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# A Brief Review of Palm print recognition Techniques

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***Abstract*— during the past years, many efforts have been made to use palm prints as a biometric modality. However, most of the existing palm print recognition systems are based on encoding and matching creases, which are not as reliable as ridges. This affects the use of palm prints in large-scale person identification applications where the biometric modality needs to be unique as well as insensitive to changes in age and skin conditions. Palm print recognition is considered the most suitable and reliable biometric recognition system owing to its merits, such as low cost, user friendliness, high speed and high accuracy. Using palm prints as a biometric modality many problems arises like skin distortion, computational complexity and diversity of different palm regions. There are several palm print authentication methods have been developed by various scientists like gobar filter, palm line matching, global features etc.**

***Index Terms*—skin distortion, computational complexity, Gobar filter, palm line matching.**

## 1. INTRODUCTION

Palmprint is the inner part of a person's hand. For centuries, the palm line patterns have commonly been believed to be able to predict a person's future. But its uniqueness and capacity for differentiate individuals has come to fore only recently [1].THE human palm consists of two main attributes: flexion creases and friction ridges. Flexion creases are formed due to the folding of the palm. The three most salient flexion creases, named major creases or principal lines, divide the palm into three regions: thenar, hypothenar, and interdigital ( Fig. 1). The palm also include many minor creases, which are not as permanent as the major creases. Friction ridges are composed as a result of a buckling instability in the basal cell layer of the fetal epidermis. And an imaging resolution of about 500 ppi is needed to observe the ridge feature. The patterns formed by the friction ridges on the palm are both identical and persistent, making it useful as a biometric trait for person identification [2].

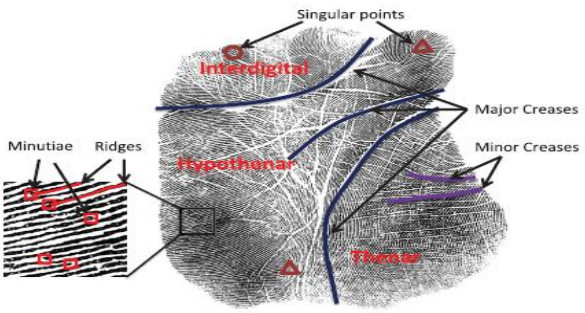


Fig. 1. Crease and ridge features in a palmprint.

Biometric consists of the automatic identification of an individual based on his physiological or behavioral properties. Fingerprint, iris, ear, pamlprint, face etc. is assumed physiological biometrics, based on straight measurements of a part of the human body. Voice, signature and etc. are regarded behavioral biometrics, they are based on measurements and data obtained from an action and consequently indirectly measure characteristics of the human body. The endured biometric verification system employs different biometric traits such as fingerprints, face, voice, iris, signature or palmprint are most common . Palmprint validation is a means of personal authentication that uses identical palmprint features Palmprint identification has gained high effect over other biometric modalities due to its reliability and higher user adoption. Palmprint based biometric depend on a persons principal lines, wrinkles , ridges on the surface of the palm, which leaves unchanged in individual life span [3]. There are two types of palmprint recognition system: high resolution and low resolution techniques. High resolution techniques implies high resolution images while low resolution approach implies low resolution images. High resolution approach is appropriate for forensic applications such as criminal observation, while low resolution is more capable for civil and commercial applications such as access control [4].


**Fig 2-**(a) a high resolution palmprint image and (b) a low resolution palmprint image [4].

### 1.1 PROBLEMS IN PALM RECOGNITION:

1.1.1 **Skin distortion:** Unlike the finger tip, the palm includes many joints and its size is much larger. As a result, distortion is quite famous between various impressions of the same palm and is much more crucial than the distortion of fingerprints. Fig. 2 gives an example of palmprints with distortion.

