IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 3, March 2016

Human Identification using Major and Minor Finger Knuckle Pattern

Ms. Aditi S. Pekhale[1], Ms. Prachi D. Thakur[2], Ms. Kavita D. Thorat[3], Ms. Ashwini V. Waje[4], Prof.Satish.N.Bhadane[5]

Department of Information Technology, Pune Vidyarthi Griha's College Of Engineering[1,2,3,4,5]

Abstract: This paper investigates the possible use of minor finger knuckle patterns The minorand minor finger knuckle patterns can either be used as independent biometric patterns or employed to improve the performance from the major finger knuckle patterns. A completely automated approach for the minor finger knuckle identification is developed with key steps for region of interest segmentation, image normalization, enhancement, and robust matching to accommodate image variations. This paper also introduces a new or first publicly available database for minor (also major) finger knuckle images from 503 different subjects. By using major and minor fingur knuckle we can accurateliy find out human The efforts to develop an automated minor finger knuckle pattern matching scheme achieve promising results and illustrate its simultaneous use to significantly improve the performance over the conventional finger knuckle identification. Several open questions on the stability and uniqueness of finger knuckle patterns should be addressed before knuckle pattern/image evidence can be admissible as supportive evidence in a court of law. Therefore, this paper also presents a study on the stability of finger knuckle patterns from images acquired with an interval of 4–7 years. The experimental results and the images presented in this paper provide new insights on themajor and minor finger knuckle pattern and identify the need for further work to exploit finger knuckle patterns in forensics and biometrics applications.

Keywords: major finger knuckle, minor finger knuckle, finger dorsal biometrics, knuckle segmentation, local binary patterns.

I. INTRODUCTION

Automatic identification of humans using their unique anatomical characteristics has been increasingly investigated for their applications in human surveillance and image forensics. Emerging national ID programs that require accurate, online and large scale identification automated personal identification have posed new challenges for the bio- metrics technologies. The unique identification project is one such ambitious project that aims to identify 1.2 billion population using ten fingerprints and two iris images. Selection of biometrics modalities in such large scale identification problems is not only limited by the individuality of the modality but also by the user-convenience in acquiring the respective modality. In this context, the finger-vein and finger knuckle images can be simultaneously acquired while acquiring the fingerprint images and with no additional inconvenience to the users. Simultaneous acquisition of finger-vein images can however require some alterations in the existing (slap) fingerprint devices, largely due to the near infra red based intrusive imaging requirements for finger-vein imaging. However, the finger knuckle images can be simultaneously acquired with the addition of an external imaging camera that simultaneously acquires finger dorsal images and syn- chronizes the acquisition with external software. Therefore it is important to ascertain the nature of information that can be extracted from the finger dorsal images.

This paper focuses on this problem and investigates the possibility of using minor finger knuckle pat- terns for the biometric identification.

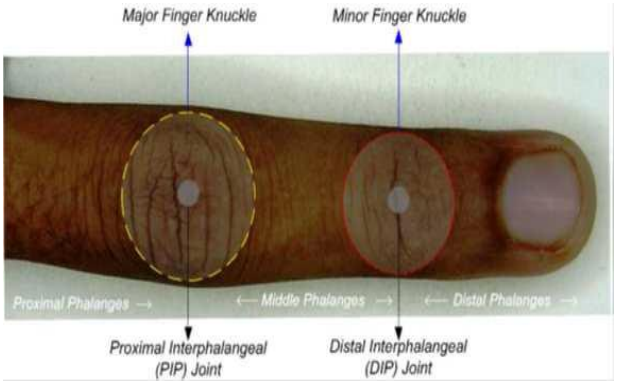


Figure 1: images sample

Accurate identification of finger knuckle patterns can be beneficial for several applications involving forensic and covert identification of suspects .There are many different types of Biometrics, these are, IRIS Identification, Retinal Identification, Face Recognition, Voice Recognition, Fingerprint, Hand/Finger Geometry, Signature verification, Keystroke Dynamics, and other esoteric biometrics. Hand-based biometrics, such as fingerprint and hand geometry, is the most prevalent biometric sys- tem in the marketplace. However, fingerprint suffers from a major drawback, which is its proneness to anti-security threats, such as the reproduction of fingerprints left on surfaces to deceive the system. On the other hand, the hand geometry features are not descriptive enough for identification when the number of users grows larger. Problem related to other identifiers are as human voice and

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 3, March 2016

signature can be copied, duplicates are available so face recognition will not be foolproof identifier. The unique identification project is one such ambitious project that aims to identify 1.2 billion population using ten fingerprints and two iris images.

