

## Use OF Finger Knuckle Patterns In Biometrics

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**Abstract-** This concept introduces a new approach for personal authentication using finger back surface imaging. The texture pattern produced by the finger knuckle bending is unique and makes the surface a distinctive biometric identifier. There are some hand features which result from complex interaction among bones, muscles, skin and tissues which remain relatively undetermined for their potential in biometric for forensic application. This paper investigates the possibility of using finger knuckle patterns formed on joints between the metacarpal and proximal phalanx bones for the personal identification. A fully automated way for finger knuckle identification is introduced with key steps as region of interest segmentation, image normalization, enhancement, and robust matching.

**Index Terms-** Biometrics, Finger knuckle biometrics, major finger knuckle, minor finger knuckle, knuckle segmentation, matching techniques.

### 1. INTRODUCTION

Biometrics is defined as the approach to recognize a person using different characteristics. Biometrics is used for human recognition which includes of two terms namely verification and authentication. Authentication can be defined as Providing the access to authenticated person. There are three methods of authentication.

- Something you have - card, key.
- Something you know - PIN, password.
- Something you are - DNA, biometric.

Combination of any of these methods will provide the high security. Application having three methods provides the highest level security. In the process of verification in the application, the biometric system needs input from the user, at which time the user tries to prove his identity via a password, user name (or any combination of the three methods).

In many applications involving forensic and convert identification of suspects exact and accurate identification of finger knuckle patterns can make work easy. There are some classes of forensic images in which the finger knuckle patterns are the only part of evidence available to identify the suspects. There are some examples like kidnapping, physical assault where the cameras are not capable to track the face or the finger prints of the suspect, in this type of case the finger knuckle pattern is the only source of information available to scientifically ascertain the identity of individuals.

the simultaneous acquisition of finger knuckle images can be obtained without any additional difficulties to users, also at less cost, with simple addition of an external imaging camera to the existing fingerprint devices which can at a time [1] acquire finger dorsal images and synchronizes the acquisition with external software. Therefore it is important to investigate the uniqueness in the parts of information which can be recovered from the finger dorsal images. In addition, there are variations in recorded forensic images (in which only the finger dorsal patterns are available to identify the suspect

. Forensic identification of knuckle patterns has invited attention in the literature and some questions relating to uniqueness of such patterns are yet to be answered. The work described in this paper investigates on such problem and examines and observes the possibility of using such second minor finger knuckle patterns for the human identification or identification of any suspect. The objective and the main goal of work is to investigate the possibility of using finger knuckle patterns, formed between the proximal and the metacarpal phalanx bones (metacarpophalangeal joints) of the fingers, for automated human identification. This paper investigates the possibility of using finger knuckle patterns formed on the joints between the metacarpal and the proximal phalanx bones for the personal identification

### 2. USE OF FINGER KNUCKLE PRINTS

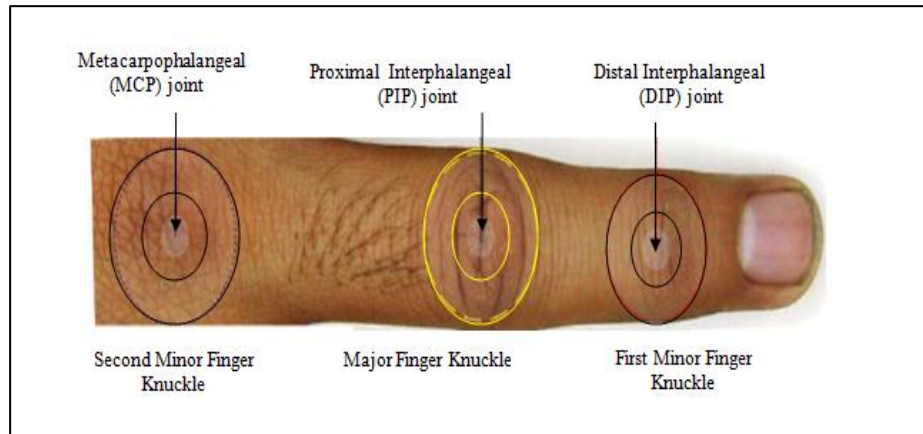


Fig. 1. Sample finger dorsal image indicating major and minor knuckles.

### 3.LITERATURE REVIEW

The use of finger knuckle print or the patterns as a biometric identifier has generated significant interest in the literature. Flynn and Woodard successfully demonstrated the use of 3D finger dorsal images for personal identification. This work essentially exploits local curvature patterns on the 3D finger surface and quantifies them into various shape indexes for the matching.

**Kumar, senior member, IEEE, [2]** This paper has successfully investigated the possibilities of working minor finger knuckle images for the identification. The coarse-to-fine segmentation strategy developed in this paper has been quite self-made because it has been able to achieve higher matching accuracy. During this paper the experimental results illustrated, on the info of 503 subjects, can achieve promising performance from contactless minor finger knuckle images. The experimental results according during this paper recommend that the synchronous use of major and minor finger knuckle images will help to improve the measurable performance which will not be attainable by victimization minor or major finger knuckle images alone.

