ISSN(Online) : 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 4, Issue 4, April 2016

A Survey on Human Identification using Palm-Vein Images using Laplacian Filter

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ABSTRACT: In the modern world, security is one of the important issue in all the fields. This security is often given by ID-cards, passwords and pin numbers. But these kind of securities are easily mislaid, misused, stolen, forgot and theft. So one of important parameter to improve the security level is Biometrics. This paper presents human identification using palm vein images. The proposed approach is done by using Laplacian filter. Initially the image is pre-processed and apply wavelet transform to remove the unwanted portion of images and the features are extracted to obtain a good resolution. And ROI region and image enhancement are obtained. Finally Laplacian filter is applied to obtain key points in an image which is stored in data base and this is used for identification and verification purpose. In this context, the proposed approach is also compared with Gabor filter. When compared to Gabor, Laplacian gives more key points and resolution. For the implementation of this proposed work we use the MATLAB R 2011b version.

KEYWORDS*:* Palm Vein,Discrete Wavelet transform, image enhancement, Laplacian Filter.

I. INTRODUCTION

Human palm vein authentication technology is the technology which uses palm veins for authentication purpose. Palm vein authentication technology is an example of biometric security system. We use passwords, locks, I-cards etc. for security. And also some biometric security systems like finger print, palm print, face recognition, gesture recognition, iris scan etc. If passwords, electronic I-cards are used for security then there is possibility of forgetting it. And when using other biometric security system then also possibility of duplicity and Hacking. But palm vein authentication technology is more secure & less expensive technology. The image of a human palm consists of palmar friction ridges and flexion creases. Latent palm print identification is of increasing importance in forensic applications since around 30% of the latent prints lifted from crime scenes (from knifes, guns, steering wheels) are of palms rather than of fingers. Similar to fingerprints, latent palm print systems utilize minutiae and creases for matching. While law enforcement and forensics agencies have always collected fingerprints, it is only in recent years that large palm print database are becoming available.

II. RELATED WORK

In [1] authors use partitioned Fourier transform for human identification. Retinal image is one of the robust and accurate biometrics. A new biometric identification system base on Fourier transform and that special partitioning presented in this article. In this method, at first, optical disc is localized using template matching technique and use it for rotate the retinal image to reference position. Fourier transform coefficient and angular partitioning of these coefficients is used for feature definition. In (2) authors use two new approaches to improve the performance of palm-vein-based identification systems presented in the literature. 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. In (3) author Palm vein authentication has high level of accuracy because it is located inside the body and does not change over the life and cannot be stolen. This paper presents an analysis of palm vein pattern recognition algorithms, techniques, methodologies and systems. It discusses the technical aspects of recent approaches for the following processes; detection of region of interest (ROI), segment of palm vein pattern, feature extraction, and matching. The results show that, there is no benchmark database exists for

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palm vein recognition. In (4) authors used gabor filter for human identification and verification. This approach provides low resolution when compare to laplacian filter.

III. PROPOSED ALGORITHM

This section illustrates the overall technique of our proposed human identification using palm vein images. The feature extraction and matching approach that can effectively accommodate the potential image deformations, translational and rotational variations by matching to the neighbourhood of the corresponding regions and generating more reliable matching scores. This approach performs very well even with the minimum number of enrolment images (one sample for training). Our proposed method shows its robustness and superiority. Pre-processing, 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 enrolment images (one sample for training) .This palm vein identification method shows its robustness and superiority. The junction point approach extracts palm-vein features by analysing 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.

(1) BIOMETRIC

Biometric recognition, or simply biometrics, is the science of establishing the identity of a person authentication. Desirable of a good biometric system are accurate discrimination between individuals, ease of use, social acceptability, secure and robust against potential attackers.

Biometric System

This section illustrates the overall technique of our proposed human identification using palm vein images. The feature extraction and matching approach that can effectively accommodate the potential image deformations, translational and rotational variations by matching to the neighbourhood of the corresponding regions and generating more reliable matching scores. This approach performs very well even with the minimum number of enrolment images (one sample for training). Our proposed method shows its robustness and superiority . Pre-processing, 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 enrolment images (one sample for training) .This 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.

