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RESEARCH ARTICLE

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HAND DORSALVEIN RECOGNITION BASED ON DISCRETE WAVELET TRANSFORMS

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ABSTRACT

Hand vein biometrics is a recent technology that offers system for identification /authentication, it ranks among the best biometric modality by the results developed. Just like any recognition system this has four steps: the acquisition, enhancement, feature extraction and classification. This project present the enhancement's step of the SAB11 Data Base followed by new adaptive feature extraction method for the dorsal hand vein biometrics; which is the discrete wavelet transform. Biometric technology is an efficient personal authentication and identification technique. As one of the main-stream branches, dorsal hand vein recognition has been recently attracted the attention of researchers. It is more preferable than the other types of biometrics because it's impossible to steal or counterfeit the patterns and the pattern of the vessels of back of the hand is fixed and unique with repeatable biometric features. Also, the recent researches have been obtained no certain recognition rate yet because of the noises in the imaging patterns, and impossibility of Dimension reducing because of the non-complexity of the models, and proof of correctness of identification is required. Therefore, in this paper, first, the images of blood vessels on back of the hands of people is analysed, and after pre-processing of images and feature extraction we began to identify people using firefly clustering algorithms. This identification is done based on the distance patterns between crossing vessels and their matching place. The identification will be done based on the classification of each part of NCUT data set and it consisting of 2040 dorsal hand vein images. High speed in patterns recognition and less computation are the advantages of this method. The recognition rate of this method is more accurate and the error is less than one percent. At the end the correctness percentage of this method for identification is compared with other various algorithms, and the superiority of the proposed method is proved.

KEYWORDS: Acquisition, Feature Extraction, Wavelet Transforms, preprocessing

I INTRODUCTION

Hand veins Biometrics have received considerable attentions in recent years. With vein pattern offers one of the best results by their stability and unicity, still more, the biometrics of the hand veins are not expensive for realized and very convenient to use by users. Good recognition should have a good classification and a good classification should be above a perfect feature extraction phase this is where lies the strength of the biometric system, our work is focused on the dorsal hand veins feature extraction step, but the question asked is which method used to ensures a better feature extraction. In this project, the hand veins pattern are shown in gray level image. The main objective of this work is to provide a method which allows feature extraction of veins pattern from low quality images Veins structure is unique to every individual. There are different imaging methods that near infrared lighting sensors are more common in capturing dorsal hand vein, palm vein and fingers vein patterns. Normally, black and white CCD cameras are also sensitive in the near infrared region, so a filter blocking the visible light is all that is needed on the camera. Since, shape and state of skin have no effect on the system's result, dorsal hand vein patterns are more secure than finger print and hand geometry. These are one of the highest popular systems among security and biometric systems because of their uniqueness and stability. Most of patterns of dorsal hand veins are in form of direct lines with one or more branches toward fingers or wrist. Thus, these patterns may lose some of their important information because of being uncomplicated. Recently, humans' identification has broadly been evaluated through images and patterns of dorsal hand veins with high recognition rate methods. In addition, among biometric features, patterns of dorsal hand veins are frequently applied in both researches and industry. For these patterns several techniques are presented.

Biometric technology is an efficient personal authentication and identification technique. As one of the main-stream branches, dorsal hand vein recognition has been recently attracted the attention of researchers. It is more preferable than the other types of biometrics because it's impossible to steal or counterfeit the patterns and the pattern of the vessels of back of the hand is fixed and unique with repeatable biometric features. Also, the recent researches have been obtained no certain recognition rate yet because of the noises in the imaging patterns, and impossibility of Dimension reducing because of the non-complexity of the models, and proof of correctness of identification is required. Therefore, in this paper, first, the images of blood vessels on back of the hands of people is analyzed, and after pre-processing of images and feature extraction (in the intersection between the vessels) we began to identify people using firefly clustering algorithms. This identification is done based on the distance patterns between crossing vessels and their matching place. The identification will be done based on the classification of each part of NCUT data set and it consisting of 2040 dorsal hand vein images. High speed in patterns recognition and less computation are the advantages of this method. The recognition rate of this method is more accurate and the error is less than one percent. At the end the correctness percentage of this method (CLU-D-F-A) for identification is compared with other various algorithms, and the superiority of the proposed method is proved.

II. METHODS

A) ROI extraction

and compared to the threshold as follows. After applying the algorithm to our image get extract. In the vein images, the region that are interested in is only the region which contains the information of the vein pattern. So, extract the region of interest from the filtered images. The centroid of the hand dorsal vein region is invariable, extracting ROI using this method can correct the local difference.

