International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 1 Volume No.7 January - February – 2023
DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

IMPLEMENTATION OF ACCURATE PERSONAL IDENTIFICATION BY USING PALM PRINT IMAGE PROCESSING

ATTAR SHAGUSTHA BANU[1], N VINOD KUMAR[2]
[1]DECS 202T1D3802, ASHOKA WOMENS ENGINEERING COLLEGE, KURNOOL, A.P.
[2]Assistant Professor – ASHOKA WOMENS ENGINEERING COLLEGE, KURNOOL, A.P

ABSTRACT
Online palmprint recognition and latent palmprint identification are two branches of palmprint studies. The former uses middle-resolution images collected by a digital camera in a well-controlled or contact-based environment with user cooperation for commercial applications and the latter uses highresolution latent palmprints collected in crime scenes for forensic investigation. However, these two branches do not cover some palmprint images which have the potential for forensic investigation. Due to the prevalence of smartphone and consumer camera, more evidence is in the form of digital images taken in uncontrolled and uncooperative environment, e.g., child pornographic images and terrorist images, where the criminals commonly hide or cover their face. However, their palms can be observable. Among various biometrics technologies, palm-print identification has received much attention because of its good performance. Combining the left and right palm-print images to perform multi-biometrics is easy to implement and can obtain better results. Existing systems deployed Line Based Method, Coding Based Method, Subspace Based Methods, Representation Based Method, SIFT Based Method. This work integrated three kinds of scores generated from the left and right palm-print images to perform matching score-level fusion. The first two kinds of scores were, respectively, generated from the left and right palm-print images and can be obtained by any palm-print identification method, whereas the third kind of score was obtained using a specialized algorithm proposed in this paper. As the proposed algorithm carefully takes the nature of the left and right palm-print images into account, it can properly exploit the similarity of the left and right palm-prints of the same subject. Moreover, the proposed weighted fusion scheme allowed perfect identification performance to be obtained in comparison with previous palm-print identification methods.
Key Words - Image Processing, palm-print, matching score-level fusion.

1. Introduction
The Biometrics is automated method of identifying a person or verifying the identity of a person based on a physiological or behavioral characteristic. Examples of physiological characteristics include hand or finger images, facial characteristics. Biometric authentication requires comparing a registered or enrolled biometric sample (biometric template or identifier) against a newly captured biometric sample (for example, captured image during a login). During, as shown in the picture below, a sample of the biometric trait is captured, processed by a computer, and stored for later comparison. Biometric Recognition can be used in mode, where the biometric system identifies a person from the entire enrolled population by searching a database for a match based solely on the biometric.

Fingerprints:
Sometime identification is called "one-to-many" matching. A system can also be used in mode, where the biometric system authenticates a person’s claimed identity from their previously enrolled pattern. This is also called “one-to-one” matching. In most computer access or network access environments, verification mode would be used. Fingerprints are unique for each finger of a person including identical twins. One of the most commercially available biometric technologies,

DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

fingerprint recognition devices for desktop and laptop access are now widely available from many different vendors at a low cost. With these devices, users no longer need to type passwords – instead, only a touch provides instant access. Fingerprint systems can also be used in identification mode. Several states check fingerprints for new applicants to social services benefits to ensure recipients do not fraudulently obtain benefits under fake names.

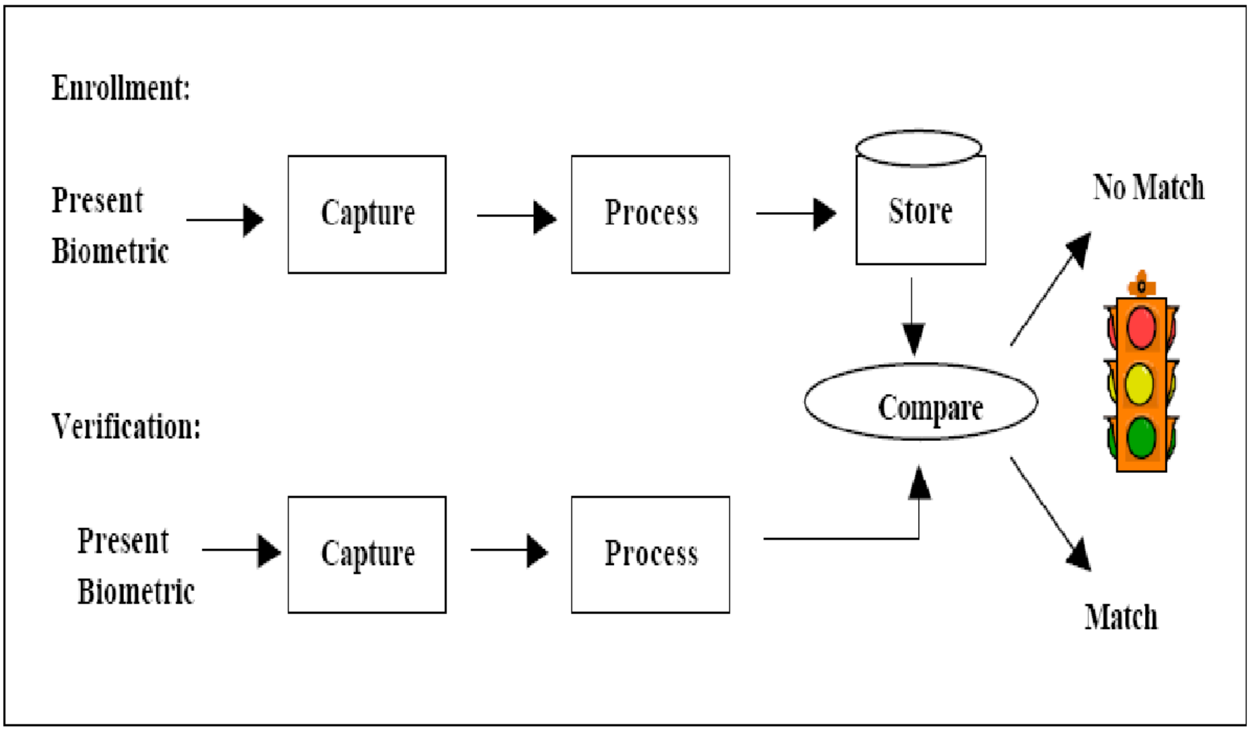

Fig.1. Basic Diagram of Biometric System

Face Recognition:

