vein identification: The idea is to trace the veins in the image by chosen directions according to predefined probability in the horizontal and vertical orientations, and the starting seed is randomly selected; the whole process is repeatedly done for a certain number of times.

In gabor filter, is a linear filter used for edge detection. And 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. Therefore in spatial domain; a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave. Gabor filters are self-similar: all filters can be generated from one mother wavelet by dilation and rotation [15].

Formula:

$$g(x, y; \lambda, \backslash theta, \psi, \sigma, \gamma) = exp\left(\backslash frac\left\{x'^2 + \gamma^{2y'^2}\right\}\{2\sigma^2\}\right)\backslash exp\left(i(2\backslash pi\backslash frac\{x'\}\{\lambda\} + \backslash psi)\right) \quad (1)$$

V. NN(NEURAL NETWORK)

Artificial neural networks are composed of interconnecting artificial neurons (programming constructs that mimic the properties of biological neurons). Therefore Artificial neural networks may either be used to gain an understanding of biological neural networks; or for solving artificial intelligence problems without necessarily creating a model of a real biological system. Therefore real; biological nervous system is highly complex: artificial neural network algorithms attempt to abstract this complexity and focus on what may hypothetically matter most from an information processing point of view. Good performance (e.g. as measured by good predictive ability; low generalization error); or performance mimicking animal or human error patterns; can then be used as one source of evidence towards supporting the hypothesis that the abstraction really captured something important from the point of view of information processing in the brain. Other incentive for these abstractions is to reduce the amount of computation required to simulate artificial neural networks; so as to allow one to experiment with larger networks and train them on larger data sets.