B) Gray scale conversion

The conversion of color image to gray scale image, the image size could be decreased from 24 bits in each pixel (color image) to 8 bits in each black and white pixel. This conversion sounds to be practical due to ability to be manipulated more easily. Since the light intensity may vary at different times, the gray scale distribution of vein images is different. To reduce these differences and thereby simplify the segmentation process, a method of gray scale normalization is adopted. Wavelet transform used to compress the image and the goal is to store image data in as little space as possible in file.

Wavelet compression can be either lossless or lossyFirst a wavelet transform is applied. This produces as many coefficients as there are pixels in the image (i.e., there is no compression yet since it is only a transform). These coefficients can then be compressed more easily because the information is statistically concentrated in just a few coefficients.

C) Contrast enhancement

The resulted images of dorsal hand veins possess low contrast. In a way that spots on vein pattern are indistinguishable. So, equal transfer functions (equalization) of histogram are helpful in improvement of veins pattern contrast. In equalization of histogram, a group of adjacent peaks are changed into a flat histogram. This causes dark pixels seem darker and light pixels seem brighter. LBP is a powerful means of texture description. It is an efficient rotation invariant texture classification technique. The contrast enhancement labels the pixels of an image by comparing the neighbourhood of each pixel with the centre value and considering the binary value.

D) Local Thresh holding

Local thresholding is a way for conversion of black and white picture to a binaries show. The white pixel is 255 and black pixel is 0. This method in current paper is used on dorsal hand images to extract veins pattern. Easy and efficient usage of this method with dynamic local threshold has been approved. The similarity score of two vein images needs to be calculated as threshold value. It focuses on the design and analysis of a practical lossless image code, where the image data undergoes image compression. The resolution progressive compression is proposed which provides better coding efficiency and less computationally complexity.

E) Morphological processing

Morphological processing holds such a capability through which small or extra particles on an image could be taken out in a way that no damage threats larger particles or the pictured shape. Generally, morphology will be changes in binary geometrical structure with evaluation of structural elements. Thus, selection of size and structural element regarded to be a significant stage in morphological operation. The major operation includes abrasion and enlargement that add or reduce few pixels from binary images according to rules of neighborhood pixels in the pattern. Abrasion operation shrinks size of image; however changing volume operation enlarges its geometrical size.

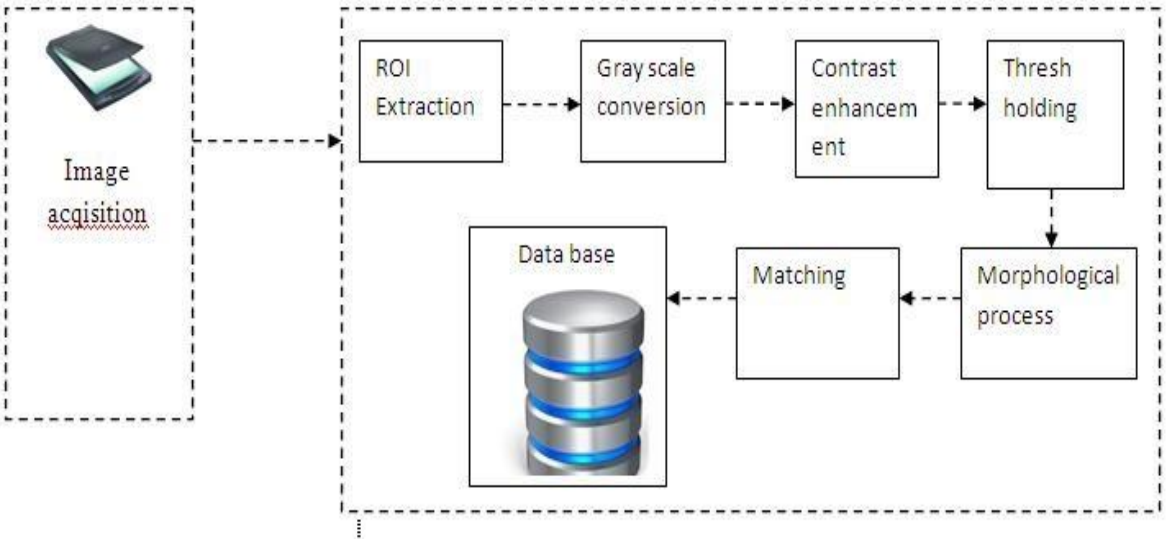
Images require substantial storage and transmission resources, thus image compression is needed to reduce the storage requirements. It covers some background of wavelet analysis, data compression and how wavelets have been and can be used for image compression. It examines a set of wavelet functions for implementation in a still image compression system and discusses important features of wavelet transform in compression of still images, including the extent to which the quality of image is degraded by the process of wavelet compression and decompression. The method of information hiding in digital image in spatial domain. The Adaptive algorithm created a database of hand dorsal vein images and simulate the actual application environment. Each image was captured at different times and some of them have shift and rotation.