The identification of a person by their facial image can be done in many of different ways such as by capturing an image of the face in the visible spectrum using an inexpensive camera or by using the infrared patterns of facial heat emission. Facial recognition in visible light typically model key features from the central portion of a facial image. Using a wide assortment of cameras, the visible light systems extract features from the captured image(s) that do not change over time while avoiding superficial features such as facial expressions or hair. Several approaches to modeling facial images in the visible spectrum are Principal Component Analysis, Local Feature Analysis, neural networks, elastic graph theory, and multi-resolution analysis. Some of the challenges of facial recognition in the visual spectrum include reducing the impact of variable lighting and detecting a mask or photograph. Some facial recognition systems may require a stationary or posed user to capture the image, though many systems use a real-time process to detect a person's head and locate the face automatically. Major benefits of facial recognition are that it is non-intrusive, hands-free, and continuous and accepted by most users.

Iris Recognition:

This recognition method uses the iris of the eye, which is the colored area that surrounds the pupil. Iris patterns are thought unique. The iris patterns are obtained through a video-based image acquisition system. Iris scanning devices have been used in personal authentication applications for several years. Systems based on iris recognition have substantially decreased in price and this trend is expected to continue. The technology works well in both verification and identification modes (in systems performing one-to-many searches in a database). Current systems can be used even in the presence of eyeglasses and contact lenses. The technology is not intrusive. It does not require physical contact with a scanner. Iris recognition has been demonstrated to work with individuals

DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

from different ethnic groups and nationalities.

Signature Verification:

This technology uses the dynamic analysis of a signature to authenticate a person. The technology is based on measuring speed, pressure and angle used by the person when a signature is produced. One focus for this technology has been e-business applications and other applications where signature is an accepted method of personal authentication.

Speaker Recognition:

Speaker recognition has a history dating back some four decades, where the outputs of several analog filters were averaged over time for matching. Speaker recognition uses the acoustic features of speech that have been found to differ between individuals. These acoustic patterns reflect both anatomy (e.g., size and shape of the throat and mouth) and learned behavioral patterns (e.g., voice pitch, speaking style). This incorporation of learned patterns into the voice templates (the latter called "voiceprints") has earned speaker recognition its classification as a "behavioral biometric." Speaker recognition systems employ three styles of spoken input: text-dependent, text-prompted and text independent. Most speaker verification applications use text-dependent input, which involves selection and enrollment of one or more voice passwords. Text-prompted input is used whenever there is concern of imposters. The various technologies used to process and store voiceprints include hidden Markov models. Pattern matching algorithms, neural networks, matrix representation and decision trees some systems also use "anti-speaker" techniques, such as cohort models, and world models. Ambient noise levels can impede both collections of the initial and subsequent voice samples. Performance degradation can result from changes in behavioral attributes of the voice and from enrollment using one telephone and verification on another telephone. Voice changes due to aging also need to be addressed by recognition systems. Many companies market speaker recognition engines, often as part of large voice processing, control and switching systems. Capture of the biometric is non-invasive. The technology needs little additional hardware by using existing microphones and voice-transmission technology allowing recognition over long distances via ordinary telephones (wire line or wireless).

Palm Print:

Palm print identification is an important personal identification technology and it has attracted much attention. The Palm print contains not only principle curves and wrinkles but also rich texture and miniscule points, so the Palm print identification can achieve a high accuracy because of available rich information in Palm print. Various Palm print identification methods, such as coding based methods and principle curve methods have been proposed in past decades. In addition to these methods, subspace based methods can also perform well for Palm print identification. No single biometric technique can meet all requirements in circumstances. To overcome the limitation of the unimodal biometric technique and to improve the performance of the biometric system, multimodal biometric methods are designed by using multiple biometrics or using multiple modals of the same biometric trait, which can be fused at four levels: image (sensor) level, feature level, matching score level and decision level. Conventional multimodal biometrics methods treat different traits independently. However, some special kinds of biometric traits have a similarity and these methods cannot exploit the similarity of different kinds of traits.

2. Literature Survey

Palm print recognition has been investigated over 10 years. During this period, many different problems related to Palm print recognition have been addressed. This paper provides an overview of current Palm print research, describing in particular capture devices, preprocessing, verification algorithms, Palm print-related fusion, algorithms especially designed for real-time Palm print identification in large databases and measures for protecting Palm print systems and users' privacy. Finally, some suggestion is offered. Palm print images contain rich unique features for reliable human identification, which makes it a very competitive topic in biometric research. A great many different low resolution Palm print recognition algorithms have been developed, which can be