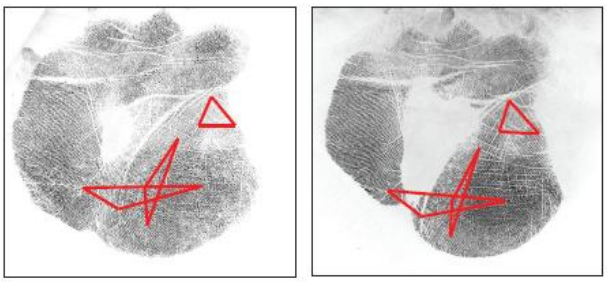

Fig. 2. A pair of mated palmprints with large distortion, as indicated by the corresponding triangles.

**1.1.2 Diversity of different palm regions**: Different regions of palm prints have varying quality and distinctiveness.

**1.1.3 Computational complexity**: Because palm prints in operational palm print databases are normally not placed in a common coordinate system, minutiae matching algorithms have to try all possible spinning and translation or all possible correlation of minutiae. Since palm prints contain much more minutiae than fingerprints, those matching algorithms which are usually adapted from fingerprint matching algorithms are very inefficient in

matching palm prints [2].

**1.2 METHODS:**

### 1.2.1Global Features:

These are methods that use information obtained from the complete palmprint at once. Therefore, no spatial information is used, and extracted features are related to the whole palm. Research using global statistical properties was short because it consists of performance by discarding spatial information. Such methods can find out what features a palm has, but not where those features are detected in the palm [4].

**1.2.2 Gobar Filter:**

Gabor filters have invited lot of attention in biometrics research Community, mainly because of its orientation decision,spatial localization and spatial frequency characterization. However, these Filters gives a limitation in bandwidth where only filters with the band width of one octave can be designed. Furthermore, large bandwidth Gabor filter introduces a important dc component [5].

Processing of Gabor techniques can be given by Figure 4

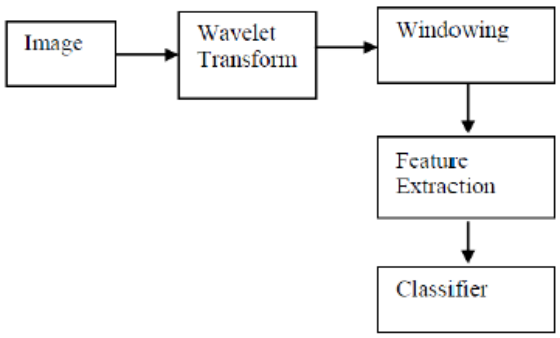


Figure 4: Block diagram of processing by Gabor technique [5].

**1.2.3 PALM LINE MATCHING:**

Template matching is a popular technique in pattern recognition for comparing a prestored template with a pattern [6]. (SIFT) Scale-Invariant Feature Transform and minutiae extraction methods were implemented for full to full and partial to full palmprint verification.The block diagram of the full-to-full palmprint matching system is shown in Fig 5.The system consists of three major components:
(1) Pre-processing,
(2) Feature extraction, and
(3) Minutiae matching [4].

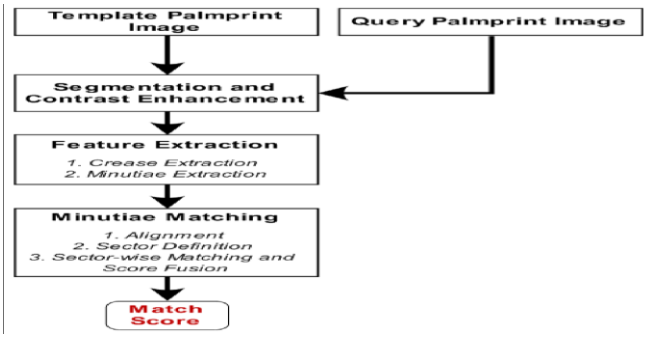


Fig 5 Block diagram of the full-to-full palm print matching system [4]

**1.2.4 Touch-less palm print recognition system:**
Fig. 1 shows the framework of the flexible hand tracking and ROI locator to detect and extract the palm print in real-time video stream.

