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Review On: Finger Vein Detection Using Repeated Line, Even Gabor and Median Filter

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***Abstract*— Vein pattern is the network of blood vessels beneath a person's skin. This vein pattern can be used to authenticate the identity of an individual. The finger-vein patterns are believed to be quite unique, even in the case of identical twins and even between the different fingers of an individual. There are various methods to obtain finger vein network as presented in the literature. Although these methods produce good result but still have some limitations. Considering the limitation and analyse previous methods, we present repeated line tracking, even Gabor filter and median filter. In research we use automatic trimap generation [2,3].The work focuses on study and performance evaluation of these categories using MATLAB 2012a.**

***Keywords:-* Finger vein, biometric system, Line tracking, Gabor filter, median filter**

I. INTRODUCTION

The uniqueness and permanence of the finger image are very well-known. Finger image which have been used for about 100 years are the oldest biometrics signs of identity, scientific studies on finger image where initiated in the late century. Archaeological artefacts prove those finger images were already used by the ancient Assyrians and Chinese as a form of identification of a person. The first scientific studies on finger image date from the late sixteen century, but the fundamentals of modern finger image identification methods were provided at the end of nineteenth century. The studies of Sir F. Galton and E. Henry led to formally accept finger image as valid signs of identity by law Enforcement agencies. Finger image consists of both finger texture and finger-vein image. Fingerprint is the most mature hand based biometric method where it has been used in many applications for years. However, fingerprint based biometric system is vulnerable to forgery because the fingerprints are easily exposed to the others. In addition, the condition of the finger's surface such as sweat and dryness can prevent a clear fingerprint pattern from being obtained. This can degrade the system's performance. 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 recognition had been researched. They proved that each finger has unique vein patterns so that it can be used in personal verification. Finger vein based biometric system has several benefits when compared with other hands based biometric methods. First, the finger vein pattern is hard to replicate since it is an internal feature. In addition, the quality of the captured vein pattern is not easily influenced by skin conditions. Moreover, as compared with palm vein based verification system, the size of the device can be made much smaller[1,5]. Lastly, finger vein recognition does not require contact between the finger and sensor, which is desirable for a hygienic viewpoint. Most of the current available approaches for finger vein recognition have similarities on the feature extraction method which utilized the features from the segmented blood vessel network for recognition. But the foundations of modern finger print identification were established by the studies of sir F.Galton and E.Henry at the end of 19th century. Finger image is formed of composite curve segments. The light areas of finger image are called ridges while dark areas are called valleys. The Galton's study introduced the minutiae, which are local discontinuities in the ridge patterns as discriminating features and showed the uniqueness and permanence of minutiae. According to F Galton finger image of a person is permanent i.e. it preserves its characteristics and shape from birth to death. Finger image of individual is unique. According to E.R.Henry, the systematic way of partitioning the finger image classes was so profound that it was traditionally used by almost all of government security force. By using the ideas above the finger image, are partitioned by the Henry classification and comparing Galton features carries out extract matching [4]. The Galton feature details formed on ridges are defined as single curve segment. The Combination of several ridges is formed by crossing and ending of the ridges are called minutiae in finger image literature. These things are shown in figure 1 as below

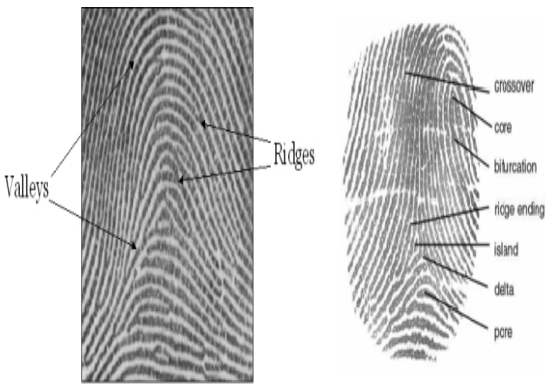

Figure1. Basic diagram of finger vein

With the increasing power of computer, automated system have been developed to automate the tedious manual classification and matching method of finger image. There are two types