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 1 Volume No.7 January - February – 2023
DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

roughly grouped into three categories: holistic-based, feature-based, and hybrid methods. The purpose of this article is to provide an updated survey of Palm print recognition methods, and present a comparative study to evaluate the performance of the state-of-the-art Palm print recognition methods. Using the Hong Kong Polytechnic University (HKPU) Palm print database (version 2), we compare the recognition performance of many holistic-based (Fisher palms and DCT+LDA) and local feature-based (competitive code, ordinal code, robust line orientation code, derivative of Gaussian code, and wide line detector) methods, and then investigate the error correlation and score-level fusion performance of different algorithms. After discussing the achievements and limitations of current Palm print recognition algorithms, we conclude with providing several potential research directions for the future. With the increasing concerns on security breaches and transaction fraud, highly reliable and convenient personal verification and identification technologies are more and more requisite in our social activities and national services. Biometrics, used to recognize the identity of an individual, are gaining ever-growing popularity in an extensive array of governmental, military, forensic, and commercial security applications. Advanced Biometric Recognition Technologies: Discriminant Criterion and Fusion Applications focuses on two kinds of advanced biometric recognition technologies, biometric data discrimination and multi-biometrics, while systematically introducing recent research in developing effective biometric recognition technologies. Organized into three main sections, this cutting-edge book explores advanced biometric data discrimination technologies, describes tensor-based biometric data discrimination technologies, and develops the fundamental conception and categories of multi-biometrics technologies. There is increasing interest in the development of reliable, rapid and non-intrusive security control systems. Among the many approaches, biometrics such as Palm prints provides highly effective automatic mechanisms for use in personal identification. In the recent years, there are numbers of technologies were developed related to biometrics authentication system but the palmprint get less development depend on reliability and cost [1]. The palmprint approach can be classified into two categories depend on the palmprint image data type such as grayscale [2, 3], 3D [4] and multispectral. There are many of researchers working in gray scale image compare with the less researcher working in 3D and multispectral palmprint images. Recently the multispectral data are used in many areas such as face [5], iris [6] and palmprint [7].

3. Implementation

Figure 2 shows illustration of atypical palm print recognition system

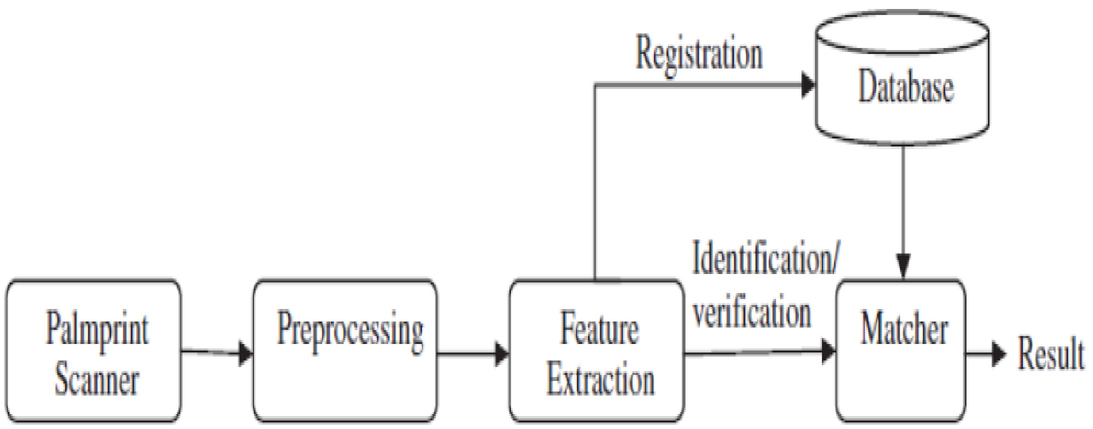

Fig. 2: An illustration of a typical palm print recognition system

Figure 3 and 4 depicts exiting and proposed system methodology in palm recognition system.

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 1 Volume No.7 January - February – 2023
DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

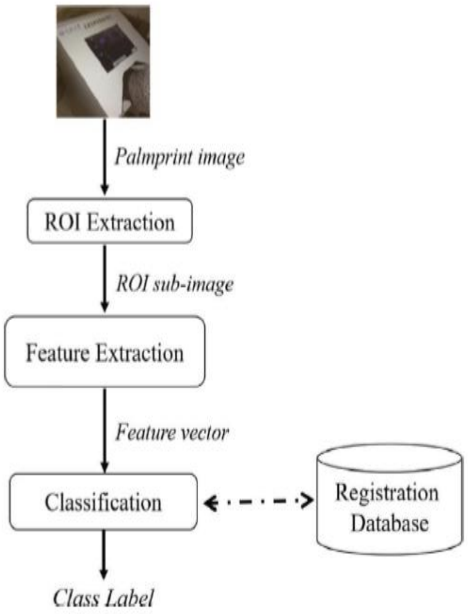

Fig 3 EXISTING system design

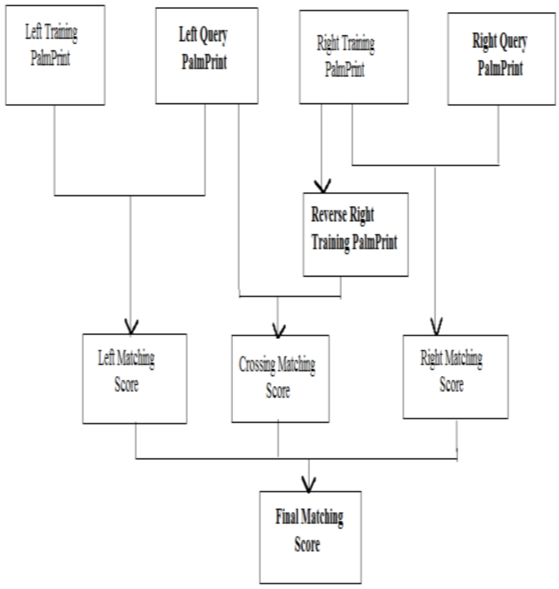

Fig 4. Proposed Design.

