



A Person Identification Framework Based on PalmPrint and Fingerprint Biometrics

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Abstract:

As an extraordinary and dependable biometric, PalmPrint recognition has pulled in different researchers and achieved great success. Be that as it may, PalmPrint alone will be unable to take care of the expanding demand of high exactness in today's biometric framework. The reason for our paper is to review whether the integration of PalmPrint and unique mark biometric can accomplish execution that may not be conceivable utilizing a solitary biometric innovation. In this work, PalmPrint authentication system is arranged into PalmPrint picture securing, preprocessing, highlight extraction, include combination and coordinating. Here we utilized an enhanced preprocessing method to improve the levelling. We propose a feature fusion and unique mark verification. Proposed framework removes different components like texture (Gabor), line and appearance (PCA) highlights from the pre-prepared PalmPrint and unique mark pictures. The element vectors acquired from various methodologies are in various measurements and furthermore the elements from same picture might be corresponded. In this manner, we proposed wavelet-based combination systems to meld extricated highlights as it contains wavelet augmentations and utilizations mean-max combination technique to conquer the issue of highlight combination. At last the component vector is coordinated with the put away layout utilizing KNN classifier. The proposed approach is endorsed for their capability on PalmPrint database of 40 clients. The trial comes about displayed that the proposed multimodal biometric system finishes an affirmation accuracy of 98.82% and with the false expulsion rate (FRR) of = 2.5%.

Keywords: Biometrics; PalmPrint; fingerprint; preprocessing; feature fusion; wavelet; Gabor; PCA.

I. INTRODUCTION

The sudden development in the utilization of Internet applications and the considerable worry of security require a dependable individual ID framework. Customary programmed individual ID plans can be separated into two classes: information based, for example, a secret word and token-based, for example, a physical key, an ID card and an identification. In any case, these methodologies have numerous restrictions. In the learning based biometric approach, the "information" can be speculated, overlooked or can be shared. In the token-based biometric approach, the "token" can be effectively stolen or lost. These things firmly show that we require a more powerful and dependable answer for human character administration. Biometrics is viewed as the potential arrangement. Biometric validation alludes to the innovation for individual ID or verification in light of our physiological or potentially behavioural attributes. Biometrics can be separated into two sorts: Unimodal and multimodal. Numerous unimodal biometrics frameworks experience the ill effects of constraints, for example, failure to endure disfigured information because of clamor, twisted information from the sensor gadget, mutilated flag from ecological commotion and inconstancy of an individual's physical appearance and example after some time. Multimodal biometrics can illuminate some of these confinements by consolidating data from different biometric sources. eg PalmPrint and unique mark, face and iris and so forth. In any case, stockpiling necessities, handling time and computational requests of a multimodal biometric framework can be higher than that of unimodel framework. Among the numerous current biometric advancements, unique finger impression distinguishing proof is the most established and the

most famous one. Unique finger impression innovation has minimal effort contrasting with others and high client acknowledgment. It is the strategy for recognizable proof utilizing the impressions made incrementally edge arrangements or examples found on the fingertips. For each individual the edge examples will be diverse for the duration of the life. Fingerprints will offer a reliable methods for individual confirmation. Other individual qualities may change, yet fingerprints don't. However a few people don't have clear fingerprints on account of their physical work or dangerous skin. Iris and retina acknowledgment framework give high precision yet input gadgets cost high. Numerous specialists have focussed on face and voice yet their execution is low. Contrasting with the numerous biometric characteristics existing PalmPrints have many preferences. The internal surface of the palm typically contains standard lines, wrinkles and edges. The standard lines and wrinkles are framed between the third and fifth months of pregnancy and shallow lines show up after we conceived. Indeed, even indistinguishable twins have diverse PalmPrints. Joining both unique mark and PalmPrint for individual recognizable proof will give a superior security and precision. The accompanying segments give an overview on various innovations utilized on unique mark and PalmPrint and give a few recommendations in regards to the best strategy.