(2) DISCRETE WAVELET TRANSFORM

The wavelet transform (WT) has been adopted as the standard tool in JPEG2000 still image compression as it produces a higher compression ration than the DCT does. Studies of image compression also show that the wavelet transform provides better frequency and time resolution than other transform techniques do. The DFT gives an excellent description of the frequency response of a signal, but no information about when particular frequency components occur in time. The Short Time Fourier Transform(STFT) improves the DFT by breaking the signal into intervals of fixed length and applying the Fourier analysis to each interval. A particular frequency response that occurs only at a certain interval be captured with STFT. However, fixed length intervals is good for identifying local variation in time (space), it is inadequate to describe frequency response whose cycles exceed the length of the interval. The major changes from (from the low-pass). It is important STFT to WT are perhaps the selection of base functions and the windowing operation. A base function of wavelet transform can be any function with zero mean and finite energy

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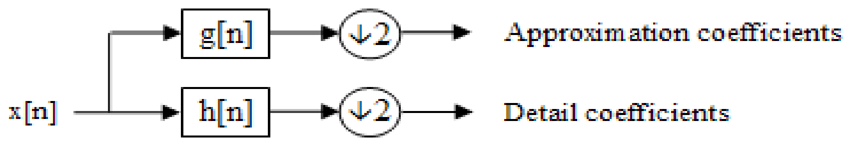
(called the wavelet). The entire set of base functions are mutually orthonormal (like sinusoidal bases) and generated from a single base function (called the mother wavelet) by scaling and translation. In WT, a base function is locally applied to a particular area of the signal at a time. Localization is realized through windowing, where the size of the window, including resolution, unlike the fixed interval used in STFT, is not a constant. Only the base function whose scale is compatible with the size of the window used. As a result, base functions of slower cycles are used under a larger window, while base functions of faster cycles are under a shorter window.

In the case of data compression, the implementation of DWT is similar to that of sub-band coding, where at each stage a coarse overall shape and details of the data obtained from the previous stage are derived. Encoding in the DWT proceeds with decomposition and down sampling. Decomposition separates data into frequency bands via high-pass and low-pass filtering. The functions of high-pass filter are the WT base functions, while the functions of the low-pass filter are the complements of the base functions. Down sampling remove data, which is not needed for future reconstruction. Decoding on the other hand involves up sampling to adjust dimensionality and recombining data from different bands. The output from high-pass and low-pass filtering is called as the filtered transform coefficients as shown in figure 2.



Block diagram of DWT

(3)FEATURE EXTRACTION

Here the main goal is to extract the existing features of the palm vein pattern, from an image, then it will be used for matching. If the image is an enrolled sample, the features are saved in a training database for later matching. Once the features are extracted, they are compared with the ones in the database and based on that comparison a decision is taken.

(3.1) SHAPE FEATURE

It is essential to locate the endpoints of each principle line for some palm print identification and verification systems. Palm print consists of lots of ridges and fine wrinkles with various directions, lengths and thicknesses. According to the palm's shape, can get easily get the corresponding geometry features, such as width, length and area. Let be the central palm image, and then apply morphological operations. Skeletonising the central palm area, then perform thinning operation on the skeletonised image. After that, extract the patterns of each thinned palm images. The shape features is further used for palm matching. The length and thickness various for each image in the database.

(3.1.1) SOBAL FILTER

Edges characterize boundaries and therefore a problem of fundamental importance in image processing. Edges in images are areas with strong intensity contrasts a jump in intensity from one pixel to the next. Edge detecting an image significantly reduces the amount of data and filters out useless information, while preserving the important structural properties in an image. There are many ways to perform edge detection. However, the majority of different methods may be grouped into two categories, gradient and laplacian.

The gradient method detects the edges by looking for the maximum and minimum in the first derivative of the image. The laplacian method searches for zero crossing in the second derivative of the image to find edges. An edge has the one -dimensional shape of a ramp and calculating the derivative of the image can highlight its location.

Clearly, the derivative shows a maximum located at the center of the edge in the original signal. This method of locating an edge is characteristic of the "gradient filter" family of edge detection filters and includes the sobel method.

(3.2) TEXTURE FEATURE

Texture provides a high-order description of the local image content. The analysis of texture requires the identification of those texture attributes which can be used for segmentation, discrimination, recognition or shape

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computation. Historically, structural and statistical approaches have been adopted for texture feature extraction. The structural approach assumes that the texture is characterized by some primitives following a placement rule.

In order to describe a texture one needs to describe both the primitives and the placement rule. The description should be sufficiently flexible so that a class of equivalent textures can be generated by using similar primitives in similar relationships. Although there has been reported by progress in this area, the approach is restricted by the complications encountered in determining the primitives and the placement rules that operate on these primitives. Therefore, textures suitable for structural analysis have been confined to quit regular textures rather than more natural textures in practice.

(4)REGION OF INTEREST

The input hand images had to pass through series of pre-processing steps to get palm-print region of interest. The region of interest contains majorly three principal lines, wrinkles and ridges. Principal lines are called the heart line, the head line and the life line, Figure shows three examples of rectangular palm-print region of interest cropped automatically from input hand images.

