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Fingerprint Recognition using Core Detection Technique

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***Abstract*— a single biometric indicator used in biometric system that is uncomfortable with noisy data in user verification process. There are some kinds of restrictions on degree of freedom with some unacceptable error rates. With existing of these problems it's very difficult for particular to improve the performance a biometric system. In biometric system finger recognition is very necessary process for safety and security purpose. In our thesis work we are going to improve performance of fingerprint recognition process using Core Detection Technique. Image of fingerprint is binarised in first step and apply thinning process to make it ready for further process of detection. There are many techniques available in market but as comparison on basis of result with the existing, core detection performs well. Core Detection Technique performs best at level for recognition of fingerprint in biometric system.**

***Keywords*— Fingerprint recognition, Minutiae, Core detection technique, Binarization.**

I. INTRODUCTION

Fingerprint recognition or palm print identification is the process of comparing questioned and known friction skin ridge impressions from fingers or palms or even toes to determine if the impressions are from the same finger or palm. When friction between skin ridge is flexible then no two finger or palm prints are ever exactly alike (never identical in every detail). Fingerprint identification (also referred to as individualization) occurs when an expert (or an expert computer system operating under threshold scoring rules) determines that two friction ridge impressions originated from the same finger or palm (or toe, sole) to the exclusion of all others [2].

A known print is the intentional recording of the friction ridges, when ink of black printer rolled across a contrasting background of white color, as like a card of white color. Friction ridges can also be recorded digitally using a technique called Live-Scan. Latent prints are often fragmentary and may require any light source, or methods of chemical and powder, in order to be visualized.

When friction ridges come in contact with a surface of any oil, grease or ink then transferred this on the item.

There are numerous factors available that affect impressions of friction ridge, thereby requiring examiners to undergo extensive and objective study in order to be trained to competency. The development medium is just some of the various factors which can cause a latent print to appear differently from the known recording of the same friction ridges. Indeed, the conditions of friction ridge deposition are unique and never duplicated.

Fingerprint images that are found or scanned are not of optimum quality. Their quality is improved by remove the noises. Some features are extracted by us like minutiae and matching. If the sets of minutiae are matched with those in the database, this is called that fingerprint is identified. After matching, post-matching steps are performed this may include showing details of identified candidate, marking attendance etc. A brief flowchart is shown in next section.

In biometric system [1], fingerprints are considered as a best recognition system in world which gives response in very short time. Every person has unique so it is secured to use and do not change in lifetime of anyone. Except these, fingerprint recognition system implementation is cheap, easy and accurate up to satiability. Fingerprint recognition has been widely used in both forensic and civilian applications. Most proven technique is fingerprint that based on biometric system as compared to other techniques and has the largest market shares. Not only it is faster than other techniques but also the energy consumption by such systems is too less.

II. WORK ALREADY DONE

V. Vijaya Kumari and N. Suriyanarayanan [4] proposed a method which measure performance in fingerprint by detecting the edges of fingerprint images using five local operators namely Sobel, Roberts, Prewitt, Canny and LoG. Individual segments from image are extracted from the edge detected image.

Raju Sonavane, and B.S. Sawant [5] presented a method for enhancement in fingerprint by using a special domain in which the fingerprint image is decomposed into a set of filtered images after that we estimated orientation field.

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We required a mask for quality purpose that differentiates between corrupted regions in the input image are generated. Using the estimated orientation field, enhancement in fingerprint image is adaptively done in the recoverable regions.

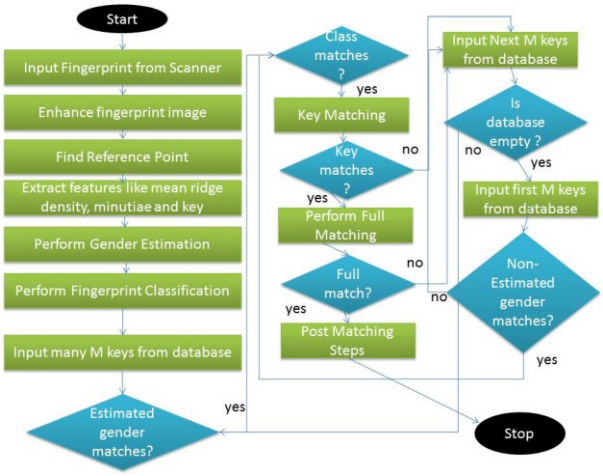
Eric P. Kukula, et al., [6] proposed a work on the investigation of that five force levels that affect the performance, quality of image and minutiae count between optical and capacitance fingerprint sensors. He chose three images from 75 participants that are indexed in sensing technology. Kruskal-Wallis conducted a test of nonparametric which found differences in minutiae counts and image quality scores based on the force level. The results concluded that there was no difference in minutiae count of images but the quality of images has much difference based on the force levels of the capacitance sensor. There were many factors that affect image quality score by force and sensor type, yet the removal of low quality images does not improve the system performance at each force level.