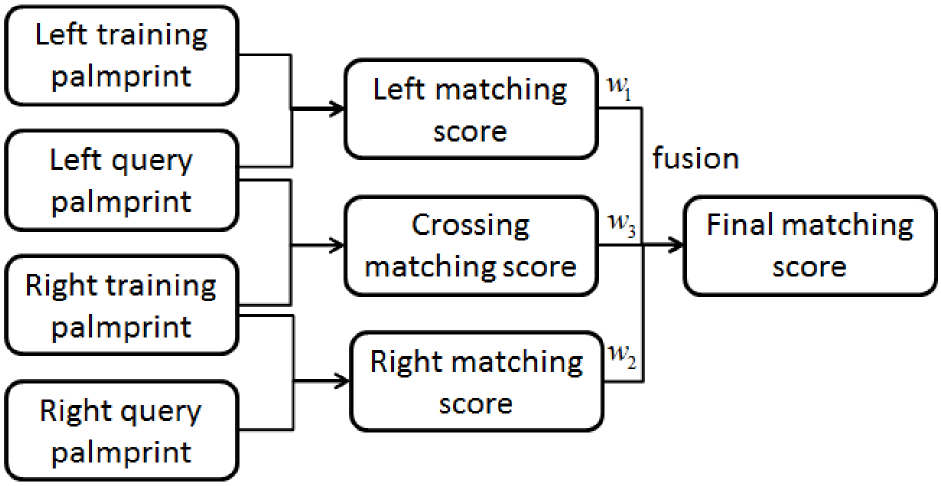

Fig.5. Fusion at the matching score level of the proposed framework.

.

4. RESULTS

The PolyU Palm print database contains7,752 Palm print images captured from a total of 386 palms of 193 individuals. Fig. 6 shows some Palm print samples on the PolyU database.

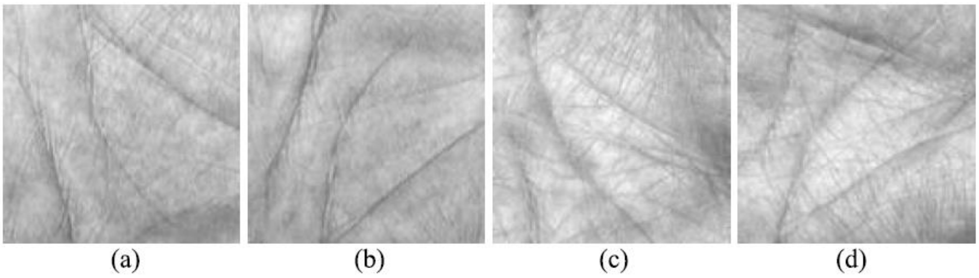

Fig.6 (a)-(d) are two pairs of the left and right Palm print images of two subjects from PolyU database.

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 1 Volume No.7 January - February – 2023
DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

The public IITD Palm print database is a contactless Palm print database. Images in IITD database were captured in the indoor environment, which acquired contactless hand images with severe variations in pose, projection, rotation and translation. The main problem of contactless databases lies in the significant intra-class variations resulting from the absence of any contact or guiding surface to restrict such variations. The IITD database consists of 3,290 hand images from 235 subjects. Seven hand images were captured from each of the left and right hand for everyone in every session. In addition to the original hand images, the Region of Interest (ROI) of Palm print images are also available in the database. Fig. 7 shows some typical hand images and the corresponding ROI Palm print images in the IITD Palm print database. Compared to the Palm print images in the PolyU database, the images in the IITD database are more close to the real-applications.

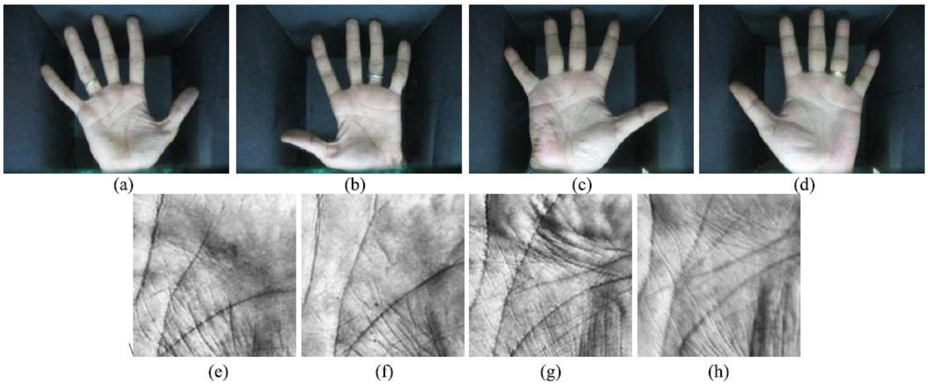

Fig.7. (a)-(d) are two pairs of the left and right hand images of two subjects from IITD database. (e)- (h) are the corresponding ROI images extracted from (a) and (d).

Fig. 8 (a)-(b) show the matching results of both databases. The False Accept Rate (FAR), False Reject Rate (FRR) and Equal Error Rate (EER) (the point where FAR is equal to FRR) [1] are adopted to evaluate the similarity between the left and right Palm prints. 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 PolyU and IITD databases are plotted in Fig. 8 (c).