III. PROPOSED SYSTEM

The proposed project hand vein biometrics is a recent technology that offers system for identification /authentication which overcomes the existing problem. For extracting the region of interest, the small algorithm that allows for automatic extraction of the region of interest by calculating the mean of each rows and columns and then compared to the threshold value. To enhance the contrast of the image, a double adaptive equalization contrast is applied to accentuate the vein contrast. The main objective of the wavelet transform is data compression which is used for signal analysis, image compression, sound processing and geology are the main application areas for wavelet. In the proposed method, the wavelets are discretely sampled in the discrete wavelet transforms. To extract the dorsal hand vein pattern, a single two dimensional wavelet transforms are used. Image compression is achieved by successive approximations of the initial information from the coarsest to the finest. A Binarisation technique is implemented to keep the pattern of the veins and also the vertical threshold and the horizontal thresholds are used. Hand vein pattern recognition offers one of the best results by their stability and unicity and also not expensive

with higher user convenience. Good recognition should have a good classification and good classification should have a perfect feature extraction. A New Adaptive texture extraction for the dorsal hand vein biometrics, which is the discrete wavelet transforms.

IV. SYSTEM ARCHITECTURE



A) Wavelet transform algorithm

Mathematics, a wavelet series is a representation of a square-integrable (real- or complex-valued) function by a certain orthonormal series generated by a wavelet. Nowadays, wavelet transformation is one of the most popular candidates of the time-frequency-transformations. This article provides a formal, mathematical definition of an orthonormal wavelet and of the integral wavelet transform.

Formal definition

A function $\psi \in L^2(\mathbb{R})$ is called an orthonormal wavelet if it can be used to define a Hilbert basis, that is a complete orthonormal system, for the Hilbert space$L^2(\mathbb{R})$of squareintegrable functions. The Hilbert basis is constructed as the family of functions $\{\psi_{jk} : j,k \in \mathbb{Z}\}$by means of dyadic translations and dilations of $\psi,\psi_{jk}(x) = 2^{\frac{j}{2}}\psi(2^j x - k)$ forintegers $j,k \in \mathbb{Z}$.

This family is an orthonormal system if it is orthonormal under the standard inner product on $\langle f,g\rangle = \int_{-\infty}^{\infty} f(x)\overline{g(x)}dx\ L^2(\mathbb{R}).$

$\langle \psi_{jk},\psi_{lm}\rangle = \delta_{jl}\delta_{km}$

where$\delta_{jl}$is the Kronecker delta. Completenessissatisfiedifeveryfunction$h \in L^2(\mathbb{R})$ may be expanded in the basis as

$h(x) = \sum_{j,k=-\infty}^{\infty} c_{jk}\psi_{jk}(x)$

with convergence of the series understood to be convergence in norm. Such are presentation of a function f is known as a wavelet series. This implies that an orthonormal wavelet is self-dual. The integral wavelet transform is the integral transform defined as

$[W_\psi f](a,b) = \frac{1}{\sqrt{|a|}}\int_{-\infty}^{\infty} \overline{\psi\left(\frac{x-b}{a}\right)} f(x)dx$

The wavelet coefficients c_{jk} are then given by

$c_{jk} = [W_\psi f]\left(2^{-j}, k2^{-j}\right)$

Here,$a = 2^{-j}$is called the binary dilation or dyadic dilation, and $b = k2^{-j}$ is the binary or dyadicposition.