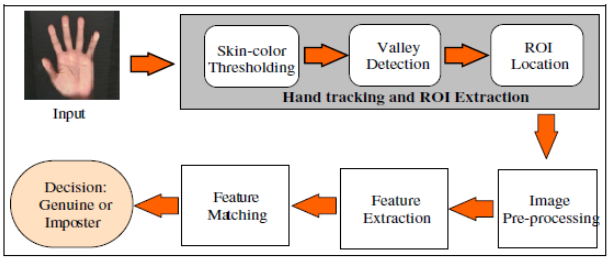


Fig. 6 The proposed touch-less palm print recognition system

**The detailed processing steps are provided in the following sections given below:**

**1.2.4.1 Skin-color thresholding:**

In order to segment human palm from the background,the skin-color method is used. following the skin likelihood value is determined, the hand is segmented from the background by applying the thresholding method (Fig. 7).

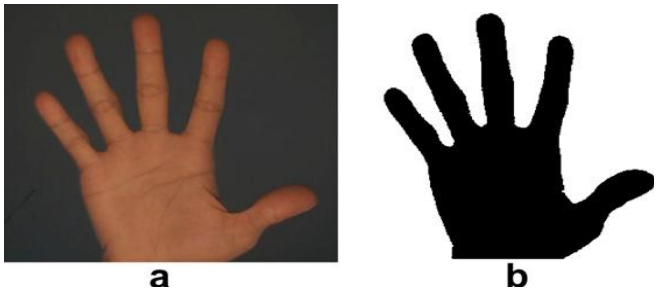


Fig. 7 Skin-color thresholding: (a) the original hand image; (b) segmented hand image in binary form.

**1.2.4.2 Hand valley detection algorithm:**

A novel (CHVD) competitive hand valley detection algorithm to locate the ROI of the palm. We trace along the contour of the hand to locate possible valley locations. A pixel is considered a valley if it has some neighboring points lying in the non-hand section while the majority neighboring points are in the hand region.If a line is directed outwards from the pixel, the line must not cross any hand area along the way [8].

**1.2.4.3 ROI location:**

After obtaining the valleys of the finger, P1, P2, P3, and P4 (Fig. 8(a)), a line is formed between P2 and P4. After that, a square is drawn below the line as shown in Fig. 8(b). The square represents the region of interest (ROI) of the palm. Based on the experiment, the average time taken to identify and locate the ROI was less than 1 ms.

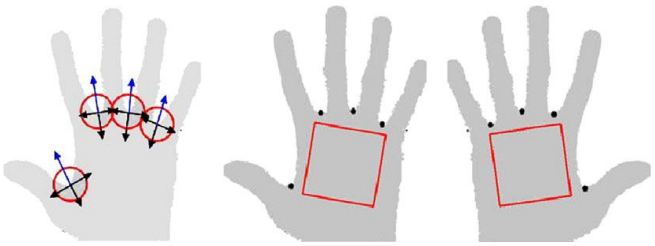

Fig. 8. The ROI location technique: (a) positions of the four valleys; (b) a line is drawn to connect P2 and P4. A square is drawn from the line. This square forms the ROI of the palm; (c) the ROI diagnosed in the other side of the hand.

ROI segmentation of palmprint is to automatically and reliably divide a small region from the captured palmprint image and palmprint extraction is to separate the palmprint from a ROI. This is considered one of important phase in these four stages because it greatly influences the overall verification accuracy and processing speed of the complete system. It is very important that to take the ROI at the same position for distinct palmprint images to guarantee the stability of the segmented palmprint features to provide genuine recognition rate and fast processing speed. In fact, a palmprint is frequently surrounded by noise, a novel palmprint segmentation scheme must separate the palmprint by removing all of these "noise" features.

## LITERATURE SURVEY

**Sumalatha K.A et al.(2014)** An easy-to-capture biometric modality that could work well even with a commodity camera is palmprint. It has coarse lines which can be easily recognized using a low resolution camera and it is easy to present due to the free mobility of our palm. On mostly surveys, hand as a biometric modality rates high on user acceptance. It is very easy and convenient to combine palmprint into an already existing Biometric Recognition System since it does not require a dedicated capture device. Because of the presence of coarse distinguishing lines, it is possible to catch palm lines even at a low resolution, using a digital camera . All this combined with a moderate recognition accuracy on large datasets makes palmprint the perfect choice as an add-on in a multi biometric system. All the factors defined above make palmprint a very useful biometric.