II. LITERATURE SURVEY

Sonal S. Athale, DhirajPatil, Pallavi Deshpande, Yogesh H. Dandawate, state that, Among the biometric modalities palm veins are the most secure and hard to copy. This palm vein check framework means to perceive a man from its restrictive

palm vein association that can't be fashioned effortlessly since veins are arranged in inward layers of skin. Implanted gadgets are increasing expanded consideration in biometrics because of unwavering quality and cost effective frameworks. An inserted palm vein acknowledgment framework is the need of today in foundations, enterprises, security places and so on. The point of this proposed work is to execute palm vein recognizable proof framework on equipment unit so it can be further incorporate with a solitary independent unit, where it can be utilized as a part of conclusive level security in multilayered security framework with no plausibility of hacking. The equipment stage utilized as a part of the proposed work is Blackfin ADSP-561 processor and the calculations utilized for coordinating of palm vein are performed utilizing C dialect. The venture concentrates on putting away pictures and actualizing the coordinating calculations on equipment stage itself with the end goal that PC or tablet is not required for distinguishing proof reason. Central segment investigation (PCA) and layout coordinating procedures are utilized as confirmation calculations of palm veins. At long last, it can be finished up from the test comes about that this approach can check a person with a normal exactness of 92% [1]. K. Usha, M. Ezhilarasan, proposed This paper contributes another strategy for individual acknowledgment utilizing finger knuckle print in view of two methodologies specifically, geometric and surface examinations. In the main approach, the shape arranged elements of the finger knuckle print are separated by methods for rakish geometric examination and afterward coordinated to accomplish better accuracy rate. While, the knuckle surface element examination is completed by methods for multi-determination change known as Curvelet change [2]. Dwindle Wild n, PetruRadu, Lulu Chen, James Ferryman, express that, Anti-parodying is pulling in developing enthusiasm for biometrics, considering the assortment of fake materials and new intends to assault biometric acknowledgment frameworks. New inconspicuous materials constantly challenge cutting edge caricaturing indicators, recommending for extra methodical ways to deal with target against ridiculing. By joining liveness scores into the biometric combination prepare, acknowledgment exactness can be upgraded, yet conventional whole govern based combination calculations are known to be exceedingly touchy to single mock cases. This paper examines 1-middle separating as a ridiculing safe summed up contrasting option to the whole control focusing on the issue of halfway multi biometric parodying where m out of n biometric sources to be joined are assaulted. Expanding past work, this paper examines the dynamic identification and dismissal of liveness-acknowledgment match exceptions for parodied tests in genuine multi-modular arrangement with its natural test of standardization. As a further commitment, bootstrap accumulating (bagging)classifiers for unique finger impression parody discovery calculation is introduced. Investigates the most recent face video databases and unique mark parodying database [3]. Jiankun Hu, Josef Pieprzyk, and Willy Susilo, proposed Biometric cryptosystems give an inventive answer for cryptographic key era, encryption and also biometric format assurance. Other than high verification exactness, a great biometric cryptosystem is relied upon to secure biometric formats viably, which requires that aide information does not uncover noteworthy data about the layouts. Past works prevalently take after a fitting entropy definition to gauge the security of biometric cryptosystems. In this paper, we call attention to confinements of entropy-based security examination and propose another security investigation system that consolidates data theoretic approach with computational

security. Also, we develop a unique mark based multi biometric cryptosystem (MBC) utilizing choice level combination. Hash capacities are utilized in our development to additionally ensure each single biometric attribute. The test results and security investigation show that the proposed MBC gives more grounded security and better validation exactness contrasted and a cryptosystem in view of single biometric [4]. YONG XIANG express that Biometrics is usually utilized as a part of many mechanized confirmation frameworks offering a few preferences over customary check techniques. Since biometric components are related with people, their spillage will disregard people's protection, which can bring about genuine and proceeded with issues as the biometric information from a man are indispensable. To ensure the biometric information containing security data, various protection saving biometric plans (PPBSs) have been created in the course of the most recent decade, yet they have different disadvantages. The point of this paper is to give a complete outline of the current PPBSs and give direction for future security protecting biometric explore. Specifically, we clarify the utilitarian instruments of famous PPBSs and present the best in class security safeguarding biometric strategies in view of these systems [5].