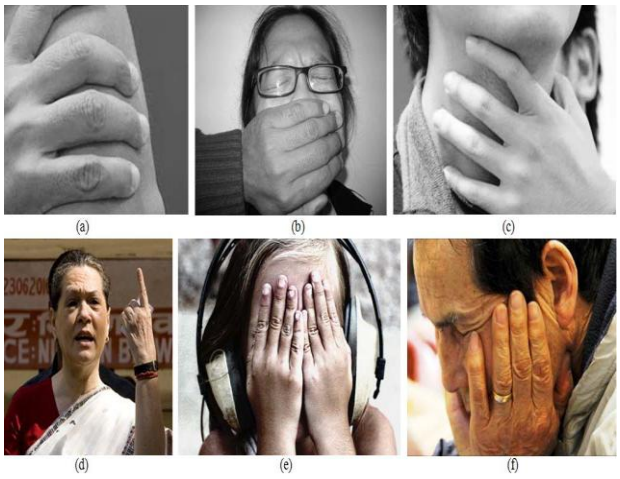


Fig. 2.Sample photographs with knuckle patterns during (a) sexual/physical assault, (b) kidnapping, (c) covert video and surveillance, (d) gesture [24], and (e)–(f) emotions [25] for surveillance and forensic applications.

II. HISTORY & BACKGROUND

The likelihood of using lowest finger knuckle patterns shaped on the joints between metacarpal and also the proximal phalanx bones for the biometric identification. We have a tendency to mechanically phase such region of interest from the hand images and normalize them to accommodate illumination, scale and create variations resulting from the contactless imaging. The normalized knuckle images square measure wont to match victimization many matchers popular within the literature. We have a tendency to use information of 110 completely different subjects no heritable from the contactless hand imaging to ascertain the performance. we have a tendency to addi- tionally appraise the performance from matching of such lowest finger knuckle patterns victimization two session information no heritable once associate interval of a minimum of two years. This paper has investigated the chance of mistreatment second minor finger knuckle image for the private identification. The approach represented during this paper is totally automated and uses contactless imaging that is predicted to pro- duce/accommodate giant variations in images. The experimental results conferred during this paper from the database of one hundred ten subjects area unit quite promising; rank- one recognition accuracy of over 80th (equal error rate of eight.36knuckle matching. Our experimental results counsel that spectral domain matching of knuckle patterns from their correlation in part elements achieves the most effective performance. Superior per- formance owing to such band restricted phase elements are often risk owing to the actual fact that spurious high frequency elements in knuckle images area unit better eliminate throughout the band limiting method which may generate additional reliable matches supported slowly variable knuckle curves/creases. We used palm dorsal images from 110 different subjects exploitation contactless imaging for the experiments. The images were no inheritable from the proper handoff the volunteers in indoor or outside atmosphere. All the acquired images were wont to mechanically section 100 100 constituent ROI ap- preciate second minor finger knuckle region. These images were enhanced and subjected to the feature extraction exploitation three matches. The band limiting threshold for BLPOC was fastened to 0.6 for all the experiments. The road dimension and length of one and seven pixel was severally fastened for all experiments in RLOC(the filter size was 11 11). Two mathematician filters of size 11 * 11 pixels were used to reason ordinal representations of the segmental knuckle for the matching. we have a tendency to used four images for the coaching and remaining images for the testing. This was continual for all the combination (leave out one protocol) of images used as test images. A. Kumar, senior member, IEEE[2],The likelihood of employing minor finger knuckle images for the identification. The coarse-to-fine segmentation strategy devel- oped in this paper has been quite self-made because it has been able to achieve higher matching accuracy. The experimental results illustrated during this paper, on the info of 503 subjects, can achieve promising performance (EER of 6.29from solely mistreatment contactless minor finger knuckle images. The experimental results according during this paper conjointly recommend that the synchronous use of major and minor finger knuckle images will help to considerably improve the performance which will not be attainable by victimization either minor or major finger knuckle images alone. Two finger joints, i.e., PIP and DIP joint as shown in figure 1.2, have vital backward motion and so need some mechanism to stop dislocation and luxations.