VI. RESULT DISCUSSION

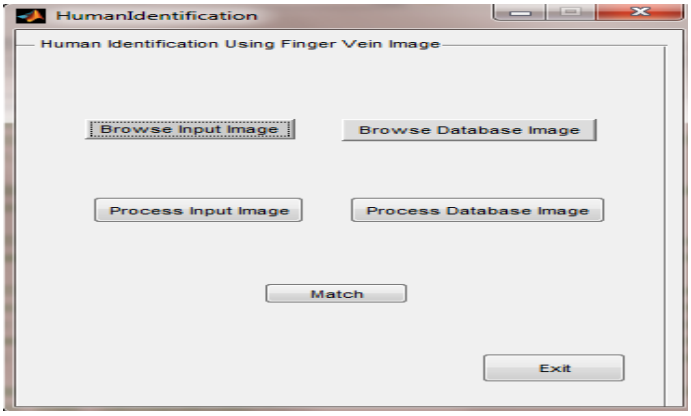

Figure 3: GUI layout

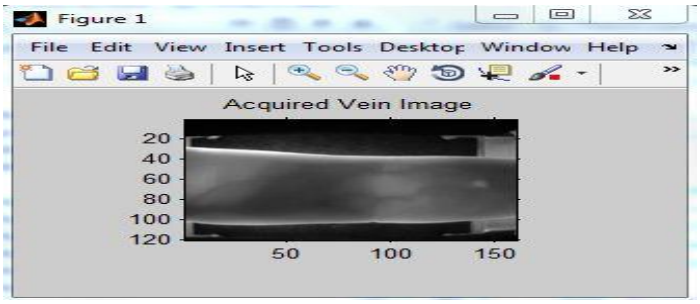

Figure 4: Acquired vein image

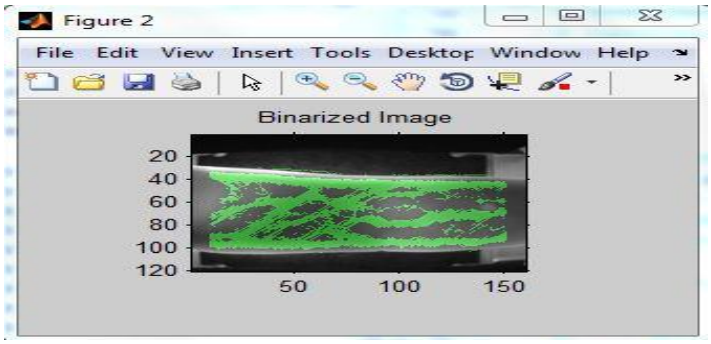

Figure 5: Binarized Image

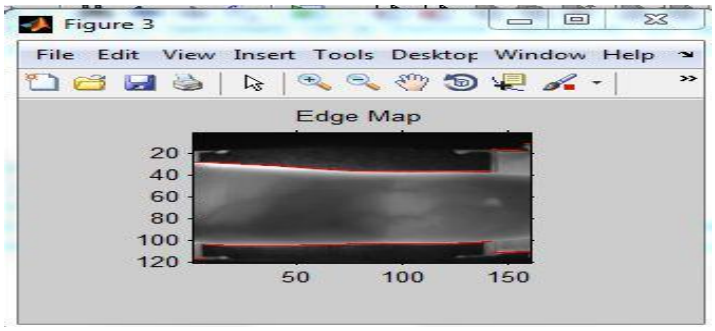

Figure 6: Edge Map Image

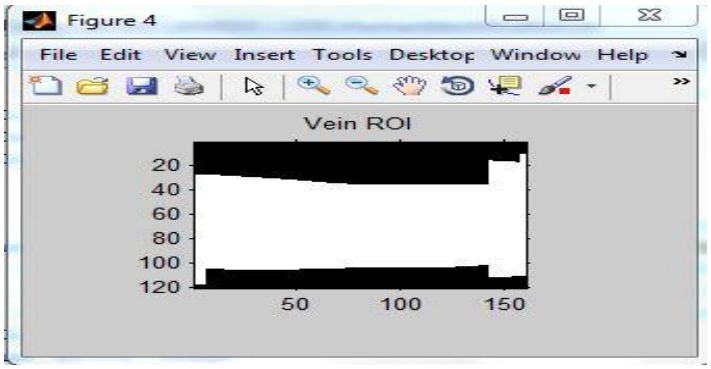

Figure 7: Vein ROI image

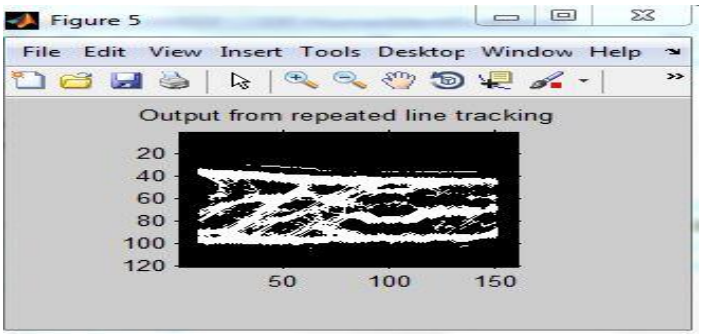

Figure 8: Output of repeated line tracking image

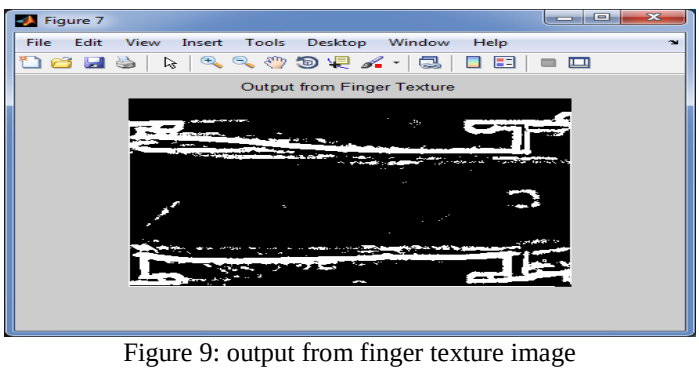

Figure 9: output from finger texture image

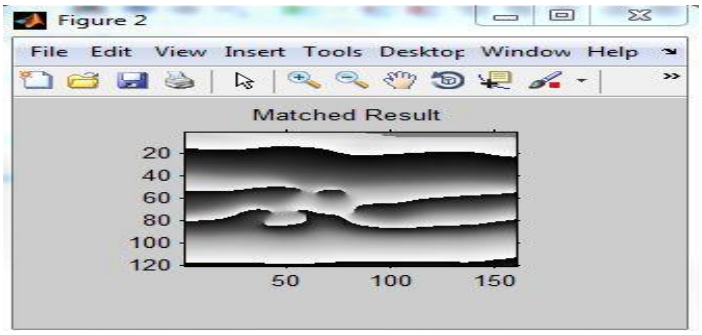

Figure 10: Matched result image

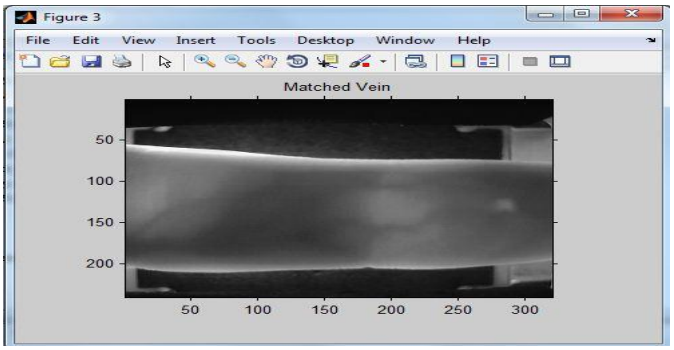

Figure 11: Matched Vein Image