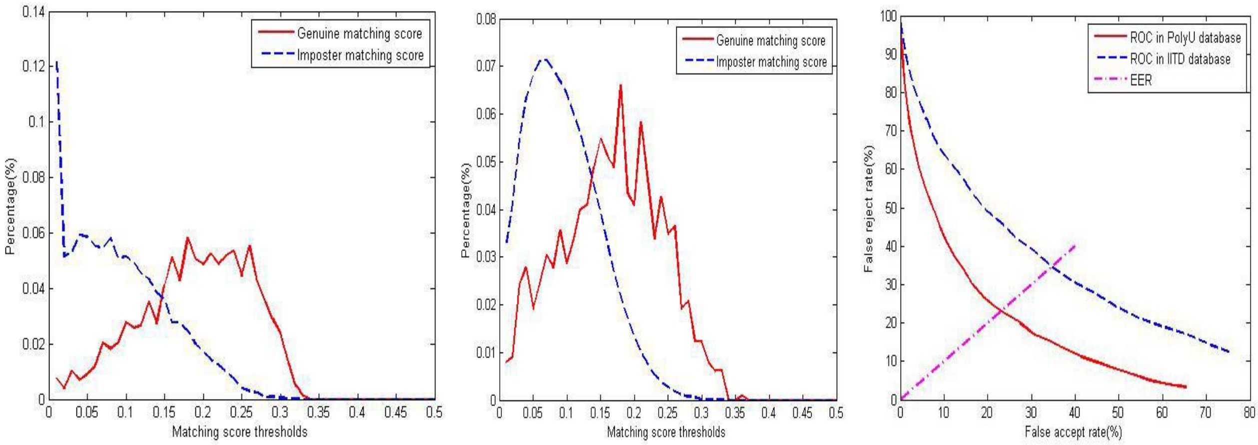

Fig. 8. (a) and (b) are matching score distributions of the PolyU and IITD databases, respectively. (c) is ROC curves of the PolyU and IITD databases.

The EERs of two databases are 24.22% and35.82%, respectively. One can observe that the EER obtained using the IITD database is much larger than that obtained using the PolyU database. The main reason is that Palm print images in IITD database have serious variations in rotation and translation. The experimental results still illustrate that the left Palm print and right Palm print of the same people generally have higher similarity than those from different subjects.

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 1 Volume No.7 January - February – 2023
DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

Methods used in individual matcher	Conventional strategy	The proposed method
RLOC	1.16s	1.74s
Competitive code	0.26s	0.39s
Palmcode	0.54s	0.80s
LDA	19.70ms	29.73ms
TPTTSR	41.91ms	62.88ms
SIFT+OLOF	15.62s	24.14s
SMCC	10.94s	16.06s

Table: 1. Computational Time of Identification

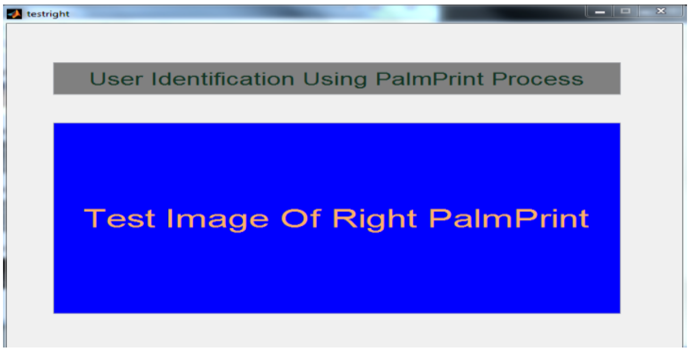

Fig.9. Test Image of Right Palm print

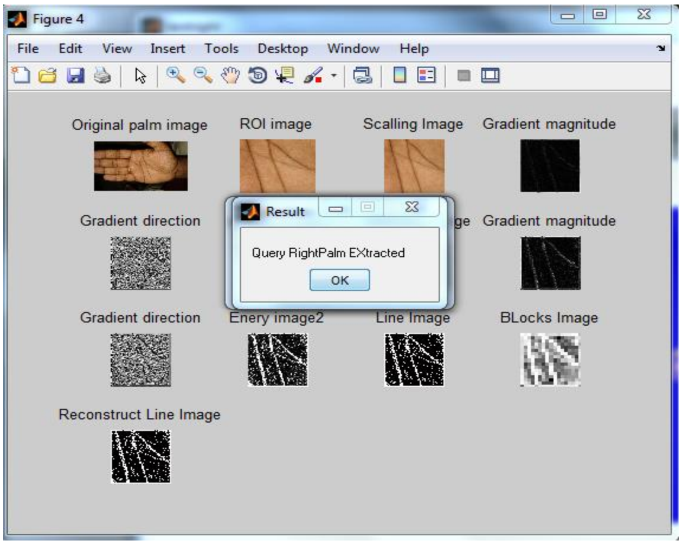

Fig.10. Right Test

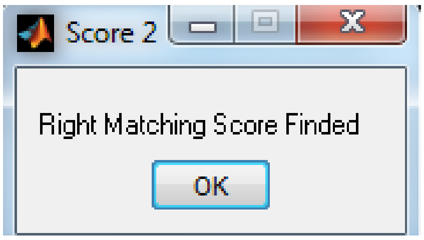

Fig.11. Right Matching score

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 1 Volume No.7 January - February – 2023
DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