III. PROPOSED SYSTEM ARCHITECTURE

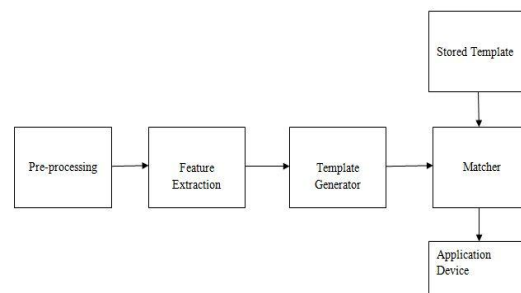


Figure.1. Typical Biometric System

A. PRE-PROCESSING

Image pre-processing is the term for operations on images at the least level of reflection. These operations don't expand picture data content yet they diminish it if entropy is a data measure. The point of pre-processing is a change of the picture information that stifles undesired mutilations or upgrades some picture highlights pertinent for further preparing and examination undertaking. Picture pre-processing utilizes the excess in pictures. Neighboring pixels relating to one genuine protest have the same or comparable brilliance esteem. Pre-processing is done for PalmPrint and unique finger impression independently. After the picture is caught by the scanner it might be mutilated or obscured because of the awful ecological conditions. In these conditions a decent pre-processing technique is an absolute necessity. The objective of unique finger impression image processing is to expand the clearness of the edge structure so that details focuses can be effortlessly separated. PalmPrint image pre-processing is for the most part completed to remove the locale of intrigue. PalmPrint pre-processing includes four normal strides.

- 1) Normalizing the pictures
- 2) Filtering to expel clamor
- 3) Binarization
- 4) Extracting the focal part for PalmPrint picture.

1) Fingerprint Feature Extraction

Unique finger impression acknowledgment framework incorporates a couple stages. The securing stage, where the

remarkable finger impression is separated using a unique finger impression sensor. The element extraction stage, which incorporates calculation of the directional field, change and division of the one of a kind stamp, and extraction of the reasonable component. Finally, the coordinating stage, where the components of the attempted special finger impression are differentiated and a format that is found in the unique mark database.

- a) Popular technique is particulars extraction
- b) A unique mark is made of a progression of edges and wrinkles on the surface of the finger.
- c) There are two sorts of particulars focuses Ridge completion and Ridge bifurcation
- d) Gabor channel used to concentrate highlights from unique mark.

2) PalmPrint highlights extraction

- a) Types-Line based approach; Subspace based approach and Statistical approach.
- b) In line based methodologies, they utilize edge identification techniques to concentrate palm lines.
- c) Subspace-based methodologies additionally called appearance-based approach. They utilize important segment examination (PCA), direct discriminate investigation (LDA) and free segment examination (ICA).
- d) Statistical methodologies are of two sorts Local and worldwide.

The Feature extraction is done utilizing

- 1) Lacunae
- 2) Fractal Dimension
- 3) Gabor Filter

B. FUSION LEVELS

Fusion is a decent approach to build the framework exactness and heartiness. Highlights taken from various biometric qualities ought to must be melded. Numerous biometric attributes including unique mark and PalmPrint, finger impression, PalmPrint and confront, finger impression, iris and face have been utilized. In any case, combination of PalmPrint and unique mark will give better outcome contrasting with others. There are four levels of data combination. Highlight level combination, score level combination, pixel level combination, and choice level combination. Any biometric framework is fit for delivering coordinating scores for information client with those in the database. The arrangement of all conceivable client personalities can be positioned by sorting the coordinating scores in the plummeting request. In this manner a biometric framework can recognize an obscure client by producing positions, i.e., integer number.

1) Sensor Level Fusion

Fusion at sensor level happens before the coordinating module is summoned. In this methodology pictures are intertwined straightforwardly or utilizing some change system then components are removed from melded picture. Sensor level combination can occur when the various attributes are situations of the same biometric quality gained from different sensors or numerous estimations of the same biometric signs procured from a solitary sensor. A case is the introduction of pictures containing different fingerprints to end up plainly a full unique mark picture. Different illustrations incorporate facial pictures taken from different cameras set up together to end up plainly a 3D model of a face. Sensor level combination is gathered into three classes, to be specific: [i] Single sensor-numerous occurrences where various occasions got from a solitary sensor are incorporated to gain the data in a reliable

and unmistakable mode. Averaging, weighted summation and mosaic development are techniques used to fulfill this combination. Amid averaging, the numerous occasions determined are consolidated to diminish the commotion, combine and organize the different occurrences; weighted summation is utilized to deal with the issue of stance variety, mosaic development is utilized. [ii] Intra-class numerous sensors: where numerous occasions acquired from different sensors are assembled to detail the data area of a comparative sensor or changeability of various sensor and [iii] Inter-class different sensors, less review has been embraced of this sensor combination mode. A case in this class is combination including the print of the palm and the pictures of the palm vein; this produced 95% acknowledgment precision utilizing the Shift Invariant Fourier Transform [SIFT] highlights that are removed from the melded and coordinated picture.