III. NEED OF FINGER KNUKLE

There are many different types of Biometrics, these are, IRIS Identification, Retinal Identification, Face Recognition,Voice Recognition, Fingerprint, Hand/Finger Geometry, Signature verification, Keystroke Dynamics, and other esoteric biometrics. Hand-based biometrics, such as fingerprint and hand geometry, is the most prevalent biometric system in the marketplace.However, fingerprint suffers from a major drawback, which is its proneness to antisecurity threats, such as the reproduction of fingerprints left on surfaces to deceive the system. On the other hand, the hand geometry features are not descriptive enough for identification when the number of users grows larger. Problem related to other iden- tifiers are as human voice and signature can be copied, duplicates are available so face Finger Knuckle Anatomy A normal human hand has four fingers and a thumb. Each of the fingers has 3 bone segments with 3 joints and the thumb has 2 bone segments with 2 joints. These segments are known as phalanges (plural of phalanx). There are three bones in every finger known as the proximal phalanges, the centre phalanges and the distal phalanges. The proximal phalanx is the first join where the finger joins the hand. The proximal interphalangeal joint, or PIP joint is

IJARCCE
ISSN (Online) 2278-1021
ISSN (Print) 2319 5940
International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 3, March 2016

the second joint. The distal interphalangeal joint or DIP is the last joint of the finger.

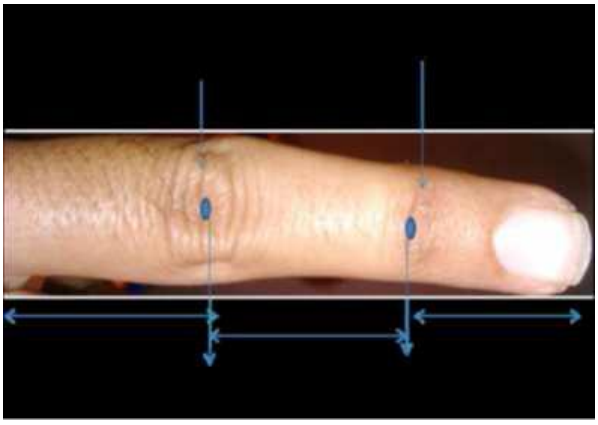


Figure 3: finger dorsal images with knuckle patterns

The unique identification project is one such ambitious project that aims to identify 1.2 billion population using ten fingerprints and two iris images. Selection of biometrics modalities in such large scale identification problems is not only limited by the individuality of the modality but also by the user-convenience in acquiring the respective modality. In this context, the finger-vein and finger knuckle images can be simultaneously acquired while acquiring the fingerprint images and with no additional inconvenience to the users. Simultaneous acquisition of finger-vein images can however require some alterations in the existing (slap) fingerprint devices, largely due to the near infrared based intrusive imaging requirements for finger vein imaging.However, fingerprint suffers from a major drawback, which is its proneness to anti-security threats, such as the reproduction of fin-gerprints left on surfaces to deceive the system. On the other hand, the hand geometry features are not descriptive enough for identification when the number of users grows

IV.SYSTEM ARCHITECTURE

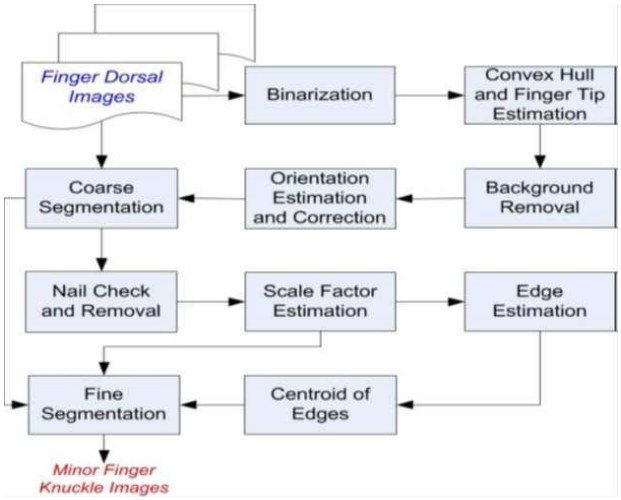


Figure 4: System Architecture

The structure mainly focuses on following areas: region of interest segmentation,image normalization, enhancement, and robust matching to accommodate image variations.

