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Survey on Palm Vein Authentication Using Susan Algorithms

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Abstract

Hand vein patterns recognition is one of the earliest biometric technologies used for the identification/verification of individuals. But the vein trace is hard to be changed or falsified since veins are internal to the human body. The survey is all about Palm vein authentication. It is one of the modern biometric technique, which employs the vein pattern in the human palm to verify the person. For vein pattern verification, nearest neighbor's method is used. The SUSAN algorithm is used in palm vein authentication as it is advantageous in edge finding, corner finding and image noise filtering.

Index term: Palm vein, Personal identification, Liveness detection, Susan algorithm.

Introduction

The extrinsic features are easily accessible which leads to some privacy and security concerns. On the other hand, intrinsic biometrics (veins, DNA) requires more efforts to acquire without the knowledge of an individual. However, it is very important that high collectability of the biometric traits from the users must be taken using biometrics device. In this context, palm vein biometric system emerged as a promising alternative for personal authentication. Palm vein pattern biometric technology is a promising feature for use in forensic and access control applications. Palm vein biometric system is relatively new and is in the process of being continuously refined and developed.

Basic of Palm Vein Authentication

Palm vein authentication uses the vascular patterns of an individual's palm as personal identification, through which near-infrared light pass deoxygenate hemoglobin in the blood flowing through the veins absorbs near infrared rays,

illuminating the hemoglobin causes it to be visible to scanner. An individual palm vein image are converted by algorithms into data points which is compress, encrypt and stores by the software registered along with the other details in his profile as a reference for future comparison.

Features of Palm Vein Authentication

Palm Vein patterns are unique to individuals bases on research by Fujitsu; Advanced authentication algorithm produced high level of accuracy. Leading-edge authentication system verifies an individual's identity by recognizing the pattern of blood veins in the palm. Contact less authentication is hygienic and non-invasively that promotes a high-level of user's acceptance. Advanced authentication algorithm produces high level of accurate and application verse. Very difficult to forge, thereby enabling a high level of security.

Why We Use Palm Vein Authentication

Security systems: physical admission into secured areas with door locks and integrated building security systems. Log-in control: network or PC access. Healthcare: ID verification for medical equipment, electronic record management. Banking and financial services: Right to use ATM, kiosk, vault.

Literature Survey on Palm Vein Authentication

To analyze about Palm vein biometric systems are superior because they provide a nontransferable means of identifying people not just cards or badges. The benefit of palm vein biometric authentication is that biometric data is based on human vein characteristics that stay constant throughout one's lifetime and are difficult to fake or change. Hence it is need to study a literature about it, to understand the techniques also to use the best methods during Palm vein biometric systems.

Palm Vein Detection and Its Various Methods

Palm vein detection involves the separation of image into two parts; one containing the False Rejection Rate (FRR) and the other containing the False Accept Rate (FAR).

False Rejection Rate (FRR)

- This error is the measure the biometric security system will incorrectly reject an access attempt by an authorize user.
- A system of FRR typically is state the ratio of the number of false rejections divided by the number of identification attempts.
- For Palm Secure this is impressively ratio 0.01%.

False Accept Rate (FAR)

- This is typically considered the most serious errors of biometric security as it gives unauthorized users access to system that expressly is trying to keep them out.

- A system FAR typically is stated as the ratio of the number of false acceptances divided by the number of identification attempts.
- Advanced authentication algorithm produces a high level of accuracy for Palm Secure this is remarkable ratio 0.00008%.

Different Palm Vein Detection Techniques

Adams Kong (2009) et al Described an overview of current palm print in particular acquire devices, preprocessing, verification algorithm palm print related fusion, algorithms especially designed for realtime palm print identification in large databases and measures for protecting palm print systems and users privacy. The different templates may require different measures for template protection. For high speed large scale personal identification iris recognition algorithm and Competitive Code or other coding methods are required.

Ying Hao (2009) et al Method involves image acquisition dedicated device under contact free and multispectral environment from each individual hand images feature-level to align ROIs from different spectral images preprocessing to locate Region of Interest (ROI). Generally forged sample can only imitate only one aspect of skin is less likely to be accepted by the system registered with fused sample to combine images from multiple spectra.