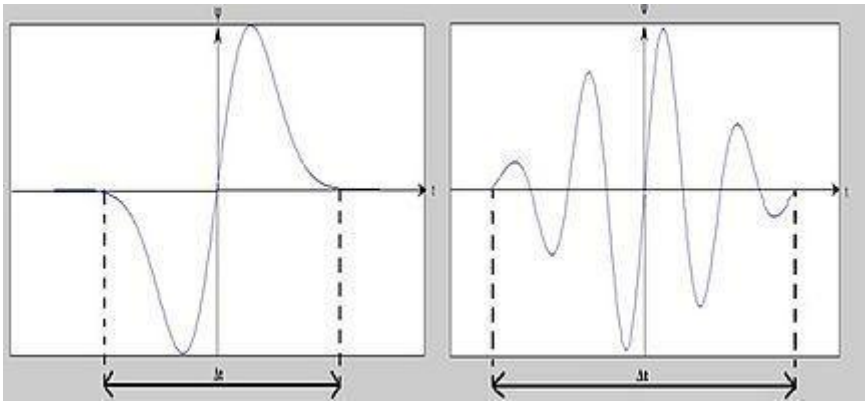
Basic idea

The fundamental idea of wavelet transforms is that the transformation should allow only changes in time extension, but not shape. This is effected by choosing suitable basis functions that allow for this. Changes in the time extension are expected to conform to the corresponding analysis frequency of the basis function. Based on the uncertainty principle of signal processing,

$\Delta t\Delta\omega \geqq \frac{1}{2}$

wheret represents time and ω angular frequency (ω = 2πf, where f is temporal frequency). The higher the required resolution in time, the lower the resolution in frequency has to be. The larger the

extension of the analysis windows is chosen, the larger is the value of Δt.



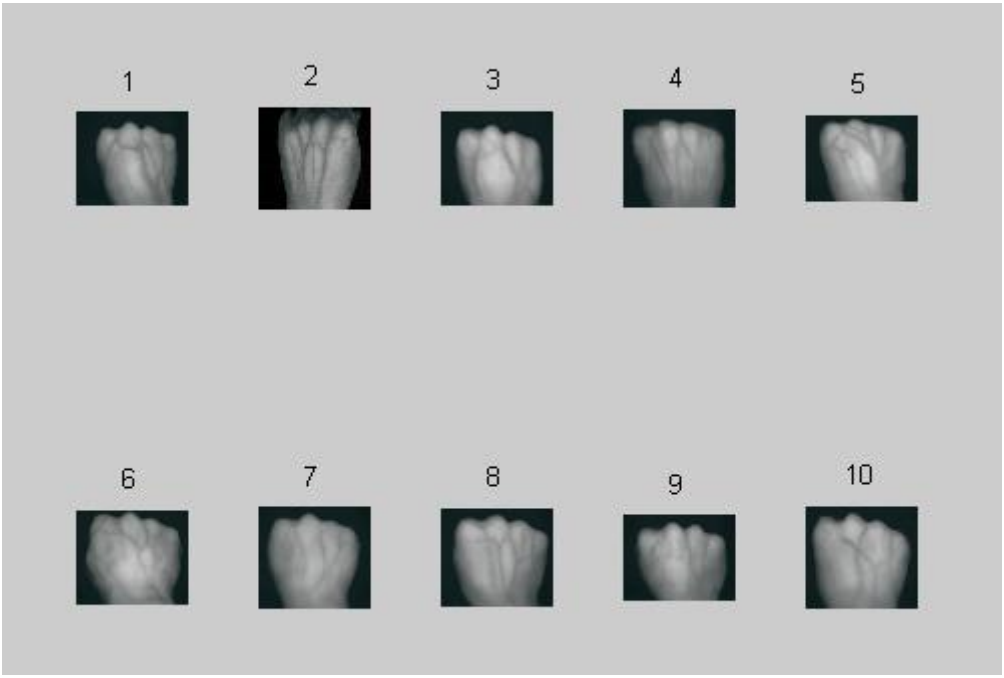
When Δt is large,

1. Bad time resolution
2. Good frequency resolution
3. Low frequency, large scaling factor

When Δt is small

1. Good time resolution
2. Bad frequency resolution
3. High frequency, small scaling factor

In other words, the basis function Ψ can be regarded as an impulse response of a system with which the function x(t) has been filtered. The transformed signal provides information about the time and the frequency. Therefore, wavelet-transformation contains information similar to the short-time-Fourier-transformation, but with additional special properties of the wavelets, which show up at the resolution in time at higher analysis frequencies of the basis function. The difference in time resolution at ascending frequencies for the Fourier transform and the wavelet transform is shown below.



V. CONCLUSION

A new hand-dorsal vein recognition method based on Partition Local Binary Pattern and the discrete wavelet transforms are proposed. To test the proposed algorithm, a database of hand dorsal vein images are created that consists of several images from distinct individuals. Having worked with wavelet gives us access to the multi resolution and it is a medium that allows the manipulation and extraction of contours which helps us a lot during the extraction even in the case where there is a bad capture and as you can found yourself pattern are

clearly visible and canbe well exploited in the recognition. Another extension to the original method is proposed which is actually termed as an Uniform patterns. The proposed method employed the hand dorsal vein images which combined to form the feature vectors of the tested sample and the targeted samples.

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