Binaization Background removal
1. Module 1. Segmentation and Normalization
2. Module 2. Feature Extraction and Matching
3. Module 3.Combining Major&Minor Finger Knuckles

A.Segmentation and Normalization

Accurate personal identification using minor finger knucklepatterns will require accurate segmentation of region of interestimages. The segmentation approach should be able to generatenormalized and fixed size region of interest images from thefinger dorsal images of subjects under varying age group. Inabsence of any fixation pegs or the finger docking frame, the acquired finger dorsal images illustrate fingers with varying poses, locations and scale changes. In addition, the varying length of fingers, finger-widths, finger-nails, skin pigmentation and location of distal interphalangeal points, poses severe challenges to exploit any anatomical characteristics of fingers for robust minor finger knuckle segmentation. Figure 5 illustrates simplified block diagram for the finger knuckle segmentation strategy attempted in this work to segment fixed size minor finger knuckle images. Each of the acquired images is firstly subjected to binarization using Otsus thresholding. The resulting images are cleaned (denoised) by automatically removing the isolated regions/pixels (¡ 100 pixels) so that the longest object representing finger is only retained. The binarized finger shape is used to estimate the location of finger-tip from the convex hull of the images. The location of finger-tip is utilized to eliminate the background image above the finger-tip. The orientation of fingers is then estimated from this binarized image using the methods of moment, similar to as also employed in [7]. This step is followed by the coarse segmentation which segments a small portion of acquired finger images that can include minor finger knuckle region while excluding major knuckle region and major part of finger nail. Such segmentation strategy requires some crude assumptions for the maximum ratio of nail length to the finger length and assumption that the major finger knuckle region is located somewhere in the middle of the acquired finger dorsal image. The resulting coarsely segmented image is further subjected to nail check and removal steps which consist of segmenting the image and locating the bonding box region for smaller parts and removing them. The width of the resulting image is computed and used to estimate the scale factor for the scale normalization. The edge detection of resulting image is used to locate the center of minor finger knuckle image. This is achieved by estimating the location of the centroid for the resulting edge detected image and segmenting a fixed size region (160 180 pixels) that represents minor finger knuckle region for the finger dorsal image.

B. Image Enhancement

The finger dorsal surface is a 3D curved surface and such curves can result in uneven illumination reflections and shadows.Therefore the egmented minor finger knuckle images often have low contrast and illumination variations. The enhancement steps areessentiallyrequired to normalize such illumination variations. The illumination

IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 3, March 2016

normaliza –tion approach used in this work is same as also used in [8]. This ap-proach firstly estimates the average background illumination in the 16 16 pixels sub-blocks of the segmented knuckle images. The estimated illumination is then subtracted from the original knuckle image to remove the uneven illuminations. The resulting image is then subjected to the histogram equalization operation which generates enhanced minor finger knuckle image for the feature extraction stage.

C.Feature Extraction and Matching

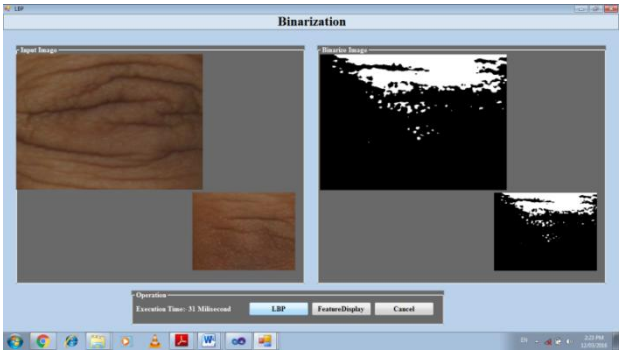
The finger knuckle images after enhancement typically represent some random texture pattern which appears to be quite unique in different fingers. Therefore a variety of spatial and spectral domain feature extraction strategies can be pursued to ascertain the matching accuracy from the minor finger knuckle images. The experimental results in this paper have employed local binary patterns [9], improved local binary patterns band limited phase only correlation and 1D log-Gabor filter based matchers for the performance evaluation.