Ajay Kumar and Ch. Ravikanth (2009) Proposed personal authentication using finger back surface image. The texture pattern produced by the finger knuckle bending is highly unique and makes the surface a distinctive biometric identifier. The finger geometry features can be at once acquires from the same image at the same time and integrated to further improve the user identification accuracy of such system. Authentication scheme highly depends on the accuracy of knuckle segmentation from the presents hands. The improvement can be achieved with the development of more accurate knuckle segmentation.

Jiansheng Chen (2008) Presented two approaches SIFT and SAX for palm prints authentication. The SIFT (Scale Invariant Feature Transformation) for palm print is used detect local image features invariant to image scaling, translation and rotation. The SAX (Symbolic Aggregate approximation) extends time series technology to 2D data for the palm print representation and matching. Palm print authentication approach using 2DSAX. The Point-wise matching is used to match SIFT key points extracted from palm print images.

Jian-Gang Wang (2008) Put forward a novel palm representation, the "Junction Points" (JP) the two set of line segments extracted from the registered palm print and palm vein images. Unlike the existing approaches the JP set containing position and orientation information is a more compact feature that significantly reduces the storage requirement. The palm prints and palm vein images are captured by a 2 CCD camera are visible and near IR image.

Mohamed Shahin (2008) et al Described hand vein authentication system using fast spatial correlation. In order to evaluate the system performance prototype was designed of 50 persons of different ages above 16 and of different masculinity, each has 10 images per human being was acquires at different interval 5 images for left

hand and right hand. The hand vein pattern is unique for each person and is also unique for each hand.

Jian-Gang Wang (2007) presented a multimodal personal identification system using palm print and palm vein images with their fusion applied at the image level. The palm print and palm vein images are fused by a new edge preserving and contrast enhancing wavelet fusion method in which the modified multi scale edges of the palm print and palm vein images are combined. There are two sensors are used to capture palm print and palm vein images respectively. It is possible to obtain palm print and palm vein almost simultaneously using one camera by either switching the filters, or obtain fully registered images by using a beam splitter cube or using a single camera which has good sensitivity in the visible and near infrared spectrum.

Yi-Bo Zhang (2007) et al Put forward authentication use palm vein. The infrared palm images which hold the palm vein information are used for our system. The liveness of a human this system can provide personal authentication and vein information represents. A low cost CCD camera and a set of infrared light source are used to capture the infrared palm images. A sub image is extracted by locating ROI in terms of image register. The palm vein in ROI is used as biometric features to do recognition.

Asmaa M.J. Abbas(2014) Proposed palm vein recognition and verification system it presents two steps the first one in the system is image enhancement and localization of veins grid which is a major challenge due to poor quality of veins images and the second challenging task is the palm vein feature extraction. The system can be applied to various parts of the human body where the veins are accessible (comparable Finger, wrist, and etc). The superiority image data is vital for the application hence more work is needed in the data preprocessing stage. The current image enrichment methods can be improved to provide better enhancement results with lower complexity and time.

David Zhang (2014) et al Presented an online personal verification system by fusing palm print and palm vein information. Considering that the palm vein image quality can vary much image quality. To increase the anti-spoof capability of the system the liveness detection method based on the image property. The designed and developed palm print verification system by fusing palm vein information algorithm based on the analysis of brightness and texture of image.

Yingbo Zhou (2011) a new approach attempts to more effectively accommodate the potential deformations, revolving and paraphrase changes by encoding the orientation preserving features and utilizing a novel region based matching scheme. The palm vein identification approaches with one or two different databases that are acquired with the contactless and touch based imaging setup. This approach performs very well even with the minimum number of enrolment images.

Daniel Hartung (2011) proposed a new system named as biometric vascular pattern recognition. In this paper vein pattern features are extracted based on minutiae points from fingerprint recognition. Minutiae points are extracted from the skeleton by the fast marching Skeletonization algorithm. Hence the proposed system enhances the performance compared to previous systems.

Deepamalar et al (2010) Proposed system is based on parallel mode multiple feature analysis and multilevel fusion. The directional information of the palm vein has been considered for better analysis. The multimodal palm vein recognition system has very low value of matching error rate and false acceptance or rejection rate. The palm vein recognition system using multilevel fusion of multimodal features and neural network classifier has been developed. The shape and texture features have been extracted and multimodal extraction level.

