FINGER PRINT IMAGE ENHANCEMENT BY USING IMAGE QUALITYANALYSIS

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Abstract— *The design will improve scalability, accessibility and flexibility. This target can be mainly decomposed into image pre-processing, feature extraction and feature match. My demonstration program is coded by MATLAB. For the program, some optimization at coding level and algorithm level are proposed to improve the performance of my fingerprint recognition system. For each sub -task, some classical and up-to-date methods in literatures are analyzed. A pre-processing method consisting of field orientation, ridge frequency estimation, Gabor filtering, feature extraction and enhancement is performed. The objective of this project is to present a better and enhanced fingerprint image*

Keywords— Finger Print,Image Enhancement,Quality Analysis

1. INTRODUCTION

In computer science and electronic engineering image processing, image processing is any form of processing of signals for which the input is an image, such as pictures or frames of video the output of image processing can be either an image or a set of characteristics or parameters related to the image. Image processing techniques have been developed tremendously during past five decades. Sometimes a distinction is made by defining image processing as a discipline in which both input and output of a process are image.

Biometrics, which refers to identifying an individual based on his or her physiological or behavioral characteristics, has the capability to reliably distinguish between an authorized person and an imposter. Since biometric characteristics are Distinctive, cannot be forgotten or lost, and the person to be authenticated needs to be physically present at the point of identification, biometrics is inherently more reliable and more capable than traditional knowledge-based and token-based techniques. Biometrics also has a number of disadvantages. For example, if a password or an ID card is compromised, it can be easily replaced. However, once a biometrics is compromised, it is not possible to replace it. Similarly, users can have a different password for each account, thus if the password for one account is compromised, the other accounts are still safe. Skin on human fingertips contains ridges and valleys which together forms distinctive patterns. These patterns are fully established under pregnancy and are permanent throughout entire lifetime. Prints of those patterns are called fingerprints. Injuries like cuts, burns and contusions can provisionally damage worth of fingerprints but when fully healed, patterns will be restored. Automatic fingerprint recognition has become a widely used technology in both forensic and biometrics applications. Despite a part of a thousand years during which finger prints have been used as individual's proof of identity and decades of research on automated systems, reliable fully automatic fingerprint recognition is still an unsolved stimulating research problem. Moreover, most of research thus far, assumes that two finger print templates being matched are approximately of the same size and cover large areas of fingertip. However, this assumption is no longer valid. The miniaturization of finger print sensors has led to small sensing areas and can only capture partial fingerprints. Incomplete fingerprints are also common in forensic applications.

Fingerprints are patterns designed on skin of fingertip. The fingerprints are of three types: arch, loop and whorl. The bounded pattern of ridges and valleys are the most obvious structural characteristic of a fingerprint. The fingerprint of each individual is considered to be unique. No two persons have same set of fingerprints. Also, Finger ridge schemes do not change throughout the life of an individual. This property makes fingerprints an excellent biometric identifier. So it is one of popular and active means for identification of an individual and used as forensic evidence. Fingerprints are very popular as biometrics measurements. Unfortunately fingerprint matching is a composite recognition problem. Physical fingerprint matching is not only time consuming but education and training of experts takes a long time. Therefore since 1970s there have been done a lot of effort on progress of automatic fingerprint recognition systems. Automatization of fingerprint recognition process turned out to be success in forensic applications. Achievements made in scientific area expanded usage of the automatic fingerprint recognition into civilian applications.

2. EXISTING SYSTEM

Fingerprint image enhancement is one of the most crucial steps in an automated fingerprint identification system. Fingerprint classification is a required preliminary step in an automated fingerprint identification system (AFIS), the performance of which is considerably affects recognition rates.

Most fingerprint classification algorithms have been used to classify fingerprints into four or five classes derived from four types, which were described by Henry. The performance of a fingerprint classification algorithm depends heavily on the quality of the

fingerprint image. When the quality of the input fingerprint image is poor, the performance of these methods degrades rapidly. Fingerprint image enhancement is one of the key steps in an AFIS which is used to reduce noise and improve the contrast between ridges and valleys in the fingerprint images. Histogram equalization (HE) is a basis method for adjusting the contrast of an image, but in the presence of lighting variations, the appearance of the HE-processed image may sometimes be unexpected.

3. DISADVANTAGES

Efficiency is better

Clarity is better

4. PROPOSED SYSTEM

One of the indices for evaluating the contributions of these systems to the enforcement of security is the degree with which they appropriately verify or identify input fingerprints. This degree is generally determined by the quality of the fingerprint images and the efficiency of the algorithm. The new versions consist of different mathematical models for fingerprint image segmentation, normalization, ridge orientation estimation, ridge frequency estimation, Gabor filtering and binarization. An effective algorithm for finger-print image quality improvement is proposed. The algorithm consists of two stages.