2) Feature Level Fusion

Combination at highlight level happens before the coordinating module is conjured. Every individual biometric prepare yields a gathering of elements. At the point when components extricated from one biometric characteristic are free of those separated from the other then it is sensible to connect the two vectors into a solitary new vector. The new element vector has higher dimensionality and speaks to a man's character in a proficiently. The procedure required in highlight level combination happens in two phases, i.e. standardization of a component and choice of an element. The standardization of highlight includes utilizing plans like the min max system and media plotting to alter the area and size of highlight qualities. Utilizing this plan, face and hand acknowledgment has been sent at this level of combination. Other research utilized scale invariant element transform in collecting features from the normalized ear and fingerprint. For improvement of the matching performance with regards to accepting more authentic as real accept, the feature selection is done to decrease the dimensionality of a new feature vector. Algorithms that deal with feature selection include sequential forward selection, sequential backward selection and partition about Medoids. In practice, feature level fusion is sometimes hard to accomplish as there may be incompatibility of feature sets to be combined and the joint feature set of different biometric sources may not be linear. If the feature vectors have the same traits, e.g. various fingerprint impressions of an individual's finger, a mono resultant feature vector can be derived as a weighted average of the individual feature vectors. On the other hand, when the feature vectors have different traits, e.g. face and fingerprint, they can be concatenated to become a single feature vector. Correlated feature values are built up by various biometric algorithms selecting the main set of features used to improve the recognition accuracy. This is seen as a major advantage of the feature level fusion.

3) Match Score Level Fusion

Match score level fusion occurs after the matcher output its result. Each individual biometric outputs a match score which shows proximity of the feature vector with the template vector. This fusion process fuses these scores can be combined into a single score, which is then compared to the system acceptable threshold. If the classification approach applied to score fusion, then the output may be direct decisions. The matching score level fusion can also be called measurement level fusion. The matched score output produced by the biometric matchers gives the necessary information about the pattern input and the representation of the feature vector. The matching score can be derived by two different approaches based on the processing of

the match score i.e. by classifying or combining the feature vector. a feature vector is designed using the matching scores output by the singular matcher, which is further classified into either "Accept class" or "Reject class". The scores of individual matching are linked to become a singular scalar score that is used to reach the end decision. The scores must be converted to a common domain to ensure a sensible combination of scores from the various modalities. For example, the fact that the matching scores could be in dissimilar scale or dissimilar probability distribution, means that the scores generated by individual matchers may not be similar. Three fusion schemes have been proposed as a way to solve this issue, i.e. density-based schemes, classifier-based schemes and transformation-based schemes. The density-based scheme is derived from the estimation of score distribution and its applicability to common models such as the Naïve Bayesian and Gaussian Mixture Model. When using the classifier-based scheme, classifiers are constructed to point out real and impostor scores derived from multiple matchers being treated as feature vector. Lastly, a transformation-based scheme is usually applied for the score normalization processes. This task is key in making sure there are agreeable conditions between various score variables by changing the position and scale parameters of the underlying match score distribution, with sum rule, min rule. etc. as techniques being applied in this scheme.

4) Decision Level Fusion

Choice level combination happens after the matcher yield its outcome. Every individual biometric process and its component vectors give its own Boolean outcome, for example, acknowledge or dismiss. The combination procedure intertwines them by a blend of various calculations, for example, AND, OR, and so on. On choice level, the joining of various data from numerous biometric modalities happens when the individual framework settles on an individualistic choice about the character of the client of an asserted personality. Here, each biometric sort is pre-characterized separately and the last order depends on the combination of the yields of the different modalities. Besides, a choice is given for each biometric sort at a later stage which diminishes the purpose behind enhancing the framework exactness through the combination procedure. This combination level makes utilization of the last yield of the individual modalities with techniques, for example, "AND" "OR" making it the least difficult type of combination. The Dempster-Shafer Theory of Evidence, Behavior Knowledge Space and Bayesian choice combination are different strategies utilized at this level of combination.