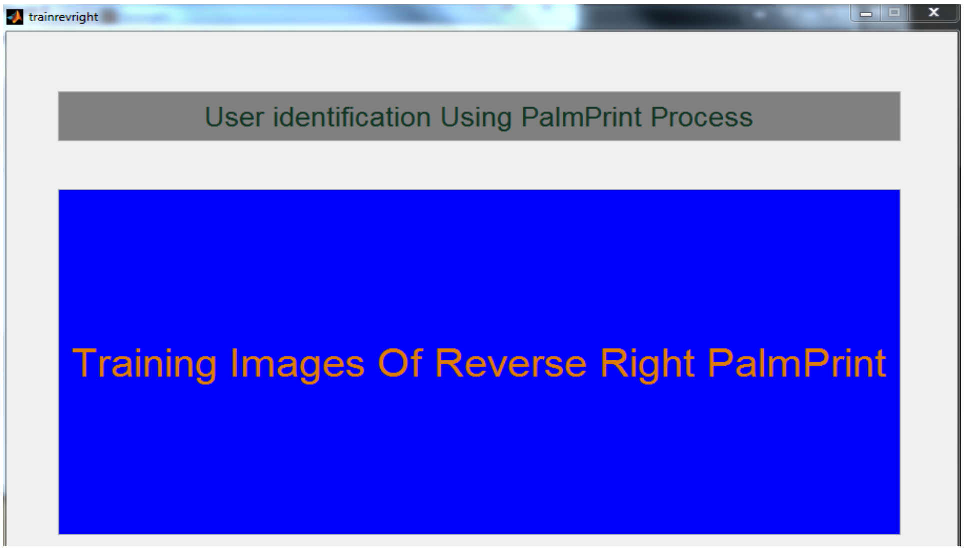

Fig.12. Training Images of Reverse Right Palm print

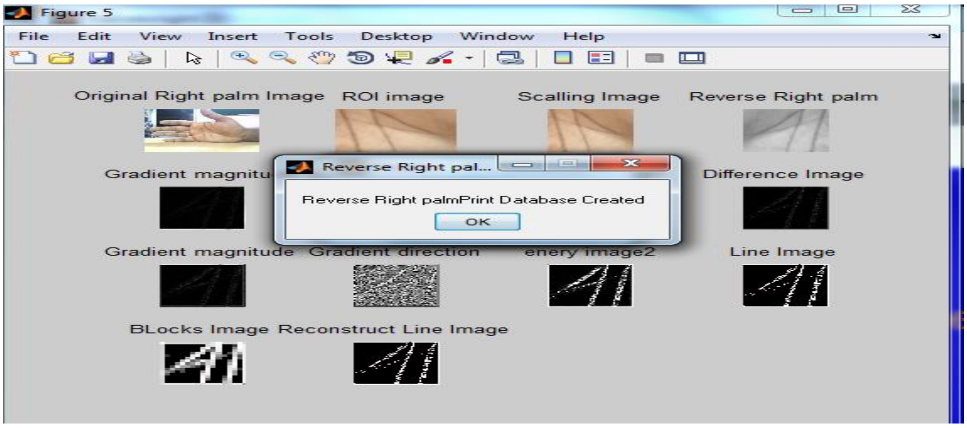

Fig.13. Reverse Right Train 1

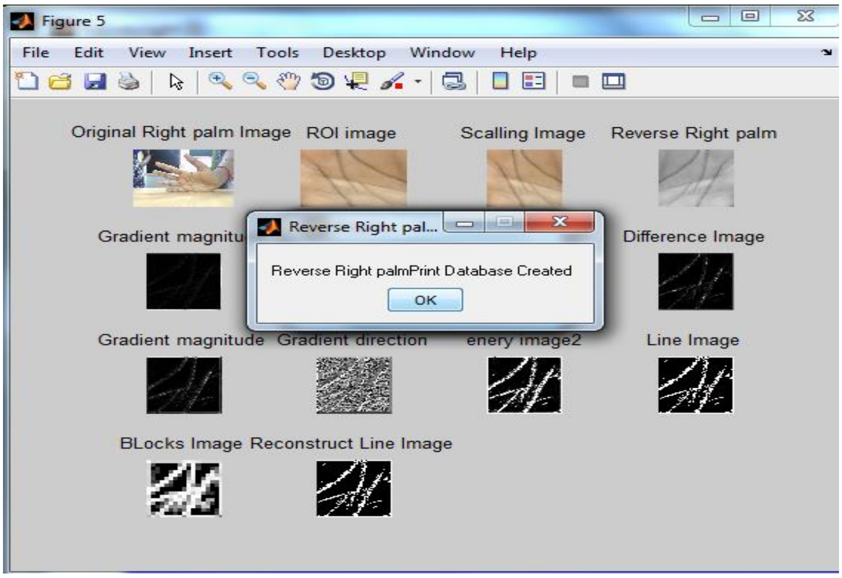

Fig.14. Reverse Right Train 2

DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