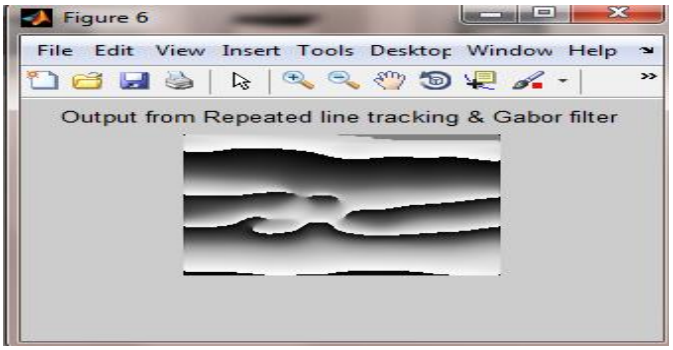

Figure 12: output from repeated line and Gabor filter image

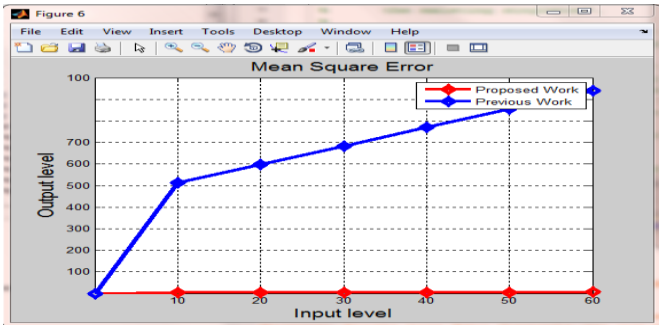

Figure 13: Graph of MSE value between input and output level

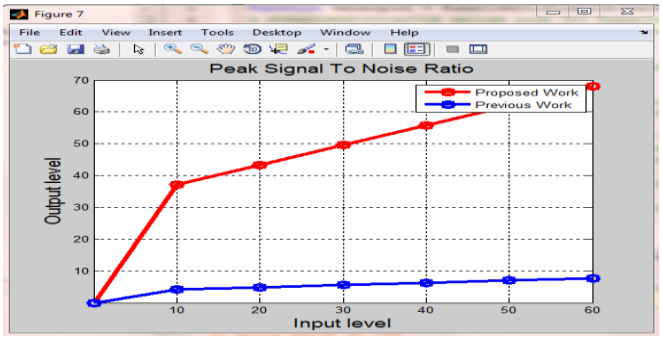

Figure 14: Graph of PSNR between input and output level

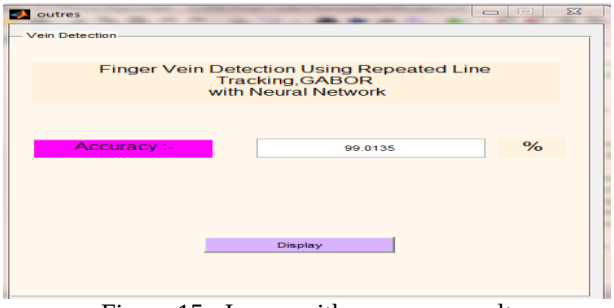

Figure 15: Image with accuracy result

The above figure shows the result of identity authentification using finger vein and image texture recognition by using repeated line tracking; Gabor filter and NN. This technique gives better result as compare to previous technique. By use this technique the value accuracy up to 99.0135 %.