Mana Tarjoman and Shaghayegh Zarei [7] proposed an approach that structural in type for fingerprint classifications. This approach is using a directional image of fingerprint instead of singularities. Dominant directions of ridge lines are included in directional image.

Sharath Pankanti et al., [8] proposed a technique for matching and representing fingerprint is known as Scale Invariant Feature Transformation (SIFT). Hybrid approaches with combination of both SIFT and conventional minutiae are providing better results than available individual schemes.

Bhupesh Gour et al., [9] have developed a method in which midpoint ridge contour representation is used for extraction of minutiae in fingerprint images. At initialisation of process segmentation process is performed separately for foreground from background of fingerprint image. Size of region is 64x64 that is extracted from fingerprint image. 64 x 64 normalized windows are used in normalization contrast of the ridges for enhanced of filtering by appropriately tuned Gabor filter. Scanning of image is performed from top to bottom and left to right and transitions from white (background) to black (foreground) are detected. Calculation is done for contour length vector in all eight directions. Each element of contour is represented as a pixel on the contour, the x, y coordinates contain field for pixel.

III. Flow Chart Of Fingerprint Recognition



IV. Techniques For Recognition Of Fingerprint

Classification of fingerprint matching can be done into three families.

a) Correlation-based matching: Two fingerprint images are superimposed and the correlation between corresponding pixels is computed for different alignments.

b) Minutiae-based matching: This technique used in wide area, being the basis of the fingerprint comparison made by fingerprint examiners. Minutiae are extracted from the two fingerprints and stored as sets of points in the 2-d plane. Matching that is based on minutiae essentially consists of finding the alignment between the template and the input minutiae sets that results in the maximum number of minutiae pairings

c) Ridge feature-based matching: Minutiae extraction is difficult in very low-quality images of fingerprint. Fingerprint ridge pattern also have other features that may be extracted more reliably than minutiae. Comparison fingerprints in term of features extracted from the ridge pattern belongs to the same family of this approach. Matching of minutiae and correlation based could be conceived of as subfamilies of ridge feature-based matching, in as much as the pixel intensity and the minutiae positions are themselves features of the finger ridge pattern.

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V. Core Detection Technique

The core point, no matter precisely or loosely located, has shown its applications in both fingerprint classification and fingerprint matching using either spatial domain or transformed domain. This section details several techniques for such a reference point locating.

Geometry of Region Technique (GR)

The following steps are followed to achieve GR technique results:-

1) Smoothed orientation field is calculated by using equation θ′(i , j).
2) Sine component of θ ′(i, j) is computed that represent by ε (i, j) , as following :

$$\varepsilon(i, j) = \sin(\theta'(i , j))$$

3) Core points are indicated in the image with label A that we initialize in starting.
4) Assign the corresponding pixel in A the value of the difference in integrated pixel intensity of each region.

$$A (i, j) = \sum \varepsilon(i, j) - \sum \varepsilon(i, j),$$

The region R1 and R2 were determined empirically and also their geometry is designed. The discontinuity of ridge and valley due to noise could be softening by applying a low pass filter. However, to apply a low pass filter the orientation image must be converted to a continuous vector field. The continuous vector field, which its x and y components are defined as Φx and Φy respectively to capture the maximum curvature in concave ridges. The radius of 10-15 pixels is used to define region (should cover at least 1 ridge). It is expected for max point due to sandwich of R1 with R2.

5) The core points are assigned to the coordinate maximum value in A.
6) If the core point still cannot be found, then 1-5 steps repeatedly followed for a number of times while decreasing the window size used in step 1) above. For instance; w = 15, 10 and 5 pixels respectively.

VI. Proposed Methodology

1) First of all we need an image on which we are going to implement. So upload an image in MATLAB tool.
2) Now requirement of conversion image into binary form.
3) Due to conversion in binary form there is requirement of thinning in image.
4) In this step we calculate minutia point for image after complete process of thinning.
5) Some false minutia is reduced for further process and better results.
6) Image with reduction of false minutia is stored in database for further use in implementation of classifiers.
7) Apply Core Detection Technique for recognition of fingerprint.
8) After implementation we get results that are better than existing Techniques with improvement in accuracy.
9) We achieve a conclusion finally with better results.

VII. Conclusion

In this work Core detection is proposed for a fingerprint matching algorithm. It combines matching and point pattern matching at principle to generate a structure that is known as synthetic algorithm. There are some steps required to complete the whole process of fingerprint recognition one of those steps is pre-processing. In pre-processing step we use morphological operation for thinning of image and neighborhood operation is used for the extraction of feature. By applying these operations and techniques like core detection we achieve a conclusion that recognition of fingerprint is more accurate than existing technique. Hence it's proved by the results of matching that achievement of this work is better. So matching of same finger provides 86.667 % result and there is 0 % score in different fingerprint matching.

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