1. Automatic Finger image Authentication System (AFAS).
2. Automatic Finger image Identification System (AFIS).

In AFAS the input is an identity and a finger image, the output is an answer of yes or no indicating whether the input image belongs to the person whose identity is provided. The system compares the input image with the one addressed by identity in the data base. In AFIS the input is just a finger print and the output is a list of identities of persons that can have the given finger image and a score for each identity indicating the similarity between the two finger image. It is possible to provide partial identity information to narrow the search space. The System compares the input image with many records in the database. Recognition is defined as a process involving perception and associating the resulting information with one or combination of more than one of its memory contents. Visual perception means deriving information from a specific scene. Biometrics systems have been an important area of research in recent year. There are two important utilization of biometrics system: first is Authentication or Verification of person's identity and second is Identification in which a person's identity is sought using biometrics scene available [7,8]. Any physiological or behavioral characteristics can be used to make personal identification as long as it satisfies the requirements like universality, uniqueness, performance, collect ability and Permanence.

II. Finger Image Features

Finger image consists of both finger texture and finger-vein image. The most common representation used in Finger image identification is the Galton features. A ridge can be defined as a single curve segment. The combination of several ridges forms a finger image pattern. The small features formed by crossing and ending of ridges are called minutiae. Ridge Ending & Bifurcation are taken as the distinctive features of finger image. In this method the location & angle of the feature are taken to represent the finger image & used in the matching process. Together with these, finger image contains two special types of feature called core & delta points. The core point is generally used as a reference point for coding minutiae & defines as the topmost point on the innermost recurring ridge. The core & delta are also called the singularity points. The finger-vein patterns are believed to be quite unique, even in the case of identical twins and even between the different fingers of an individual. There are two key factors that are cited for the preference of finger-vein biometrics. First, the finger veins are hidden structures; it is extremely difficult to steal the finger-vein patterns of an individual without their knowledge, therefore offering a high degree of privacy. Second, the use of finger-vein biometrics offers strong antispoofing capabilities as it can also ensure liveness in the presented fingers during the imaging [5,9].

III. Finger Image Recognition

The acquired finger images are noisy with rotational and translational variations resulting from unconstrained imaging. Therefore, the acquired images are first subjected to pre-processing steps that include:

1) ROI Extraction
2) Image Resizing
3) Image Enhancement

The enhanced and normalized ROI images are employed for feature extraction.

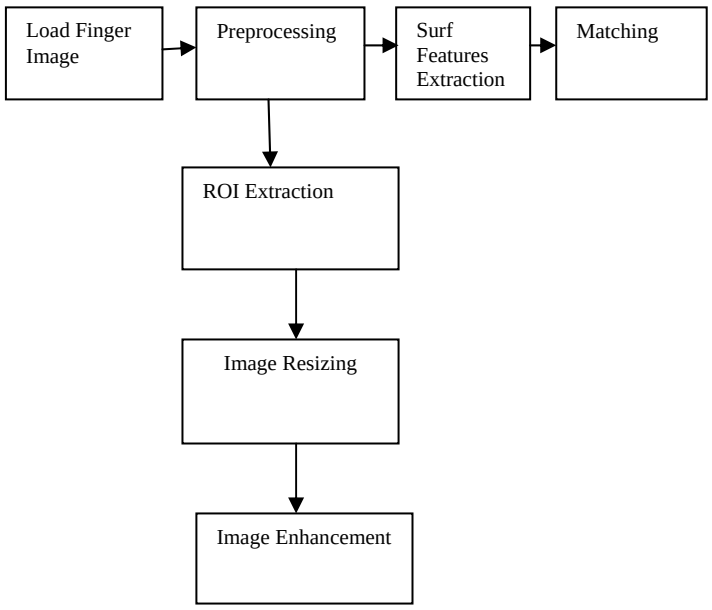

Figure 2. Block diagram illustrating key steps employed for the pre-processing of acquired finger-vein images

