A Novel Fingerprints Identification System Based on The Edge Detection

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Abstract
This paper describes an efficient fingerprints identification technique which uses a gray level watershed method to find out the ridges present on a particular fingerprint image. Fingerprint system is an important biometric technique for personal identification. The metric used for performance of identification techniques are directly scanned fingerprints or inked impression of fingerprints. These parameters are applied to gray level water shed method. For better accuracy in matching the images 5 level decomposition of matching is performed. These parameters perform better in comparing the resultant fingerprints. When tested on a database of 7 images this system is faster and more accurate to analyze the fingerprints matching process.

Key words:
AFAS, AFIS, Image enhancement, Classification, Edge detection, Correlation and feature extraction.

1. Introduction

Fingerprints which have been used for about 100 years are the oldest biometrics signs of identity, scientific studies on fingerprint where initiated in the late century. But the foundations of modern fingerprint identification were established by the studies of sir F.Galton and E.Henry at the end of 19th century. Fingerprint is formed of composite curve segments. The light areas of fingerprint are called ridges while dark areas are called valleys. The Galton's study introduced the minutiae, which are local discontinuities in the ridge patterns as discriminating features and showed the uniqueness and permanence of minutiae. According to F Galton fingerprint of a person is permanent i.e. it preserves its characteristics and shape from birth to death. Fingerprint of individual is unique. According to E.R.Henry, the systematic way of partitioning the fingerprint classes was so profound that it traditionally used by almost all of government security force.

The names given to these classes are Right loop (R), Left loop (L), Whorl (W), Arch (A), Tented Arch (T). By using the ideas above the fingerprints, are partitioned by the Henry classification and comparing Galton features carries out extract matching. The Galton feature is details formed on ridges are defined as single curve segment. The combination of several ridges are formed by crossing and ending of the ridges are called minutiae in fingerprint literature with the increasing power of computer automated system have been developed to automate the tedious manual classification and matching method of fingerprints.

There are two types first is Automatic Fingerprint Authentication System (AFAS). And second is Automatic Fingerprint Identification System (AFIS). In AFAS the input is an identity and a fingerprint image, the output is an answer of yes or no indicating whether the input image belongs to the person whose identity is provided. The system compares the input image with the one addressed by identity in the database. In AFIS the input is just a fingerprint and the output is a list of identities of persons that can have the given fingerprint and a score for each identity indicating the similarity between the two fingerprints. It is possible to provide partial identity information to narrow the search space. The System compares the input image with many records in the database. Recognition is defined as a process involving perception and associating the resulting information with one or combination of more than one of its memory contents. Visual perception means deriving information from a specific scene. Biometrics systems have been an important area of research in recent year. There is two important utilization of biometrics system: first is Authentication or Verification of person's identity and second is Identification in which a person's identity is sought using biometrics scene available. Any physiological or behavioral characteristics can be used to make personal identification as long as it satisfies the requirements like universality, uniqueness, performance, collectability and Permanence.

2. Fingerprint Features

The most common representation used in fingerprint identification is the Galton features. A ridge can be defined as a single curve segment. The combination of several ridges forms a fingerprint pattern. The small features formed by crossing and ending of ridges are called

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minutiae. Ridge Ending & Bifurcation are taken as the distinctive features of fingerprint. In this method the location & angle of the feature are taken to represent the fingerprint & used in the matching process. Together with there, fingerprint contains two special types of feature called core & delta points. The core point is generally used as a reference point for coding minutiae & defines as the topmost point on the innermost recurring ridge. The core & delta are also called the singularity points. Delta point is center of the triangular where 3 different directions flows meet.

3. Fingerprint classification

Fingerprint classification is used in AFIS .The purpose of classification is clustering a database of fingerprint into as many dusters as possible. The oldest classification scheme which is used in manual fingerprint identification is the Henry classification scheme. In the scheme there are 5 classes namely arch, tented arch, right loop, left loop whorl. These classes are determined by the ridge flow on the area & the number &relative location of core &delta points. In this paper a novel technique is used for identification and classification. The novel technique consist the following steps:

Step 1: image acquisition: The aim of image acquisition subsystem can be summarized as the transformation of optical data into an array of numerical data which may be manipulated by a computer so the overall aim of vision may be achieved. In order to achieve this aim three major issues must be tackled and they are representation, transduction (or sensing) and digitization.