IV. METHODOLOGY USED FOR FEATURE EXTRACTION

1. Fingerprint minutiae Extraction

Unique mark is second key biometric qualities which is use for mix. Unique mark is a champion among the most comprehensively used biometric system. The major reason for the use of remarkable finger impression biometric is that it is the most shown strategy to recognize the individual. The novel stamp is basically the blend of edges and valleys on the surface of the finger. [9]

2. Image Enhancement

Unique mark Image upgrade is to done to make the picture clearer for simple further operations. Since the unique mark pictures procured from sensors or different Medias are not

guaranteed with impeccable quality. For expanding the difference amongst edges and wrinkles and for associating the false broken purposes of edges because of lacking measure of ink are exceptionally valuable for keep a higher exactness to unique mark acknowledgment. Histogram Equalization and Fourier Transformer embraced in unique mark upgrade. Histogram leveling is to extend the pixel esteem appropriation of a picture in order to build the perceptual data, and Fourier change partition the picture into little handling squares (32by 32 pixels) and keeping in mind the end goal to improve a particular piece by its predominant frequencies, increase the FFT of the square by its extent an arrangement of times and get Enhanced unique mark picture (Figure 2 (b)).



(a) Original image



(b) Enhanced Fingerprint

Figure.2. Enhanced Fingerprint Image(a,b)

3. Image Binarization

Upgraded unique mark picture is than binarized as In Fingerprint Image binarization is procedure to change dark picture into twofold picture in framework it use for change the 8-bit Gray finger impression picture to a 1-bit picture with 0-esteem for edges and 1-esteem for wrinkles. After the operation, edges in the unique mark are highlighted with dark shading while wrinkles are white. A locally versatile binarization strategy is performed to pairs the unique finger impression picture. Such a named strategy originates from the system of changing a pixel incentive to 1 if the esteem is bigger than the mean force estimation of the present square is 16x16 to which the pixel, then from the binarized picture appraises the bearing for unique mark.

4. Image Segmentation

Picture division is valuable to highlight extraction to be perceived for each unique finger impression picture. The picture zone without powerful edges and wrinkles are first arranged since it can hold just foundation data. At that point the bound of the staying viable region is watch out since the minutia in the bound locale are mistake for those are fake minutia that are produced when the edges are out of the sensor. To extricate the ROI, two-stage techniques are utilized. The

initial step is square bearing evaluation and heading assortment check, while the second is captivated from some Morphological techniques.

5. Minutiae Extraction

For minutia extraction organize, three diminishing calculations are tried and the Morphological diminishing operation is at last given out with high proficiency and quite great diminishing quality. For this stage, a more thorough calculation is produced to evacuate false minutia based. Additionally another co-ordinate portrayal for bifurcations in unique mark is proposed to bind together terminations and bifurcations.

a. Ridge Thinning

Edge Thinning is to expels the excess pixels of edges till the edges are only one pixel limit. In each output of the full unique mark picture, the calculation discounts repetitive pixels in every little picture window (3x3 pixels). Lastly expels each one of those checked pixels after a few sweeps. In my testing, such an In this technique select edges has greatest dark force esteem. Notwithstanding, binariestion is verifiably solid that lone pixels have greatest dark power esteem is remained. In the testing, the headway of each choosing venture has substantial number of unpredictability despite the fact that it doesn't require the development of pixel by pixel as in other diminishing calculations. Utilize morphological diminishing capacity in MATLAB and diminished unique mark picture (Figure 3).

b. Minutia Marking

After the fingerprint ridge thinning, marking minutia points is relatively easy. But it is still not a trivial task as most literatures declared because at least one special case evokes my caution during the minutia marking stage. Minutia marking stage where mark the ridged and bifurcation of fingerprint. Minutiae are extracted by scanning the 3x3 window across each ridge pixel which determines the CN value is use in many system in this it consider 8 neighbors, but in this system divide thinned image in 16x16 processing block and perform the scanning and it have a 3x3 window. Then interest in find the Neighbors Value. Neighbor value (NV) is calculated and then find the number of Neighbors.



