3D PALMPRINT IDENTIFICATION FOR FASTER AND MORE ACCURATE MATCHING

Sabeena E.R,
PG student, Department of CSE
Ponjesly College of Engineering,
Nagercoil, Tamilnadu.

Manju C. Thayammal
Associate Professor,Department of CSE
Ponjesly College of Engineering,
Nagercoil, Tamilnadu.

Abstract- A palm-print refers to an image acquired of the palm region of the hand. It can be either online image or offline image. Palm-print contains the information such as texture, and marks which can be used when comparing to one palm to another. Palm-print with larger inner surface of hand contains many features such as principle lines, ridges and textures. Palm-print can be used for person identification and commercial applications with high confidence. 3D palm-print method is used in palm-print identification. Although two-dimensional palm-print identification is accurate, the 2D palm-print images do not have much depth information about the image. The results of three-dimensional palm-print technique have high recognition performance. The three-dimensional palm-print recognition has the capability of avoiding replicas and it is more robust to variations by illumination. The 3D feature is binary and more efficiently computed. It encodes the 3D shape of palm-print to either convex or concave. Palm vein is one of many features that can be used in biometrics. Several advantages of palm vein are that they are not easily damaged and are rather difficult to reproduce because it is located deep inside the skin layer. Palm veins cannot be seen with normal eyes or with ordinary cameras. The study of the biometric recognition system uses local binary mode rotation invariant (LBPROT) as the feature extraction method on palm vein image.

Keywords: *convex, contactless palm-print matching, encoding, textures, 3D palm-print, 2D palm-print.*

I. INTRODUCTION

A palm-print refers to an image acquired of the palm region of the hand. It can be either an online image or offline image. The palm itself consisting of principal lines, wrinkles and ridges. It differs to a finger print in that it also contains other information such as texture and marks which can be used for comparing one palm to another. Palm-prints can be used for criminal, forensic or commercial applications.

Palm-print matching is a comparison of two given palm-prints and returns either yes or no decision. In palm-print matching two kinds of matching strategies are used.

- One-to-one matching
- One-to-many matching

In one-to-one matching the hamming distance between the codes with same position is returned as the final distance. In one-to-many the code in one template matrix is matched to the neighbourhood of the corresponding code in another matrix and the minimum hamming distance is returned as the final distance.

3D palm-print contains the depth information of the palm surface, while 2D palm-print contains plenty of textures. It uses state-of-art methods. The state-of-art method is used for the highest level of general development of a device, technique achieved at a particular time. The state-of-art method is used for online palm-print identification. The two strategies are

- One-to-one matching
- Binary representation

These two arguments are used to develop a new approach for 2D palm-print reffered to as fast matching. The Ordinal Code, robust line orientation code (RLOC) and the competitive code (Comp Code) can be considered as most competing and state-of-art palm-print identification methods reported in the literature. These methods are highly efficient and suitable for the online palm-print matching and therefore can be considered as competing. During the feature extraction stage, both of the Comp Code and RLOC use six spatial filters to extract dominant texture orientation and generate one feature template. In the matching stage, they use one-to-one matching strategy and one-to-many matching strategy respectively. The feature extraction stage of the Ordinal Code only use two filters to extract feature and for each probe, the processing is repeated three times and therefore three feature templates are generated. In the matching stage, it employs one-to-one matching strategy and the sum of three distances is the final matching distance. These three competing methods using pre-template generation, number of encoding classes for each code and matching strategy. There are two key challenges in accurately matching two palm-print images. The first one is relating to the accurate representation of features which is seriously influenced by the noise introduced on the surface due to sweat, dirt, etc. The other challenge is resulting from inaccurate alignment of matched palm-prints which is mainly contributed from the palm-print deformations due to surface pressure such as stretching, as palm is not a rigid surface.

1.1 A framework for palmprint matching

In order to comparatively analyse most promising and competing palmprint identification methods in the literature, we firstly present a generalized framework. Assuming that all the palmprint images in the dataset are pre-processed, such as the image normalization and the region of interest segmentation, this framework is generalized to unify feature extraction and matching stage for the palmprint identification. The feature extraction stage consists of pre-template generation followed by their consolidation in encoding stage.

The $T1, T2 \ldots$ describe the intermediate results usually generated by the convolution operation between filters and the pre-processed probe. Encoding of these multiple intermediate results generates the final feature template which can effectively characterize the palmprint image. The encoding operation is usually some kind of voting technique, like max or min operation. The two matching strategies used are (a) One-to-one and (b) one-to-many matching strategy. Supporting Tk represents the max value over other pre-templates, then k is marked as the feature of current position.