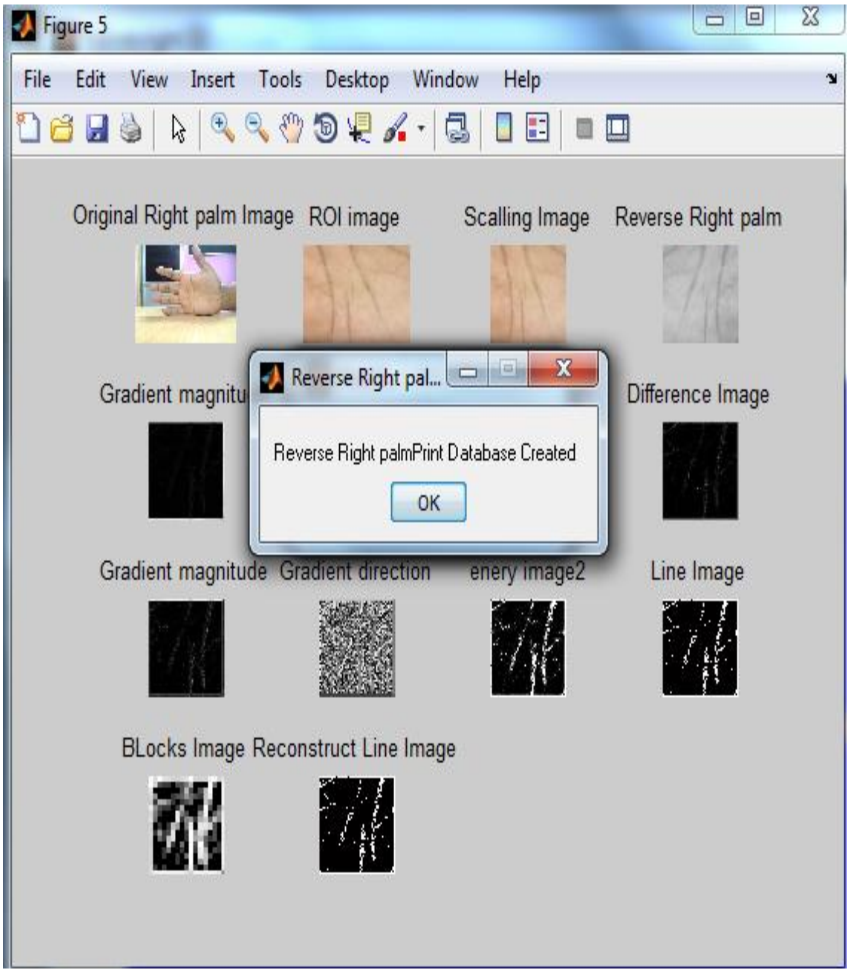

Fig.15. Reverse Right Train 3

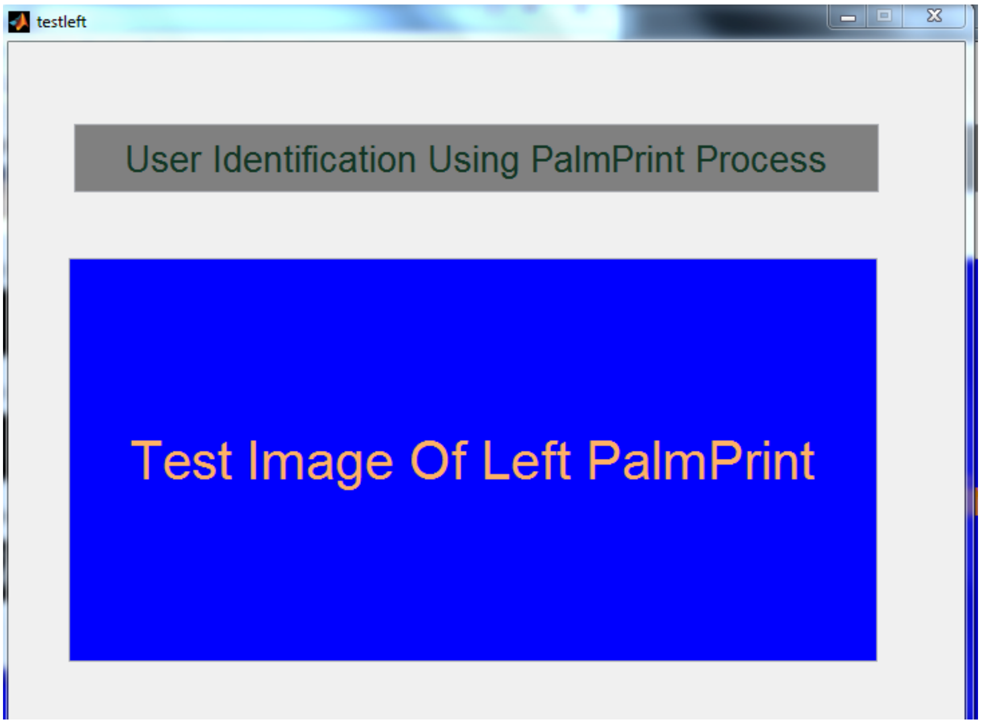

Fig16. Left Test

International Journal of Engineering Technology and Management Sciences
Website: ijetms.in Issue: 1 Volume No.7 January - February – 2023
DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