David Zhang (2010) et al Presented online multispectral palm print system the requirement of realtime application. A palm print images under Blue, Green, Red, and near infrared (NIR) data acquisition device is design to capture the illuminations in less than 1s. The establishment of multispectral palm print database is recognition performance of each spectral band. It was also found that due to the much redundant information across some bands.

Lingyu Wang and Graham Leedham (2006) Presented the system consists of five individual processing stages: Hand Image gaining, Image improvement, Vein model Segmentation, Skeletonization and Matching. The system captures the vein pattern images using a thermal camera. Unlike other vein pattern verification systems that compare the vein patterns based on a predefined set of features extracted using techniques like Multi resolution analysis. The system directly recognizes the shapes of the vein pattern using line segment Hausdorff distance.

Stephen (2002) Advised new feature detectors based on the minimization of the local image region. The noise reduction method uses this region as the smoothing neighborhood. The obtained results are accurate noise resistant and fast. The Susan principle allows image edges, lines, corners and junctions to be accurate and quickly found. Thus, this method results in good noise suppression and also the localization of the features are independent of the mask size used.

Literature Survey Table

S. No	Title	Author's Name	Publication Year	Methods	Remarks
1.	Palm Vein Recognition and Verification System Using Local Average of Vein Direction	Asmaa M.J. Abbas	2014	Image enhancement and feature extraction.	Hand shape recognition devices is leading to poor performance
2.	Palm Print and Palm Vein Verification Online	David Zhang	2014	anti-spoof capability	To improve the palm vein image quality.
3.	Human Identification Using Palm-Vein Images	Yingbo Zhou	2011	Contactless and touch based images	It is not suitable for large contactless database.
4.	Spectral Minutiae for Vein Pattern Recognition	Daniel Hartung	2011	fast marching Skeletonization	Hausdorff distance measure does not give satisfactory

					results.
5.	Palm Vein Recognition with Local Binary Patterns and Local Derivative Patterns	Leila Mirmohamadsadeghi	2010	Local Binary Patterns (LBPS) and Local Derivative Patterns (LDPS)	Unable to find discriminative information.
6.	Personal Authentication using Finger Knuckle Surface	Ajay Kumar	2009	Peg-free imaging	Deformations generated in the knuckle texture.
7.	Multispectral Palm Image Fusion for Accurate Contact-Free Palm Print Recognition	Ying Hao	2009	Peg free or contact-free and hand biometrics	To increase the capability of image in hierarchical fusion capability
8.	SIFT Features in Palm print Authentication	Jiansheng Chen	2008	SIFT(Scale Invariant Feature Transformation) and SAX(Symbolic Aggregate approximation)	Better to increase matching stratagem
9.	Biometric Authentication Using Fast Correlation of Near Infrared Hand Vein Patterns	Mohamed Shahin	2008	fast spatial correlation	Noise reduction and Smoothing.
10.	Person recognition by fusing palm print and palm vein images	Jian-Gang Wang	2007	Fisherpalm and Eigenpalm	Unacceptable error rates and Spoof attacks.

Proposed System of Palm Vein Authenication

The SUSAN edge detector, scale-space graphs showing edge localization against mask size of plotting a single horizontal line from the edge image against mask size give vertical lines. This is obviously required feature, as it measures the accuracy does not depend on mask size. This is to be expected; the minimum SUSAN area when approaching an edge occurs on top of the edge regardless of the mask size. The algorithm performs the following steps at each image pixel.

1. Place a circular mask around the pixel in the nucleus.
2. Using the number of pixels within the circular mask which have similar brightness to the nucleus.
3. Using subtract the SUSAN size from the geometric threshold to produce an edge strength image.
4. Use moment calculations applied to the SUSAN to find the edge direction.
5. Apply non-upper limit suppression thinning and sub-pixel estimation is required.

Result & Conclusion

This paper presents various methods used for palm vein authentication to identify a person. Susan algorithm is selected as an optimal one in palm vein authentication which reduces noise in an image. The localization of the features is independent of the mask size used, and noise suppression is shown to be good. Complex junctions are detected correctly by the "corner" finder.

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