VI. CONCLUSION

Here numbers of Finger Vein and texture image techniques have been proposed earlier but they were not secure enough and can be temporarily tampered with so the task was not fulfilled. Finger Vein and image texture detection using Repeated Line Tracking or Gabor Filter alone could not provide better results. Identity authentification Using Repeated Line Tracking has been proposed previously but there have been always need for better Finger Vein and texture recognition Technique. The existing Identification Using Finger Vein and texture image recognition algorithm is costlier. And propose an enhanced Identification algorithm Using Finger Vein and texture image which is based on Repeated Line Tracking; Gabor Filter and NN. The Identification Using Finger Vein and texture image algorithm this will be low cost and more accurate with respect to Human Identifications Using Finger Vein with other Technique.

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REFERENCES

[1] Ajay Kumar & Yingbo Zhou "Human Identification Using Finger Images" Published by IEEE in 2012.
[2] Jinfeng Yang & Yihua Shi "Finger Vein Based Enhancement and Segmentation" Published by Springer in 2013.
[3] Vanathi G, Nigarihaa R,Uma Maheswari G &Sjuthi R "Real Time Recognition System Using Finger Vein" Published by IJAEEE in 2013.
[4] Wenming Yang, Qing Rao, Qingmin Liao "Personal Identification For Single Sample Using Finger Vein Location and Direction Coding" Published by IEEE in 2011.
[5] Jinfeng Yang and Xu Li "Efficient finger Vein Localization and recognition" Published by ISSN in 2010.
[6] Qin Bin Pan Jian-fei Cao Guang-zhong & Du Ge-guo "The Anti Spoofing Study of Vein Identification System" Published by IEEE 2009.
[7] Yang JF, Yang JL, Shi YH "Finger-vein segmentation based on multi-channel even-symmetric Gabor filters" Published by IEEE international conference on intelligent computing and intelligent systems in 2009.
[8] David Mulyono & Horng Shi Jinn " A Study of Finger Vein Biometric for Personal Identification" Published by IEEE in 2008 .
[9] Kejun Wang, Hui Ma, Oluwatoyin P. Popoola and Jingyu Li "Finger Vein Recognition" Published by ISSN in 2008.
[10] Naoto Miura , Akio Nagasaka , Takafumi Miyatake "Extraction of Finger-Vein Patterns Using Maximum Curvature Points in Image Profiles Published by IEEE in 2005.
[11] Naoto Miura, Akio Nagasaka, Takafumi Miyatake "Feature Extraction of Finger-Vein Patterns Based on Repeated Line Tracking and its Application to Personal Identification" Published by Springer in 2004.
[12] C. Yam, M. Nixon, and J. Carter, "Gait Recognition by Walking and Running: A Model-Based Approach," Proc. Asia Conf. Computer Vision, pp. 1-6, 2002.
[13] E. C. Lee and K. R. Park, "Restoration method of skin scattering blurred vein image for finger vein recognition," *Electron. Lett.*, vol.45, no. 21, pp. 1074–1076, Oct. 2009.
[14] Z. Zhang, S. Ma, and X. Han, "Multiscale feature extraction of fingervein patterns based on curvelets and local interconnection structure neural network," in *Proc. ICPR*, Hong Kong, 2006, pp. 145–148.
[15] N. Miura,A. Nagasaka, and T. Miyatake, "Feature extraction of fingervein patterns based on repeated line tracking and its application to personal identification,"*Mach. Vis. Appl.*, vol. 15, no. 4, pp. 194–203, Oct. 2004.
[16] N. Miura, A. Nagasaka, and T. Miyatake, "Extraction of finger-vein patterns using maximum curvature points in image profiles," in *Proc.IAPR Conf. Mach. Vis. Appl.*, Tsukuba Science City, Japan, May 2005,pp. 347–350.
[17] A.K. Jain, Y. Chen, and M. Demirkus, "Pores and ridges: High resolution fingerprint matching using level 3 features," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 29, no. 1, pp. 15–27, Jan. 2007.
[18] A. Kumar and K. V. Prathyusha, "Personal authentication using hand vein triangulation and knuckle shape," *IEEE Trans. Image Process.*,vol. 18, no. 9, pp. 2127–2136, Sep. 2009.