IV. Main Block Diagram Of Finger-Vein Image Processing

Fingerprint is the most mature hand based biometric method where it has been used in many applications for years. However, fingerprint based biometric system is vulnerable to forgery because the fingerprints are easily exposed to the others. In addition, the condition of the finger's surface such as sweat and dryness can prevent a clear fingerprint pattern from being obtained. This can degrade the system's performance. 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 recognition had been researched. They proved that each finger has unique vein patterns so that it can be used in personal verification. Finger vein based biometric system has several benefits when compared with other hands based biometric methods. First, the finger vein pattern is hard to replicate since it is an internal feature. In addition, the quality of the captured vein pattern is not easily influenced by skin conditions. Moreover, as compared with palm vein based verification

system, the size of the device can be made much smaller. Lastly, finger vein recognition does not require contact between the finger and sensor, which is desirable for a hygienic viewpoint. Most of the current available approaches for finger vein recognition have similarities on the feature extraction method which utilized the features from the segmented blood vessel network for recognition [10].

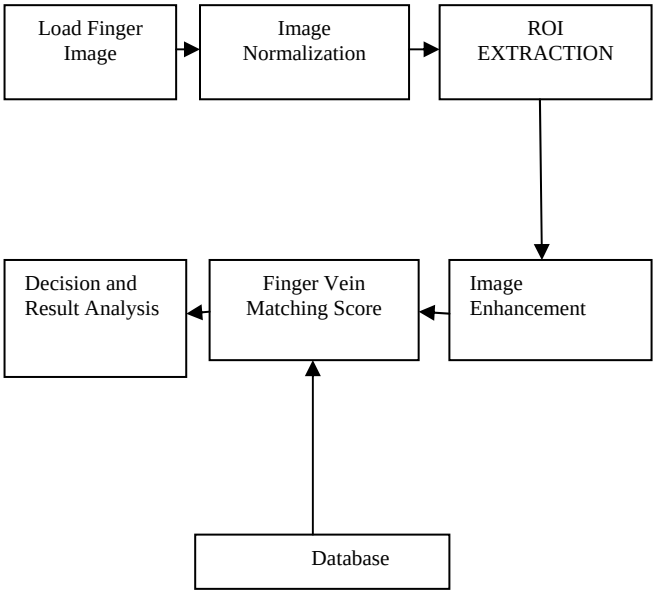

Figure 3: Diagram of Proposed system.

V. Different Techniques Of Identification

A. Repeated line Tracking and Gabor Filter:

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:

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

B. Median Filter**:**

We have seen that smoothing (low pass) filters reduce noise. However, the underlying assumption is that the neighboring pixels represent additional samples of the same value as the reference pixel, i.e. they represent the same feature. At edges, this is clearly not true, and blurring of features results. You have used convolution techniques to implement weighting kernels as a neighborhood function, which represented a linear process. There are also nonlinear neighborhood operations that can be performed for the purpose of noise reduction that can do a better job of preserving edges than simple smoothing filters. One such method is known as median filtering. In median filtering, the neighboring pixels are ranked according to brightness (intensity) and the median value becomes the new value for the central pixel. Median filters can do an excellent job of rejecting certain types of noise, in particular, “shot” or impulse noise in which some individual pixels have extreme values. In the median filtering operation, the pixel values in the neighborhood window are ranked according to intensity, and the middle value (the median) becomes the output value for the pixel under evaluation. In particular, compared to the smoothing filters examined thus far, median filters offer three advantages:

1. No reduction in contrast across steps, since output values available consist only of those present in the neighborhood (no averages).
2. Median filtering does not shift boundaries, as can happen with conventional smoothing filters (a contrast dependent problem).
3. Since the median is less sensitive than the mean to extreme values (outliers), those extreme values are more effectively removed.

VII. Conclusion

To implement an algorithm for human identification from the finger vein image. Propose an enhanced Human Identification algorithm Using Finger Vein which will base on Repeated Line Tracking, Even Gabor and Median Filter. Better Average Recognition Performance and PSNR results of Enhanced Human Identification Using Finger Vein. we propose enhanced Human Identification Using Finger Vein algorithm which will assure quality of result with respect to other Human Identification Using Finger Vein technique. And use enhanced Human Identification Using Finger Vein algorithm thus providing high tier security.

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