



Palmprint Recognition using Novel Fusion Algorithm

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ABSTRACT: Palmprint is a promising biometric feature for use in access control and forensic departments. Already availed researches on palmprint recognition mainly concentrates on low-resolution (about 100ppi) palmprints. But for high-security applications forensic usage), high-resolution palmprints (500ppi or higher) are required from which more useful quality information can be extracted. In this paper, we introduce a novel- recognition algorithm for very high-resolution image. The main contributions of the proposed algorithm include the following: 1) use of multiple features namely minutiae, principle lines, density and orientation, palmprint recognition to significantly improve the matching performance of the conservative algorithm. 2) Design of a quality-based and adaptive orientation field estimation algorithm which performs better than the present algorithm in case of regions with a large number of creases. 3) Use of a novel-fusion algorithm for an detection application which performs better than conservative fusion methods, e.g., SVMs, Neyman-Pearson rule or weighted sum rule. Besides, we analyze the discriminative influence of different characteristic combinations and find that concreteness that is very useful for palmprint recognition. Experimental outcome on the database containing 14,576 palmprints show that the proposed algorithm has achieved a good piece. In the case of verification, the recognition system's False Rejection Rate (FRR) is 16 percent, which is 17 percent lesser than the best existing algorithm at a False Acceptance Rate (FAR) of 10^{-5} , while in the credential experiment, the rank-1 live-scan fractional palmprint recognition rate is enhanced from 82.0 to 91.7 percent.

KEYWORDS: Palmprint, orientation field, the composite algorithm, density map, data fusion.

I.INTRODUCTION

Palm print recognition inherently implements many of the same matching characteristics that have allowed fingerprint recognition to be one of the most well-known and best revealed biometrics. Both palm and finger biometrics are represented by the information existing in a friction ridge impression.

This information combines ridge structure, ridge flow and ridge characteristics of the raised portion of the epidermis. The represented data by these friction ridge impressions allow a determination in corresponding areas of friction ridge impressions either originated from the same source or could not have been made by the same source.

Because fingerprints and palms have both uniqueness and performance, they have been used for over a century as a trusted from a identification. However palm recognition was slower in becoming automated due to some restraints in computing capabilities and live-scan technologies. This paper on palmprint recognition using Novel Fusion algorithm provides a brief overview of the historical progress of future implications for palm print biometric recognition.

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 2, Issue 4, April 2014



Fig. 1. Developed palm print authentication system with structured light imaging and an example of the use of the system.

II. PALM IDENTIFICATION

The are three groups of marks which are used in palmprint identification:

- Geometric features, such as the width, length and area of the palm. Geometric features are a coarse measurement and are relatively easily duplicated. In themselves they are not sufficiently distinct.
- Line features, principal lines and wrinkles. Line features identify the length, position, depth and size of the various lines and wrinkles on a palm. While wrinkles are highly distinctive and are not easily duplicated, principal lines may not be sufficiently distinctive to be a reliable identifier in themselves; and
- Point features or minutiae. Point features or minutiae are similar to fingerprint minutiae and identify, amongst other features, ridges, ridge endings, bifurcation and dots. Palm creases and ridges are often superimposed which can complicate feature extraction.

Some specialist terms describe the techniques used in palm, hands and feet recognition:

- Ridgeology is the study and identification of the friction ridges found on palms, fingers and feet.
- Edgeoscopy is the study of the detail and characteristics of ridge edges.
- Palmar Flexion Crease Identification studies creases on palms caused by flexing the hand.
- As with fingerprint recognition, there are three principal palm matching techniques.

These are:

- minutiae-based matching, the most widely used technique
- correlation-based matching, and
- ridge-based matching.
- Data Capture

There are three capture methods:

- Off-line, where palm prints are inked onto paper and later scanned into the palm print system.
- On-line, where palm prints are directly scanned.
- Real-time, where palm prints are scanned and processed in real-time.

There is continuing research into the use of palm and hand prints for biometric identification using, for example, eigenspace techniques described as eigenpalm and eigenfinger. This technique uses features extracted from the fingers, thumb and palm which are mathematically transformed and consolidated to provide an overall matching.



International Journal of Innovative Research in Computer and Communication Engineering

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Other techniques being researched include cross one and two-dimensional ratios of the locations of finger creases¹³, quantized co-sinusoidal triplets, Gabor filters, Fourier Transforms, wavelets, Principal Component Analysis (PCA) and Independent.

Reader Types

Palm readers are generally optical, although they may incorporate other reader technologies such as capacitive sensors also used in a “liveness” test. Other technologies include ultrasound, and thermal imaging. In this respect palm and hand readers are similar to fingerprint readers. Some palm readers have the capability of capturing 10-print fingerprints, as well as palm prints.