**Kumar and C. Ravikanth [3]** details an online system using the hand dorsal surface images which can at a time exploit the finger knuckle patterns from the multiple fingers and also their characteristics with geometrical shapes. With different combinations of basic techniques better results were found out as Principal Component Analysis (PCA), Linear Discriminate Analysis (LDA) and Independent Component Analysis (ICA). This approach overcome problem due to finger rings and black background. Previous method used black background

problem of using dark background is that the finger surface can be dark, so they used white background which needs the simple pre-processing as compared to that. The disadvantage of this approach is, as it uses scanner for imaging then the speed of working is less. **A. Kumar, [4]** in this paper they work on a new method to enhance the performance of finger vein identification System. The projected system at the same time obtains the finger vein and low resolution finger print images and combines these two evidences making a novel score level combination technique. The utility of low resolution fingerprint pictures non inheritable from a digital camera is observed and examined to establish the matching performance from such pictures. They invent investigated two new score level combos, that is holistic and nonlinear fusion, and assess them with additional score level fusion methods to establish their effectiveness in their projected system. They presented the information of 6,264 pictures from 156 subjects illustrate important improvement within the performance, each from the authentication experiments. **S. Aoyama, K. Ito, and T. Aoki, [5]** in this paper they work on FKP recognition based on Band Limited Phase Only Correlation (BLPOC). POC is an imaging matching technique using the phase components in 2D DCT of given images. BLPOC is a modified version of POC which is dedicated to evaluate similarities between the images, in order to handle the non-linear deformation of FKP images. Most of POC based biometric recognition algorithms cannot handle the nonlinear deformation of pictures, since the part information obtained from that complete image is used. So to handle the nonlinear deformation of FKP pictures, the planned algorithmic program works native block matching exploitation BLPOC, since the nonlinear deformation is around diagrammatically by

the minute translational displacement between that native image blocks. The Region of Interest (ROI) is extracted from the FKP image within the pre-processing. The translational displacement between the 2 ROI pictures is computable victimization BLPOC and also the two images region unit aligned consistent with the computable displacement. Then, the common area of that two images is extracted. If the world magnitude relation of the common area between the ROI pictures is below the edge, the BLPOC work between the ROI images is computed. Otherwise, the BLPOC works between the common areas are computed. Finally, the average BLPOC function is computed from all the related point pairs regardless of the reliability of relation.

#### 4.PROPOSED SYSTEM

We proposed to investigate the probabilities of using second minor knuckle patterns of the finger for identification of the human or suspect. Invention and investigation done on the skin patterns of finger dorsal formed between the proximal phalanx bones and metacarpal of the fingers for their probable future use in the biometrics. The uniqueness of such patterns is obtained from the experimental results, on the database of 501 subjects. This work also observes and examines at a time use of available major, first minor and second minor knuckle patterns to obtain superior performance which may not be possible with the use of any of these knuckle patterns[12]. In order to identify the suspect there are number of forensic images recorded with varieties and in which there are the finger dorsal patterns as a evidence for investigation. For biometric authentication with the use of second minor finger knuckle the experiments performed with number of steps or phases.

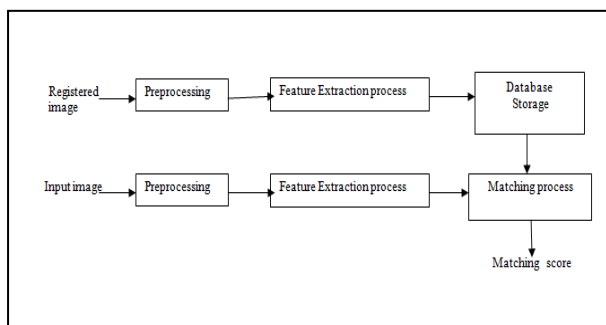


Fig2.Diagram of biometric recognition system

#### 4.1 Image Normalization

From the 3D knuckle surface which is curved the images of finger dorsal are obtained and this curves results in or gives output in uneven illumination shadows and reflections. Because of that the minor finger knuckle images which are segmented have illumination variations and the low contrast. The improvement steps of the image are necessarily required in ROI images to normalize illumination variations. The method of illumination normalization used in this work is same as used in[6]. The average background illumination is firstly estimated in this image of knuckle. Then from the original knuckle method in 16×16pixels sub-blocks of that segmented image computed illumination is subtracted in order to prevent the influence of uneven illumination. The image which is resulting then subjected to the operation of histogram equalization which produces improved finger knuckle image which is then used in feature extraction step.

#### 4.2 Feature Extraction and Matching

After the enhancement or the improvement on that images of second minor finger knuckles the randomly illustration of textured patterns which appeared to be unique in images of different fingers. The lines, wrinkles with thickness, creases are included in such patterns which also consist the forward movement of that fingers. The number of matching techniques which gives effective results while matching the major finger knuckle patterns is also computed. To perform convolution with images of knuckle the spatial filter comes in use and response of quantization of resulting filter produces features regarding to chosen quantization levels[12]. The smallest size template representation or compact provided by two-level quantization and using the simpler Hamming distances. Fast similarity scores produced.

With the use of Local Radon Transform work of matching knuckle images referred to as RLOC[14] has shown to be quite effective in major knuckle pattern matching and was also evaluated in this work. This method also encodes knuckle creases and local orientation of curved lines into dominant orientation which is represented using three bit binary code and using Hamming distance such templates are matched. The details of this method founds in [7],[8] or [10]. It generates smaller template size and efficient in producing templates than BLPOC this is one of the advantage of this method. The feature extraction method using the ordinal representation also considered [9] for the comparison of performance.

compcode[8] this another method referred which is in some manner similar in encoding local knuckle crease orientations but using the even Gabor filter it was also calculated. The measurement based on relative distance [11] calculated using ordinal measures. To offer promising results the ordinal representation and textured like palm has shown and because of that this approach was also computed to obtain its accuracy in matching knuckle images similar to explained in reference[9], two orthogonal Gaussian filters oriented at 0,30 and 60 degrees are utilized to produce binarized feature templates. Hamming distance between resulting feature templates is used to produce match scores between the knuckle images matches.

## 5. ACKNOWLEDGEMENT

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## 6. CONCLUSION

We have surveyed various techniques for Finger Knuckle Matching like the use of second minor knuckle patterns for identification of the person as well as the efficient use of first minor knuckle pattern and major finger knuckle pattern.

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