Step 2: Pre processing: The image acquired from the fingerprint sensor often results in poor quality. The poor quality image can be due to the following reasons:

1. The distortion due to elastic deformation of the finger.
2. Cuts and abrasions on the finger.
3. Dirt, oil or moist on the finger or on the scanner.
4. Partial imaging of the fingertip prints image with different rotations.
5. Non uniform contacts between finger and the sensor surface, which causes breaks in ridges and bridges between them.
6. Contrast variation of the gray scale image.

To overcome these problems image enhancement process is necessary for accurate of the parameters. The goal of the image enhancement process is to make the non-continuous ridges and valleys of the fingerprint continuous, highly interesting foreground extraction from the noisy and irrelevant background. Median filter has been used for noise elimination.

Step 3: minutiae detection is a process of distinguish the fingerprint area in the image mostly consist of uniform background & the fingerprint impression. In minutiae detection areas corresponding to the background are determined and discarded from the rest of the processing. The image is partitioned into blocks and each block is then labeled a background or fingerprint area. A gray level method is used for minutiae detection. In this method, we present a gray level modification of the watershed transform on grey level image. This method applies watersheds on the grey levels of neighboring pixels. For this the present paper imagines that a hole is drilled in minimum of the surface, and water will be flood from different positions into the hole. The hole is assumed to be a central pixel of a neighborhood. For the following 3X3 grey level mask the watersheds are identified as follows with a peak or highest level h>=25. Peak points are shown as bold figures.

75	**50**	20
4	**25**	**40**
60	20	**56**

Fig.3.The possible watersheds of the grey level image when h >=25.

By increasing h value water will be falling from peak top points to bottom points, thus forms a good number of watersheds with different peak levels. The advantage of proposed segmentation scheme is watersheds can be easily applied on a 5X5 and also on different masks, which is not possible on a binary image.

Step 4: minutiae reduction: In minutiae reduction minutiae which are too close to each other are discarded, or minutiae which are too close to the segmented regions i.e. the region corresponding to the background or bad areas in the fingerprint, are discarded. The width of the ridges is reduced to the one pixel by applying thinning technique.

Step 5: Finger print matching: Two Images are converted into binary Images and compare the images to find out the percentage of matching. In this case we need to specify some input image and that image get compared with all the other images that are present in our database. The correlation matching technique is applied for matching.

4. Results

In this paper we are needed to go through just all the module as specified above only the difference is that the comparison will take place only between the specified two images & give their corresponding percentage of matching. Therefore, we need to specify the two input images that are present in our database. Photos the resolution of the images while scanning is kept 250 X 250 pixels and images are in TIF and BMP format of 256

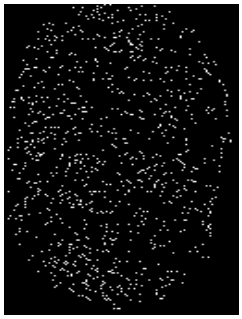
colors. The accuracy of results depends upon the quality of fingerprints images.

The collection has nearly 7 images from different categories like directly scanned images through scanner and images with inked impression.

1. Color BMP **2. Gray-Level** **3. Binary**





4. Water shed **5. AND Operation.** **6. Correlation**

Table1

Image1	Image2	Correlation Matching	Matching Percent
skp1.tif	thumb1.tif	0.098754	10%
thumb1.tif	asg1.bmp	0.0811522	10%
asg1.bmp	skp1.tif	0.062539	10%
sb1.tif	sb2.tif	0.0468073	10%
as2.bmp	as3.bmp	0.0932518	10%
skp1.tif	skp1.tif	1	100%

5. Conclusions

The system performance can be improved by considering the orientation of the image greater than 45º.At present the computation of vectors only depends on the number of arches, it can be improved by having another template consisting of a set of arch tangent values for orientation field estimation. It will improve the robustness of the system. The system can be modeled for driving the relay for electromechanical operations, it can be used for time and attendance system, security systems, and centralized database management can be implemented via internet, intranet facilities. The final percentage of matching depend upon the quality of scanner which we use and also the quality of fingerprint whether it is much pressed or very lightly kept over the scanner or whether we are taking that fingerprint from the inkpad. Finger surface should not be dumped with the dust and also it should not be very oily, dry and wet. Also the orientation of the fingerprint while giving the

fingerprint it should be given properly with right direction. That's why, here in our paper we are concluding that whenever there will be above 80 % matching between two fingerprints then those fingerprints are of same person i.e., 100% matching will take place.

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