V. RESULT AND ANALYSIS

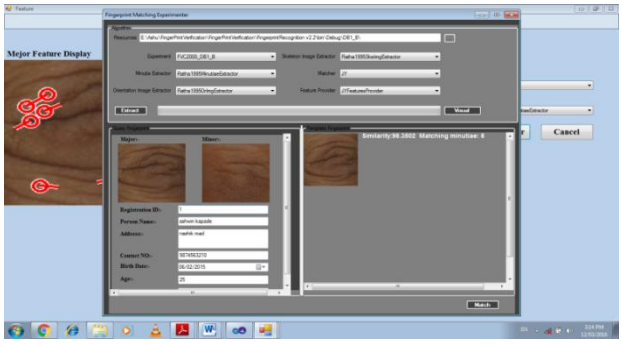
Therefore a variety of spatial and spectral domain feature extraction strategies can be pursued to ascertain the matching accuracy from the minor finger knuckle images. The experimental results in this paper have employed local binary patterns improved local binary patterns These matchers are briefly described in the following.

Local Binary Patterns

The local binary patterns (LBP) encoding can acquire local knuckle patterns and also represent multi-scale texture appearances. Improved LBP (ILBP) is one such variant that uses mean value of neighborhood pixels for binarization (1), instead of center value used in LBP, and has also been investigated in this work.The ILBP enables us to utilize the gray level of center pixel and may deliver superior performance as the resulting LBP descriptor becomes more robust to the noise influencing the center pixel.



major and minor knuckle patterns, can be simultaneously combined to improve matching accuracy for the personal identification. Among several possibilities to integrate minor and major knuckle patterns, this work explored match using linear and nonlinear strategies. In current application, it is important to select the score level combination strategy which is computationally simpler and yet effective to significantly improve the performance. Therefore several popular approaches were explored to consolidated matching scores from the simultaneously extracted major and minor finger knuckle images, and these are summarize. In this work the matching scores from the major finger knuckle are chosen as the controlling factor to benefit from their superior accuracy due to its rich/stable knuckle patterns



VI .CONCLUSION

Thus we conclude that we are developing a system which identifies human beingson basis of both minor and major finger knuckle images for the biometric identification. The coarse-to-fine segmentation strategy developed in this systemis able to achieve higher matching accuracy.The finger dorsal images in this system acquires the accuracy points towards the uniqueness of major/minor finger knuckle patterns in the given database rather than on the stability of such patterns with time.The system states that the knuckle is a viable biometric trait, and can be used as an alternative to fingerprint or palm print or in conjunction with them in multi modal systems to improve over all accuracy.

REFERENCES

[1] Ajay Kumar, Zhihuan Xu, Can we use Second Minor Finger Knuckle Patterns to Identify Humans?, Department of Computing, The Hong Kong polytechnic Univer-sity Hung Hom, Kowloon, Hong Kong
[2] A. Kumar, Importance of being unique from finger dorsal patterns: Exploring Minor Finger Knuckle Patterns in verifying Human Identities, IEEE Trans. Inf. Forensics Security, vol.9, no.8, pp.98-110, Aug 2014.
[3] Ajay Kumar,Contactless Finger Knuckle Identification using Smartphones, Hong Kong Polytechnic University,Hung Hom, Kowloon, Hong Kong.
[4] Shanmugalakshmi Ramachandran,A Multimodal Biometric System Based on Palm- print and Finger Knuckle Print Recognition Methods.
[5] Ajay Kumar, Department of Computing, The Hong Kong Polytechnic University, Can we use Second Minor Finger Knuckle Patterns to Identify Humans?
[6] S. Ribaric and I. Fratric, A biometric identification system based on eigenpalm and eigenfinger features, IEEE Trans. Pattern Anal. Mach. Intell., vol. 27, no. 11, pp. 16981709, Nov. 2005.
[7] A. Kumar and Y. Zhou, Human identification using finger images, IEEE Trans. Image Process., vol. 21, no. 4, pp. 22282244, Apr. 2012.
[8] A. Kumar and Y. Zhou, Human identification using knuckle-codes, in Proc. IEEE 3rd Int. Conf. Biometrics, Theory, Applicat., Washington, DC, USA, Sep. 2009, pp.147152.
[9] T. Ojala, M. Pietikinen, and T. Menp, Multiresolution gray-scale and rotation in- variant texture classification with local binary patterns, IEEE Trans. Pattern Anal. Mach. Intell., vol. 24, no. 7, pp. 971987, Jul. 2001.