FUSION OF LEFT AND RIGHT PALMPRINT FOR EFFICIENT SECURITY SYSTEM

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Abstract—Reliable user authentication has become very important with rapid advancements in networking and mobility coupled with increased concerns about security. Most biometric systems will serve one of the two purposes: identification or verification/authentication. Biometric systems provide several advantages over the traditional palm print methods. Multibiometric systems combine multiple sources of biometric evidences. The integration of these evidences is known as fusion. Multibiometric systems combine the information from multiple sensors, samples or traits of an individual, matching algorithms operating on the same biometric. Data security is one of the important issues among computer users. The biometrics recognition is one of the most important parts in the security of the data and the application of computer vision. The biometrics is the authentication method used in a wide variety of applications such as e-banking, e-commerce, e-government and many others. A biometric system is one which requires the recognition of a pattern, whereby it enables the differentiation of features from one individual to another. Biometric technology is mainly used for identification and access control, or for identifying individuals that are under surveillance. This study emphasizes palm print recognition which provides a wide deployment range of authentication methods. The palm print of person differs from one to another because the palm print contains principal lines, wrinkles, fine lines, ridges and surface area. In this paper, we proposed a framework by combining left palm print and right palm print to perform matching score level fusion. The first two kinds of score were generated from left and right palm print by any palm print identification method. For third kind of score, we propose a special algorithm which takes the nature of left and right palm print images. It can properly exploit the similarity between left and right palm print of same object.

Keywords: Multibiometrics, SIFT, Matching Scores, Feature Level, Feature Extraction

I. INTRODUCTION

Important personal identification technique is palm print identification. Due to availability of rich information in palm print and this technique contains principle curves, wrinkles, rich texture and minuscule points. It has capacity to achieve a high accuracy. In past years, various palm print identification methods, such as coding based methods and principle curve method have been proposed. One more method called subspace based method which defines Palm as the inner surface of human hand from human wrist to the root of their fingers. Many other techniques are deployed for palm printing in that Representation Based Classification (RBC) method also shows good performance in this regard and also Scale Invariant Feature Transform (SIFT) which transforms image data into scale-invariant coordinate. A print is an impression made in or on a surface by pressure. A palm print is defined as the skin pattern of a palm, composed of the physical characteristics of skin pattern such as lines, points and texture. Palm print has a much larger area than fingertip. As the security system has very much important in several fields, it is very important to authenticate the users for any access. As many studies have been proposed but these researches did not explore the security issue in depth. So in this paper we established a framework in order to...
perform multibiometrics by combining left and right palm print images. Multimodal systems combine evidences obtained from different (two or more) biometric traits. Multibiometrics are a relatively new approach to overcome those problems. Besides enhancing matching accuracy, the multibiometric systems have many advantages over traditional multibiometric systems. They address the issue of non-universality. It becomes increasingly difficult (if not impossible) for an impostor to spoof multiple biometric traits of an individual.

Multimodal Biometric System
Multimodal biometric system may be classified using four parameters:
- architecture;
- Sources that provide multiple evidence;
- Level of fusion;
- Methodology used for integrating the multiple verifiers.

To overcome the limitation of unimodal biometric system and to performance of system, Multimodal biometric system with multiple sensors are used.

Fusion in multimodal biometric system can be performed at four levels: Different sensors are usually required to capture the image of same biometric in the image level. At Decision Level, it only abstracts identity labels decided by different matchers and fusion is too rigid at this level. The Feature level provides better identification accuracy than fusion at other levels. It involves the use of feature set by concatenating several feature vectors to form large 1D vector. At the Matching score level, the final matching score is generated from three kinds of matching scores. The first and second matching scores obtained from left and right palm print reps. The third kind of score is calculated based on the crossing matching between the left and right palm print. In this paper, we proposed technique which combines the left with right palm print at the matching score level. The three types of matching scores which are obtained by the left palm print matching, right palm print matching and crossing matching between the left query and right training palm print in the framework and they are fused to make the final decision. It combines the left and right palm print images for identification and also properly exploits the similarity between the left and right palm print of the same subject. For performing identification and can achieve higher accuracy than conventional method, the proposed framework can integrate most conventional palm print identification methods.

II. LITERATURE SURVEY

1. “A multispectral whole-hand biometric authentication system”, Refer to [7], in 2007, proposed by R.K.Rowe. The pre-processing and to collect palm print information with clear fingerprint features are the main objectives. The speed of feature extraction is very low. And feature matching makes it unsuitable for real time application. So as to increase the accuracy of proposed system many enhancement can be made in the system by applying many other palm print techniques.

2. “Comparative studies on multispectral palm image fusion for’ biometrics”. Refer to [8], in 2007, proposed by Y. Hao, Z. Sun, and T. Tan. Contact-free multispectral palm sensor architecture has developed for identifying the palm printing for security and authentication. The image quality is very limited therefore recognition accuracy is not so high. So as to increase accuracy in the proposed system there can be enhancement of system which can be achieved by applying many other palm print techniques.

3. “FCM based Orientation Selection for Competitive Coding-based Palm print Recognition”. Refer to [5], in 2010, proposed by FengYue, Wangmeng Zuo and Kuanquan Wang. In this paper they concentrated on the security issues and tried to overcome all the issues, for this they used statistical orientation distribution and the orientation separation principle and modified fuzzy C-means cluster algorithm to determine the orientations of filters. This method achieves higher verification accuracy.
as compared with that of the original competitive code and several state-of-the-art methods. FCM-based orientations Selection has proposed for Competitive Coding.