**Jifeng Dai et al.(2012)** During the past decade, many efforts have been made to utilise palmprints as a biometric modality. However, most of the existing palmprint recognition systems are based on encoding and matching creases, which are not as genuine as ridges. This affects the use of palmprints in large-scale person verification applications where the biometric modality needs to be distinctive as well as insensitive to changes in age and skin conditions. Recently, various ridge-based palmprint matching algorithms have been proposed tofill the gap. Major contributions of these systems consists reliable orientation field estimation in the presence of creases and the use of multiple attributes in matching, while the matching algorithms adopted in these systems simply follow the equality algorithms for fingerprints. However, palmprints differ from fingerprints in several aspects: 1) Palmprints are much larger and thus include a large number of minutiae, 2) palms are more deformable than fingertips, and 3) the quality and discrimination power of different sections in palmprints vary significantly. As a result, these matchers are unable to perfectly handle the distortion and noise, despite heavy computational cost. Motivated by the matching techniques of human palmprint experts, we developed a novel palmprint recognition system. The main contributions are as descibe: 1) Statistics of major properties in palmprints are quantitatively studied, 2) a segmentbased matching and fusion algorithm is suggested to deal with the skin distortion and the varying discrimination power of different palmprint regions, and 3) to minimize the computational complexity, an orientation field-based registration algorithm is designed for entering the palmprints into the same coordinate system before matching and a cascade filter is built to deny the nonmated gallery palmprints in early stage. The suggested matcher is tested by matching 840 query palmprints compare to gallery set of 13,736 palmprints. Experimental results show that the proposed matcher outperforms the existing matchers a lot both in matching accuracy and speed**.**

**Yatam Laxmi Malathi Latha(2013)** Palmprint authentication is a means of personal verification that uses unique palmprint features. Palmprint is obtained by just scanning the user's palm on the platform of the scanner when scanning is executed. So, it is subjected to various physical disturbances such as variable size, noise and orientation, which will deteriorate the verification process. Therefore image preprocessing plays an crucial role in palmprint recognition. Preprocessing is a technique of aligning different palmprint images, obtaining coordinate systems and to divide the central region for feature extraction. The proposed algorithm focuses on extraction of Dynamic (ROI) Region Of Interest from the palmprint image. Most of the existing work uses static region from palmprint not utilizing a important portion of the palm. Intuitively, the larger area captures more distinctive features when related to fixed size ROI. The experimentations are performed on the PolyU database to validate the proposed algorithm.

**Mojtaba Darini et al.(2015**) Palmprint recognition has been in the attention of biometric research over the last ten years. Identifying a person or validating a person has been most vital process and mandatory in several real time applications for security reasons. For example log into a computer system, accessing an ATM machine, entering a room, etc. Are some of the real time applications needs verification of people. Simple and cost effective authentication systems are working based on password, pin number, etc. For verifying people. Significant places or critical applications require biometric authentication where the verification failure rate is very less and easy to use. Also, forging the biometric system is highly typical. Palmprint is one of the biometric used in validating people. Palmprint recognition has been researced more then fifteen years. There are several palmprint verification systems have been developed by various scientists.

**Sharanbasappa Sali et al.(2012)** Palm print recognition is one of the most widely researching section in security and criminal detection. All the things hold by hands so that more importance is given to the palm print recognition because palm has so many deviations for person to person. This paper presents Gabor convolve method and its correlation with ICA based techniques for Palm print recognition and neural network. We have taken ten palms of a person from Singapore polytechnic database, eight palms for training and two palms for testing. We are directly taking cropped database and using the above described techniques on those palms. We have achieved 92.50% efficiency by Gabor convolve technique and 83.33% by ICA and 40.o% by neural network. These tests have been performed over 20 users.