(5) 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 but should be automatically generated for contactless imaging.

(6)HISTOGRAM EQUALIZATION

This method usually increases the global contrast of many images, especially when the usable data of the image is represented by close contrast values. Through this adjustment, the intensities can be better distributed on the histogram. This allows for areas of lower local contrast to gain a higher contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values.

The method is useful in images with backgrounds and foregrounds that are both bright or both dark. In particular, the method can lead to better views of bone structure in x-ray images, and to better detail in photographs that are over or under-exposed. A key advantage of the method is that it is a fairly straightforward technique and an invertible operator. So in theory, if the histogram equalization function is known, then the original histogram can be recovered. The calculation is not computationally intensive. A disadvantage of the method is that it is indiscriminate. It may increase the contrast of background noise, while decreasing the usable signal.

In scientific imaging where spatial correlation is more important than intensity of signal (such as separating DNA fragments of quantized length), the small signal to noise ratio usually hampers visual detection.
Histogram equalization often produces unrealistic effects in photographs, however it is very useful for scientific images like thermal, satellite or x-ray images, often the same class of images to which one would apply false-color. Also histogram equalization can produce undesirable effects (like visible image gradient) when applied to images with low color depth. For example, if applied to 8-bit image displayed with 8-bit gray-scale palette it will further reduce color depth (number of unique shades of gray) of the image. Histogram equalization will work the best when applied to images with much higher color depth than palette size, like continuous data or 16-bit gray-scale images.

(7) 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. First estimate the background intensity profiles by dividing the image into slightly overlapping 32 blokes (three pixels overlapping between two blocks to address the blocking 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 bi-cubic 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.

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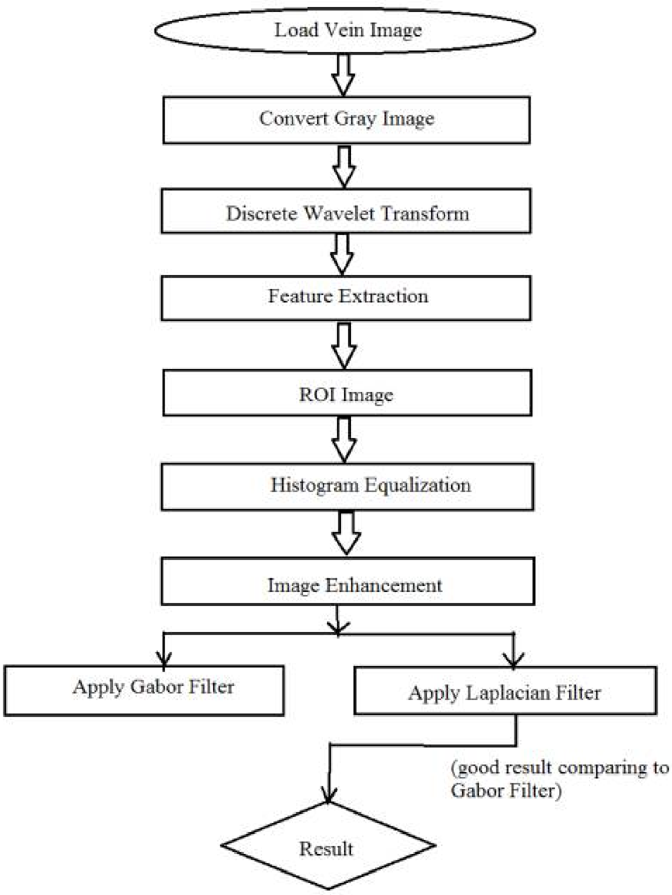
(8)LAPLACIAN FILTER

The Laplacian pyramid is ubiquitous for decomposing images into multiple scales and is widely used for image analysis. However, because it is constructed with spatially invariant Gaussian kernels, the Laplacian pyramid is widely believed as being unable to represent edges well and as being ill-suited for edge-aware operations such as edge-preserving smoothing and tone mapping. To tackle these tasks, a wealth of alternative techniques and representations have been proposed, e.g., anisotropic diffusion, neighbourhood filtering, and specialized wavelet bases. While these methods have demonstrated successful results, they come at the price of additional complexity, often accompanied by higher computational cost or the need to post-process the generated results. In this paper, we show state-of-the-art edge-aware processing using standard Laplacian pyramids. We characterize edges with a simple threshold on pixel values that allows us to differentiate large-scale edges from small-scale details. Building upon this result, we propose a set of image filters to achieve edge-preserving smoothing, detail enhancement, tone mapping, and inverse tone mapping. The advantage of our approach is its simplicity and flexibility, relying only on simple point-wise nonlinearities and small Gaussian convolutions; no optimization or post-processing is required. As we demonstrate, our method produces consistently high-quality results, without degrading edges or introducing halos.