4.”A SIFT-based contactless palmprint verification approach using iterative RANSAC and local palmprint descriptors.” Refer to [3], in 2014 SIFT-based Image Alignment has been proposed for Contactless Palm print Verification by X. Wu, Q. Zhao, and W. Bu. They proposed a contactless palmprint recognition method with a precise palm print image alignment. Firstly the original contactless palm print images are aligned using a projective transformation model that estimated from the matched SIFT feature points. From the obtained images, an exact palm print feature representation method, the competitive code, is extracted and matched. Finally, matching scores obtained from both SIFT and competitive code is fused to further improve the accuracy. Various experiments on a public contactless palm print database show that after the image alignment, the verification accuracy of competitive code has increased dramatically, and the result is further enhanced by fusing the matching scores of competitive code and SIFT features.

III. PROPOSED SYSTEM

Fig. 1 shows the procedure of the proposed framework. In the framework, three types of matching scores, which are obtained by the left palm print matching, right palm print matching and crossing matching between the left query and right training palm print. They are fused to make the final decision. The framework properly exploits the similarity between the left and right palm print of the same subject and also combines the left and right palm print images for identification. In paper [2], various experiments shows that the proposed framework can integrate most conventional palm print identification methods for performing identification and can achieve higher accuracy than conventional methods. This work has the following notable contributions. Firstly, for the first time it shows that the left and right palm print of the same subject are correlated, and it shows the feasibility of exploiting the crossing matching score of the left and right palmprint for improving the accuracy of identity identification. Second, it proposes an elaborated framework to integrate the left palmprint, right palmprint, and crossing matching of the left and right palmprint for identity identification. Third, it conducts extensive experiments on both touch-based and contactless palmprint databases to verify the proposed framework. A palmprint recognition system generally consists of four parts: palmprint scanner, pre-processing, feature extraction and matcher. Palmprint scanner is used to collect palmprint images. To setup a coordinates system to align palmprint images and to segment a part of palmprint image for feature extraction, pre-processing is done. The effective features from the pre-processed palm prints is obtained from Feature extraction. Finally, a matcher compares two palmprint features that the left palmprint images and uses a palmprint identification method to calculate the scores of the test sample with respect to each class. Then it
applies the palmprint identification method to the right palmprint images to calculate the score of the test sample with respect to each class. After the crossing matching score of the left palmprint image for testing with respect to the reverse right palmprint images of each class is obtained and performs matching score level fusion to integrate these three scores to obtain the identification result.

**Matching Score Level Fusion**

In the proposed framework, the final decision making is based on three kinds of information: the left palmprint, the right palmprint and the correlation between the left and right palmprint. At four levels, fusion in multimodal biometric system can be performed. In the image (sensor) level fusion, different sensors are usually required to capture the image of the same biometric. Fusion at decision level is too rigid since only abstract identity labels decided by different matchers are available, which contain very limited information about the data to be fused. Fusion at feature level involves the use of the feature set by concatenating several feature vectors to form a large 1D vector. The integration of features at the earlier stage can contains much richer information than other fusion stages. So feature level fusion is supposed to provide better identification accuracy than fusion at other levels. Because of the incompatibility between multiple kinds of data, fusion at the feature level is quite difficult. The advantages of the score level fusion have been concluded in [9], [4], and [6] and the weight-sum score level fusion strategy is effective for component classifier combination to improve the performance of biometric identification. By assigning a weight to each matching score, the strength of individual matchers can be increased to the ease in combining three kinds of matching scores of the proposed method.

**IV. IMPLEMENTATION**

The proposed work is implemented using MATLAB tool which offers good variety of in-built functions to support multimodal biometric implementation. The implementation is basically divided into identification and Fusion, Fig. 6 shows some typical hand images and the corresponding ROI palmprint images in the IITD palmprint database.

![Fig. 2](image1)

**Fig. 2 (a)-(d) are two pairs of the left and right palmprint images of two subjects from PolyU database**

![Fig. 3](image2)

**Fig. 3 (a)-(d) are two pairs of the left and right hand images of two subjects from IITD database. (e)-(h) are the corresponding ROI images extracted from (a) and (d).**
**Fig 4. Identification in Palmprint Identification method**

*Left input image*  
*Right input Image*  
*Reverse of Right Palmprint Image*

*Left Palmprint ROI*  
*Right Palmprint ROI*
V. EXPERIMENTAL RESULT

The Receiver Operating Characteristic (ROC) curve, which is a graph of FRR against FAR for all possible thresholds, is introduced to describe the performance of the proposed method. The ROC curves of both the Poly U and IITD databases are plotted in Fig. 7.
Fig. 7. The comparative results between the proposed method and the conventional fusion method on the Poly U database

Fig. 8 clearly shows that the palmprint identification accuracy of the proposed framework is higher than that of the direct fusion of the left and right palmprint for both the Poly U database and the IITD database.

VI. CONCLUSION

The proposed method carefully takes the nature of the left and right palmprint images into account, and designs an algorithm to evaluate the similarity between them. The proposed weighted fusion scheme uses a method to integrate the three kinds of scores generated from the left and right palmprint images. Extensive experiments show that the proposed framework obtains very high accuracy and the use of the similarity score between the left and right palmprint leads to important improvement in the accuracy.

REFERENCES