The probe template, regarded as feature, is matched to templates generated from the gallery. Each template can be seen as a feature matrix, each entry on the matrix is an encoded feature code. The feature code is generated by voting scheme from several pre-templates. Distance between the two templates is defined as the sum of distance between such codes. There are two kinds of prominent template/feature matching strategy successfully used in the literature, *i.e.* (a) *one-to-one* and (b) *one-to-many* matching strategy. For one-to-one matching strategy, the Hamming distance between the codes with same position is returned as the final distance. For one-to-many matching strategy, the code in one template matrix is matched to the neighbourhood of the corresponding code in another matrix, and the minimum Hamming distance is returned as the final distance.

II. RELATED WORK

In two dimensional palm-print identification the images can be easily forged which will threaten the security of palm-print authentication system. Two dimensional images are easily affected by noise such as scrabbling and dirty in the palm. Due to misalignment of matched palm-print the matching time also gets increased [1]. 2D palm-print contains plenty of textures while 3D palm-print contains depth information of the palm surface [3]. The 2D palm-print identification cannot identify the convex and concave images. In order to overcome these drawback three dimensional palm-print identification systems is developed.

In the verification experiment, each sample is matched to the other samples to generate genuine score [2]. The comparison between this method and orientation-feature conforms that the proposed method is significantly more accurate, efficient and results in small template size.

III. PROPOSED SYSTEM

In proposed system the method used is Local Binary Pattern Rotation Invariant(LBPROT). Biometrics system using palm vein can be used for security purposes. The LBPROT method is used to extract the feature from veins. After the 3D depth information of the 3D palm-print is obtained, a sub-area called Region Of Interest (ROI) of the 3D palm-print is extracted. Initially the image is captured by infrared sensor which senses the hand. When the hand is detected multiple light patterns are projected to the palm surface. Pre-processing is very important for the performance of character segmentation. These two methods can also be unified in our general palm-print identification framework.

A. Capturing of image

The device consists of infrared sensor to sense the hand. When the hand is detected multiple light patterns are projected to the palm surface. The system uses computer controlled LCD projector to generate arbitrary strip pattern. To distinguish between strips they are coded with different brightness. The quality of image produced by ant sensor is determined by the characteristics of the light present at the time of exposure. In order to record color information each pixel needs to be shown one color of light through a filter. Three different coloured filters are used to record and reconstruct the image as red, green, blur. These primary colors of light can be mixed in different quantities to form any other color of light. An array with a pattern of red, green, and blue filters is therefore placed in front of the image sensor to achieve color information.

In the palm-print identification for image acquisition, placed his/her palm and captured an image from a webcam or digital image. In the image, the fingers should be clearly separated from each other in order to obtain complete palm of the individual, and the background should be clean. Ideally the placement of the palm on the surface at verification and enrolment should be identical one, special marking provided on the surface of the finger where palm should be placed. Capturing good image which increase the accuracy. So taking snapshot of image is very important step in this method.

B. Segmentation and binary representation

The process of separating objects of interested from uninterested segment is called segmentation. Partitioning digital image in to multiple segments is called super pixel. It is used to analyse the image. Region of interest is done by intensity value of pixel. It is used to determine the area. The Region of Interest is a subset of samples within a dataset identified for a particular purpose. In binary representation 0’s and 1’s are used. The 0’s are considered as uninterested region and 1’s are considered as interested region. Image segmentation is typically used to locate objects and boundaries in images. Biometrics is used as one of many alternative methods in recognition systems. Palm vein is one of many features that can be used in biometrics. Several advantages of palm vein are that they are not easily damaged and are rather difficult to reproduce because it is located deep inside the skin layer. Palm veins cannot be seen with normal eyes or with ordinary cameras. The study of the biometric recognition system uses local binary mode rotation invariant (LBPROT) as the feature extraction method on palm vein image. The matching process itself determines the closest distance to the image by using the cosine distance. Binary images are the simplest type of images and can take on two values, typically black and white, or '0'and '1'. A binary image is referred to as a 1 bit/pixel image because it takes only 1 binary digit to represent each pixel. These types of images are most frequently used in computer vision applications where the only information required for the task is general shape, or outline information.

C. Matching and Identification

The one-to-one matching strategy is used in this method. Feature is binary representation, the Euclidian distance is the final distance. Euclidian distance is the distance between two images. If the distance is 0 then the image is matched.