IV. WORK FLOW



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IV. SIMULATION RESULTS

The simulation studies involve the survey on Human Identification Using Palm-vein Images using Laplacian filter using MATLAB. Figure 1 shows the input image of human hand which identify the palm-vein image. Figure 2 shows the output of discrete wavelet transform it contains four segment the first image is approximation image and remaining three detailed images. The feature extraction contains two types of features first Figure 3 shows the shape feature. And then the figure 4 shows texture feature. Figure 5 shows the region of interest of the human palm. Figure 6 shows the cropped image of human palm. Figure 7 shows the feature enhancement because the vein image is low contrast in this feature enhancement increasing the contrast level. Figure 8 shows the final result of the project the sharpened palm vein images using laplacian filter.

Figure: 1. Input Image

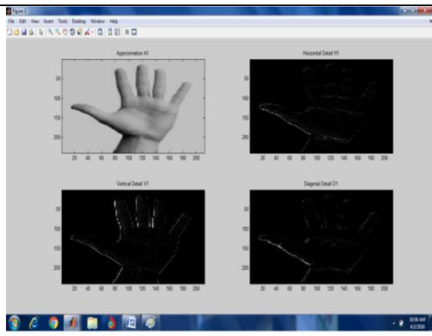

Figure: 2. DWT

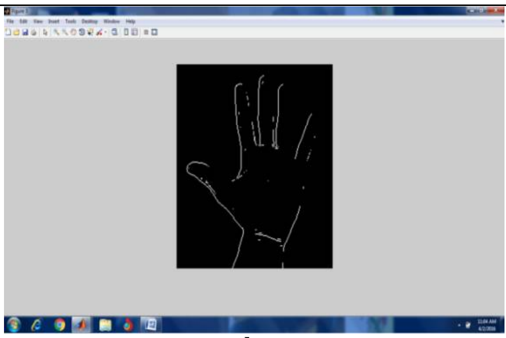

Figure: 3. Shape Feature

Figure: 4. Texture Feature

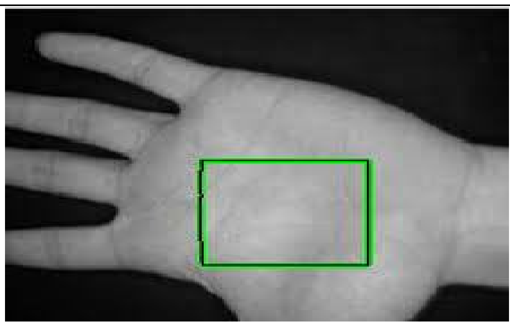

Figure: 5. ROI Image

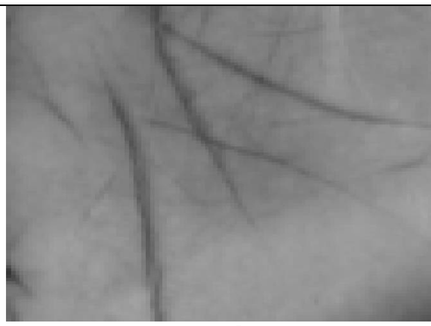

Figure: 6. Palm Image

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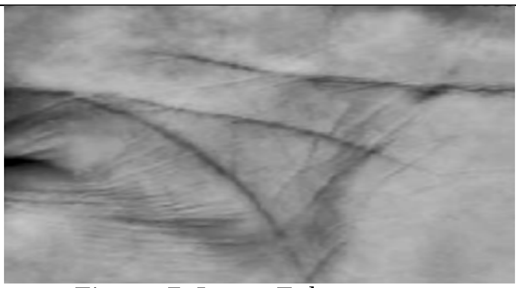

Figure: 7. Image Enhancement

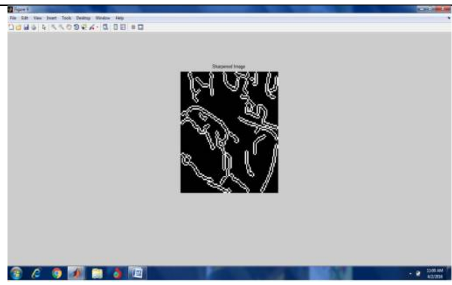

Figure: 8. Laplacian Filter

V. CONCLUSION AND FUTURE WORK

In this paper, 'Human Identification Using Palm-Vein Images Using Laplacian 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 Laplacian filter is created and convolution on the enhanced images and convolution images as feature vectors. The paper is implemented using palm-vein recognition to get best features for verification using MATLAB and this is very helpful in various fields.

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BIOGRAPHY

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