**Xiangqian Wu (2006)** The palm print is a new and emerging biometric application for personal recognition. The stable line features or "palm lines," which are composed of principal lines and wrinkles, can be used to certainly describe a palm print and can be separated in low-resolution images. This paper gives a novel approach to palm line extraction and matching for use in personal verification. To separate palm lines, a group of directional line

detectors is devised, and then these detectors are used to separate these lines in different directions. To elude losing the details of the palm line structure, these irregular lines are described using their chain code. To relate palm lines, a matching score is describe between two palm prints according to the points of their hand lines. The experimental results show that the suggested approach can effectively discriminate between palm prints though when the palm prints are dirty. The storage and speed of the suggested approach can satisfy the requirements of a real-time biometric system.

**Goh Kah Ong Michael et al.(2008**) In this paper, author suggest an unusual touch-less palm print recognition system. This project is motivated by the public's need for non-invasive and hygienic biometric technology. For many reasons, users are concerned about touching the biometric scanners. That's why, author suggest to use a low-resolution web camera to capture the user's hand at a distance for identification. The users do not require to touch any device for their palm print to be acquired. A novel hand tracking and palm print (ROI) region of interest extraction method are used to track and capture the user's hand in real-time video stream. The discriminative palm print attributes are extracted based on a new method that implies (LBP) local binary pattern texture description on the palm print directional gradient responses. Experiments show promising result using the suggested method. Performance can be further enhanced when a modified (PNN) probabilistic neural network is used for feature matching. Verification can be executed in less than one second in the suggested system.

| Ref. No. | Year | Method Used | Findings |
|---|---|---|---|
| 1 | 2014 | Several Methods of recognition system | Palm print acquisition using CCD based canneris recommended |
| 2 | 2012 | Ridge-Based Palmprint Matching | provide assistance for the low-resolution palmprint recognition |
| 3 | 2013 | Dynamic Region of Interest (ROI) for Palmprint | Extracts maximum possible ROI region without background information. |
| 4 | 2010 | Aregion-of-Interest Segmentation Algorithm for Palmprint Images | Algorithm is effective and effective in palmprint ROI segmentation and is robust for noise surroundinging palmprint images. |
| 5 | 2012 | Palm print recognition using Log Gabor filter | The performance evaluation and comparisons with other methods indicate that the proposed method is a viable and very efficient method for palm recognition. |
| 6 | 2006 | novel approach to palm line extraction and matching for use in personal authentication. | approach is more powerful for palm print verification than the 2-D Gabor algorithm. approach can distinguish palm prints effectively and is a promising algorithm for establishing a real personal authentication system using palm print biometrics. |
| 7 | 2008 | Touch-less palm print biometrics(novel palm print tracking algorithm to automatically detect and locate the ROI of the palm | reduces noise and increases the is criminatory power of the system. proposed touch-less palm print system could perform very fast in real-time application. It takes less than one second to capture, process and verify a palm print image |

**Conclusion**

Biometric identification system has high productivity,high verification rate and comfortable to user's operating characteristics. Palm recognition is considered the most usable and reliable biometric recognition technique with merits of low cost, user friendliness, high speed and high accuracy**.** Palm print recognition is an emerging field. In this paper various methods for palmprint recognition system explained and summarize few points Gober filter method has potentials to be incorporated as a quick, simple and efficient palmprint classification algorithm within a biometric security system. ROI segmentation of palm is to automatically reliable segment a region from the captured palm image. It is one of the most important stage in palm print recognition system because it greatly influences the complete identification accuracy and processing speed of the whole system. global features improve palm-print classification which greatly reduces search times. Touch-less palm print system could execute very fast in real-time application. It takes less than one second to catch process and verify a palm print image. Besides, the system is able to cope with real-time identification challenges such as hand movement, lighting change and variation in hand location and orientation. Ridge-Based Palmprint Matching provides a strategy to deal with distortion and

varying discrimination power of distinct regions for palmprint matching, while the cascade filtering idea may also be useful for acceleration. It also provide assistance for the low-resolution palmprint recognition.

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