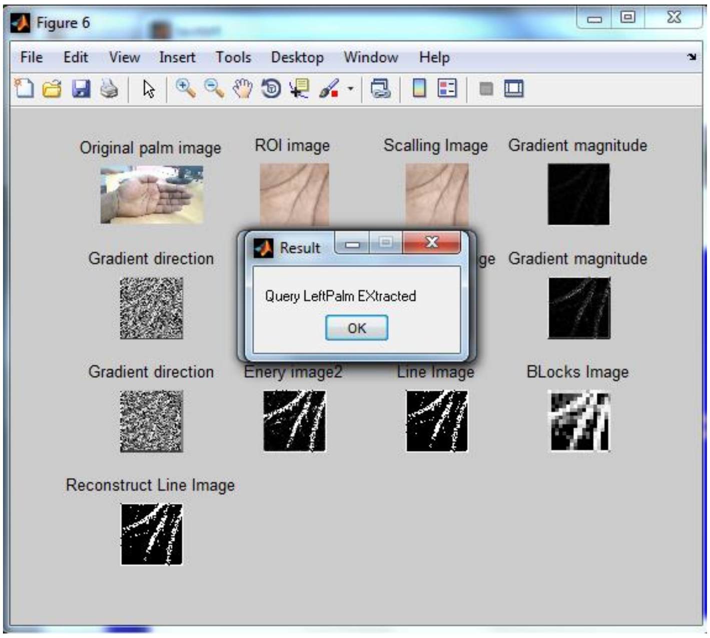

Fig.17. Query left palm extraction

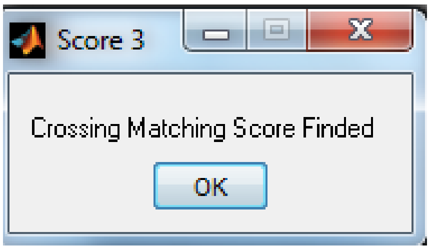

Fig.18. Crossing Matching Score

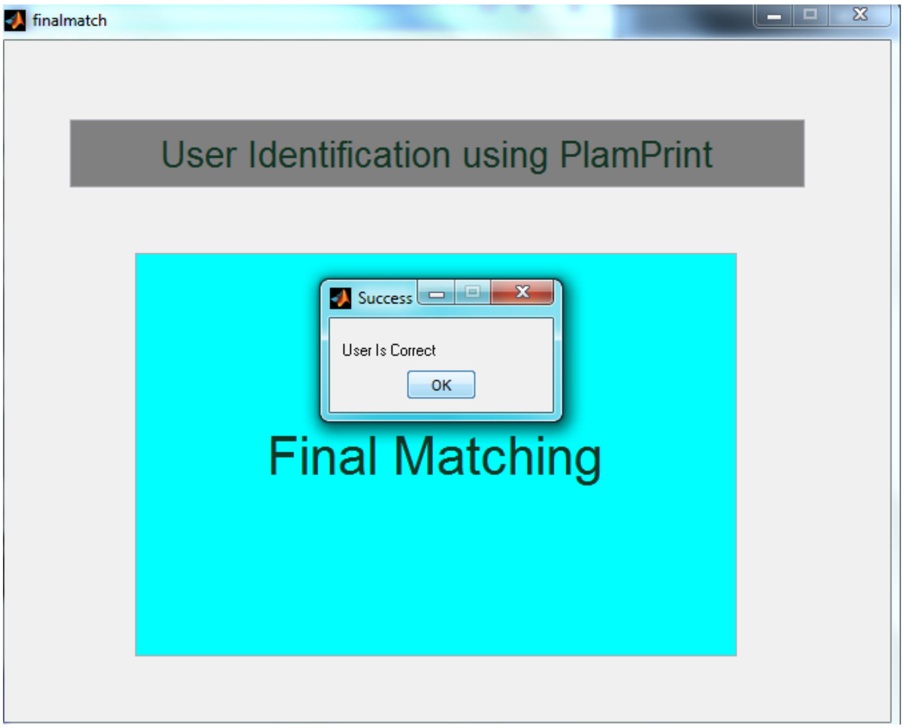

Fig.19. Final Result

DOI:10.46647/ijetms.2023.v07i01.020 ISSN: 2581-4621

5. Conclusion

This work shows that the left and right Palm print images of the same subject are somewhat similar. The use of this kind of similarity for the performance improvement of Palm print identification has been explored in this paper. The proposed method carefully takes the nature of the left and right Palm print images into account, and designs an algorithm to evaluate the similarity between them. Moreover, by employing this similarity, the proposed weighted fusion scheme uses a method to integrate the three kinds of scores generated from the left and right Palm print images. Extensive experiments demonstrate that the proposed framework obtains very high accuracy and the use of the similarity score between the left and right Palm print leads to important improvement in the accuracy. In this paper, we present a face and Palm print multimodal biometric identification method and system to improve the identification performance. Effective classifiers based on ordinal features are constructed for faces and Palm prints, respectively. Then, the matching scores from the two classifiers are combined using several fusion strategies. Experimental results on a middle-scale data set have demonstrated the effectiveness of the proposed system. The competitive coding scheme uses multiple 2-D Gabor filters to extract orientation information from palm lines. This information is then stored in a feature vector called the competitive code. The angular matching with an effective implementation is then defined for comparing the proposed codes, which can make over 9,000 comparisons within 1s. In our testing database of 7,752 Palm print samples from 386 palms, we can achieve a high genuine acceptance rate of 98.4% and a low false acceptance rate of 3×10^{-6}%. The execution time for the whole process of verification, including preprocessing, feature extraction and final matching, is 1s.

References

[1] Kumar A, Zhang D, 2010,"Improving biometric authentication performance from the user quality". IEEE Trans Instrum Meas 59(3):730–735
[2] Kong A, Zhang D, Kamel M ,2006, " Palmprint identification using feature-level fusion". Pattern Recogn 39(3):478–487
[3] Wu X, Zhang D, Wang K ,2006, " Palm line extraction and matching for personal authentication", IEEE Trans Syst Man Cybern Syst Hum 36(No. 5):978–987
[4] Li W, Zhang D, Zhang L,2009," Three dimensional palmprint recognition", IEEE international conferenceon systems, man, and cybernetics, pp 4847–4852
[5] Singh R, Vatsa M, Noore A,2008,"Hierarchical fusion of multispectral face images for improved recognition performance", Inf Fusion 9(2):200–210
[6] Park JH, Kang MG,2007," Multispectral iris authentication system against counterfeit attack using gradient-based image fusion", Opt Eng 46(No. 11):117003–1117003-14
[7] Han D, Guo Z, Zhang D,2008," Multispectral palmprint recognition using wavelet-based image fusion", In: Proceeding of the 9th international conference on signal processing, Oct 2008, pp 2074–2077.
[8] Rajesh Kumar, Varun Pramod Bhartiya, "Palm Print Recognition and Authentication using Digital Image Processing", IJCRT2112151 International Journal of Creative Research Thoughts (IJCRT) www.ijcrt.org, b486-b493.
[9] D. Zhang, W. Zuo, and F. Yue, "A comparative study of Palm print recognition algorithms," *ACM Comput. Surv.*, vol. 44, no. 1, pp. 1–37, Jan. 2012.
[10] D. Zhang, F. Song, Y. Xu, and Z. Lang, "Advanced pattern recognition technologies with applications to biometrics," *Med. Inf. Sci. Ref.*, Jan. 2009, pp. 1–384.
[11] R. Chu, S. Liao, Y. Han, Z. Sun, S. Z. Li, and T. Tan, "Fusion of face and Palm print for personal identification based on ordinal features," in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (CVPR)*, Jun. 2007, pp. 1–2.