The experimental results also demonstrate other key advantages in addition to improving the matching accuracy, which lies in significantly reduced template size, significantly reduced feature extraction time and the matching time, making it most suitable palm-print matching approach to-date, especially for large scale and online applications. These two arguments are evaluated for the 3D palm-print matching and used to propose a new method of 3D palm-print feature extraction and matching.

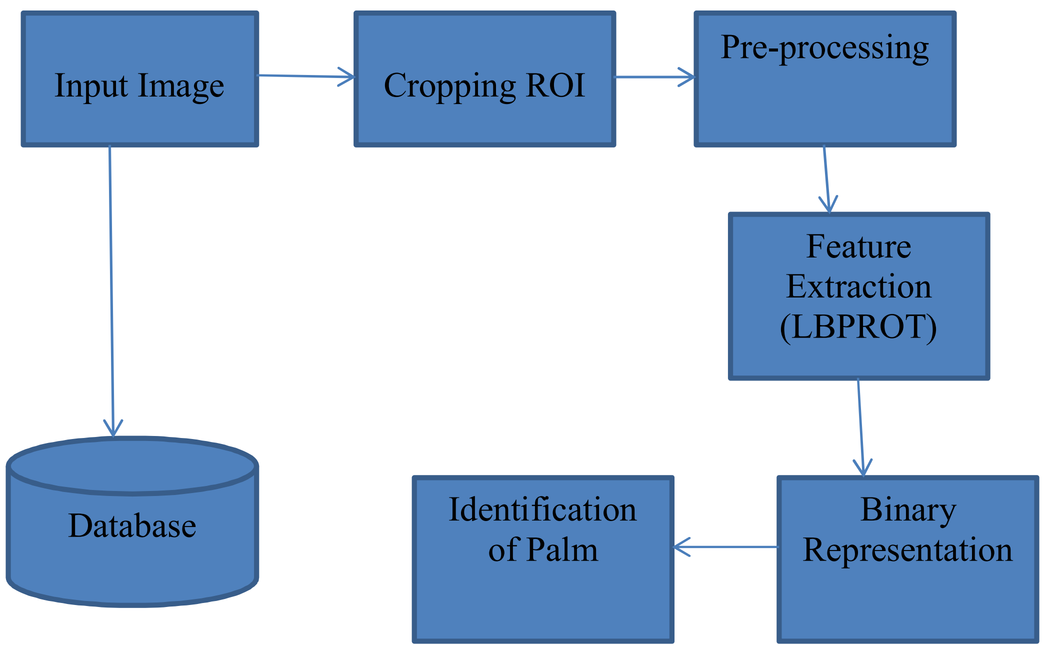

Figure 1: Architecture diagram

The Fig.1 explains the system architecture of palm-print identification. The palm-print image is captured using the sensor contained device. Using pre-processing technique the noise is removed. The image is segmented to extract the feature and finally the palm-print matching is identified.

IV. CONCLUSION

The experimental results on two publicly available contactless and contact-based databases suggest the proposed method is significantly faster, more accurate and results in the least template size. However it is not difficult to observe that our method of 3D palm-print identification is more accurate and also significantly faster which is primarily due to the simplicity of the feature extractor. One-to-one matching strategy is employed on both of these methods. The method not only achieves high performance but also results in reduced feature extraction time and matching time.

REFERENCES

1. W. Jia, D.-S. Huang, and D. Zhang, "palmprint verification based on robust line orientation code", pattern recognit., vol. 31, no. 5, pp.1504-1513, may 2008.

2. A.Kumar and D.Zhang, "Hand geometry recognition using entropy-based discretization,"IEEE Trans.Inf.Forensicssecurity,vol. 2,no. 2,pp. 181-187, jun.2007.

3. W. Li, L. Zhang, and D. Zhang, "Three Dimensional palmprint recognition", in proc. IEEE int. Conf. Syst., Man Cybern., oct. 2009,pp.4847-4852.

4. Z.Sun, T.Tan, Y.Wang, and S. Z. Li, "ordinal palmprint representation for personal identification [representation read representation]," in proc. IEEE Comput. soc. Conf. Comput. Vis. Pattern Recognit., vol. 1. Jun. 2005, pp.279-284.

5. L.Zhang, Y.Shen, H. Li, and J. lu,"3D palmprint identification using block-wise features and collaborative representation,"IEEE Trans.pattern Anal. Mach. Intell.,vol. 37, no.8, pp.1730-1736, Aug.2015.