Figure.3. Thinned fingerprint image

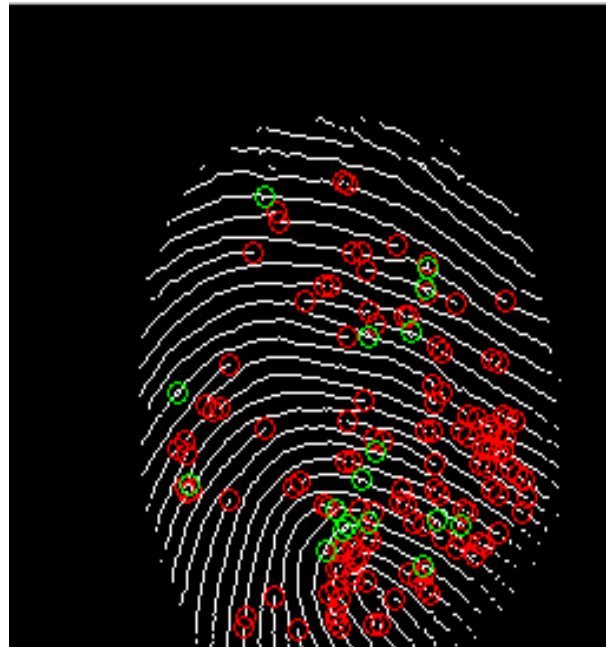
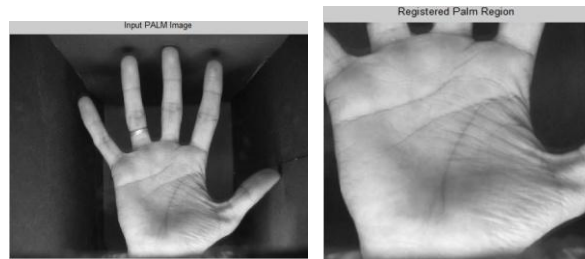


Figure.4. marked minutia

A. PalmPrint Feature Extraction

Geometric features, like a width, length and area of the palm. Line features, principal lines and wrinkles. Line features indicates the length, position, depth and size of the various types of lines and wrinkles on a palm, wrinkles are highly distinctive and are difficult to duplicate, 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 like ridges, ridge endings, bifurcation and dots.



V. EXPERIMENTAL SET UP-

In our experiment we took a total of 50 images of fingerprint and PalmPrint of 10 persons having 5 similar samples. These 10 images are fused and generate a template image file. These 40 images are trained as per our propose design and the feature data are fused and stored in the data variable. The test sample is belongs to one of the person but untrained. The result is as follows: Multifeature Accuracy of Train and Test Image: Using the normalization method the calculated class using the test sample is five but the fifth class has four similar images. We used the method of similarity matching among these images and we found as follows: The similarity percentage of the matched image 98.82 to 40 images of the trained image from the database. It is true that the result is 100% accurate. Which consist of original palmprint and fingerprint image and the fusion result which is treated as database image and the test image? Figure 9 explains the nearest neighbor classification result. Table 1 explains the comparison of various modality combinations and their achieved accuracy due to fusion.

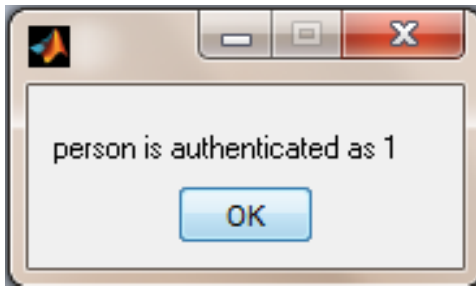


Figure.5. shows the actual output

Method	Recognition Percentage	Modalities
PCA	79.79	Finger and PalmPrint
Proposed Method	95.83	Finger and PalmPrint

VI. CONCLUSION

Proposed system provides better security application. It helps to avoid forge application, spoofing attacks. It is user-friendly and more generous to user and very less complex in nature. Cost is very less as it is software based method. We often face problems due to the fact that there exists only a single sample for personal identification in practice. The biometrics fusion technology is considered to be an effective solution to improve the performances of single sample biometrics systems. Meanwhile, the fusion of hand-based is promising in real world application because of the convenience and acceptance of the public. We have presented a feature level fusion scheme for PalmPrint and finger print verification and identification system using the combination of three PalmPrint representations. The extracted Gabor, line and PCA features are fused using a wavelet based feature fusion technique supported by wavelet extensions for feature reduction and mean and max fusion rule to avoid correlation. The experimental results show that the combination of LogGabor filter, line and PCA outperforms than using them individually. Finally, the proposed multimodal biometric system achieves a recognition accuracy of 98.82% and with the false rejection rate (FRR) of = 2.5%. Furthermore the proposed method obtains a better recognition results than the other methods when only one modality is used. In the future work, more experimental test will be performed on the real multimodal biometric data.

VII. REFERENCE

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