Low resolution readers (generally less than 100 dpi) can effectively only record principal lines and wrinkles. High resolution readers (generally greater than 400 dpi) are able to record point features. Hand geometry, for example the points at which fingers are attached to the hand or the gaps between fingers, is used to establish the co-ordinates of the hand in relation to the reader for feature extraction and comparison purposes.

Reading Difficulties

Where users hands do not fully contact the palm readers, there made be some difficulty in obtaining a clear image. A complicating factor here is a change in scale caused by increasing or varying the distance between the reader and palm.

Another difficulty is in capturing a clear image of the hollow of the palm which may not fully contact the reader. This has been solved, to some extent, by providing curved readers that fully contact all parts of the palm.

Other difficulties have been caused by shifting position, closing fingers or placing the hand on different parts of the reader when registering. Again this has been largely solved by designing hollows for the palm and fingers to occupy or by providing pins to separate and locate the hand on the scanner. Clearly a degree of user co-operation is required in registering palmprints or using biometric hand scanners. Because of the need to touch the hand reader, other concerns include hygiene and latent prints.

Palm Recognition

Some palm recognition systems scan the entire palm, while others allow the palm image to be segmented in order to improve performance and reliability. In general terms, reliability and accuracy is improved by searching smaller data sets. Palm systems categorise data based upon the location of a friction ridge area.

III.EXISTING SYSTEM

A novel fusion scheme for an identification application which performs better than conventional fusion methods like weighted sum rule, SVMs, or Neyman-Pearson rule, and another one algorithm at a False Acceptance Rate of 10^{-5} , while in the identification experiment, the rank-1 live-scan partial palmprint recognition rate is improved from 82.0 to 91.7 percent. Research on palmprint recognition mostly concentrates on low-resolution (about 100 ppi) images which are mainly captured by contactless devices. For low-resolution images, palmprint ridges cannot be observed, and the matching is mainly based on crease and texture features. Extracted the hand shape and principal line features to build the palmprint recognition system. Presented the datum point invariance and line feature matching characteristics in palmprint verification. . Tried to represent and match the principal lines with feature points which locate on the principal lines and are extracted by a series of morphological operations. Matched the principal lines by the interesting points, which are extracted by the Plessey operator

Disadvantages

- Low resolution
- Recognition scan partial rate is low level



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Proposed system

A multifeature-based high-resolution palmprint recognition system in which minutiae; orientation field, density map, and principal line map are reliably extracted and combined to provide more discriminatory information. Novel orientation field estimation algorithm is not significantly affected by the presence of creases. It can adaptively choose a suitable estimation method according to the qualities of different regions. And it achieves a higher recognition palmprint acquisition device using a CCD camera and a 2D Gabor phase encoding scheme to extract palmprint textures. In highlighted the discriminative power of principal lines and used those to design a palmprint verification system. A modified fuzzy C-means cluster algorithm for competitive code based palmprint recognition. A region-growing could extract the orientation field on palmprints in the presence of creases. And a novel minutia descriptor, Minutia Code, was utilized. In the matching stage, the weighted sum of minutiae and orientation field similarities was calculated to measure the similarity between palmprints. The algorithm achieved a rank-1 recognition rate of 78.7 percent when searching live-scan partial palmprints on a background database containing 10,200 full palmprints.

Advantages

- Achieved a good performance
- Good supplement to minutiae for palmprint recognition.
- Highly security

IV. CONCLUSION

We developed a novel high-resolution palmprint recognition system which can handle palmprints with a large amount of creases, leading to much higher accuracy than the previous systems. The main contributions are as follows:

First, use of multiple features for palmprint recognition to significantly improve the matching accuracy. Second, design of a quality-based and adaptive orientation field estimation algorithm. It can reliably estimate the ridge direction by adaptively choosing suitable estimation method according to the image quality. Third, use of a novel heuristic rule for identification applications to combine different features. Fourth, the discriminative power of different feature combinations is analyzed and we find that density is very useful for palmprint recognition. We argue that further research on palmprint recognition should focus on handling nonlinear deformation and matching efficiency. Relative nonlinear deformation among different impressions of the same palm is unavoidable in the case of a contact-based scanner. And this significantly affects the matching of minutiae, orientation, and density map, especially in the case of palmprints that have much larger size as compared to fingerprints. Another challenge for high resolution palmprint recognition is fast matching in a large-scale database. A better indexing and searching method should be studied.

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Vol. 2, Issue 4, April 2014

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