The first stage is decomposing the input finger print image into four sub-bands by applying two-dimensional discrete wavelet transform. At the second stage, the compensated image is produced by adaptively obtaining the compensation co-efficient for each sub-band based on the referred Gaussian template. The proposed algorithm can improve the clarity and continuity of ridge structures in a finger-print image.

5. ADVANTAGES

Efficiency is good

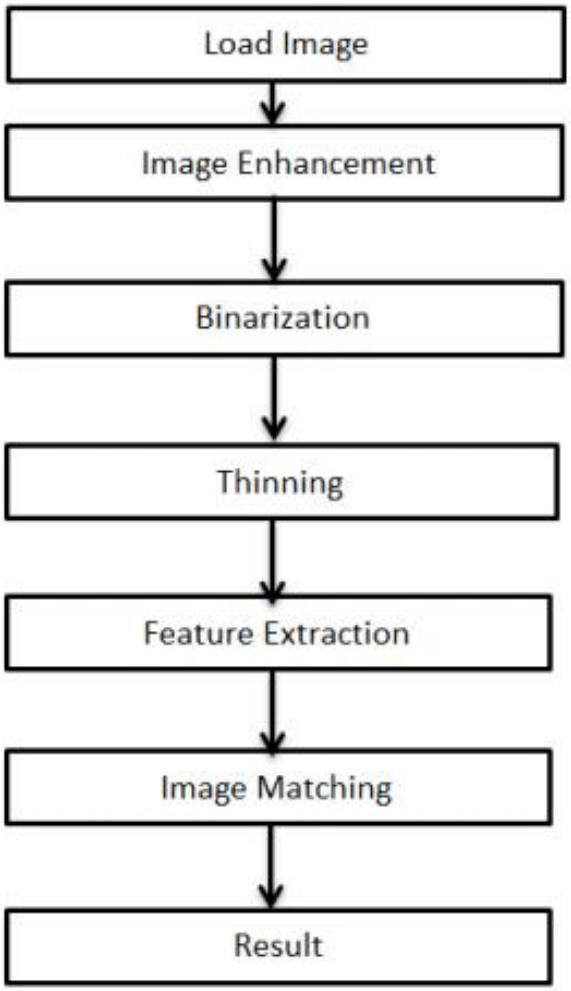
Clarity is good compared to the existing system

6. ALGORITHM

Pre-processing stage

The employment of the enhancement technique is done in the post-processing stage. We have used anisotropic diffusion to enhance the poor quality fingerprint impression. The enhancement stage plays a very important role in image processing because it helps to improve the low contrast images. The result which is obtained after the enhancement stage is much better as compared to the original fingerprint impression. But the degradation of an image takes place after the employment of the enhancement algorithm. Anisotropic diffusion helps in enhancing the features of an image. Image enhancement technique are of two types .They are spatial and frequency domain techniques. Spatial domain techniques are be further divided into point, mask and global enhancement operators.

BLOCK DIAGRAM



Anisotropic diffusion technique helps in improving the quality of the ridge and valley region. Anisotropic enhancer is a powerful image enhancer which is based on the partial differential equation of a heat transfer. Anisotropic filter helps in getting rid of the speckle noise from the fingerprint impression. The degradation of the image is possible after applying the enhancement algorithm. Hence the enhanced fingerprint image is binarized and thinned during the feature extraction step.

Feature extraction step

Feature extraction is the carried out after the enhancement of the fingerprint impression. We have extracted the minutiae points of the fingerprint impression during the feature extraction process. The feature extraction step is done in three steps. They are binarization, thinning and minutiae extraction.

Binarization

Binarization is the first step involved in the minutiae extraction process. Binarization is used to convert the 8 bit gray scale fingerprint impression in to 1 bit black and white image. In the black and white image, ridges have zero value and valleys have one value. Hence, the ridges

are black in colour and the valleys are white in colour. This black and white image is also called the binary image. The colour which is used to define the objects in the image is called the foreground colour and the rest of the image is known as the background colour of the image. Locally adaptive binarization can be also used to convert the gray scale fingerprint impression into binarized or the black and white image. Segmentation and the thresholding process can also be used in the binarized images.

Thinning

Thinning process is the second step involved in the minutiae extraction process. After the thinning process is applied, ridges in the fingerprint impression become one pixel wide. The main purpose of the thinning algorithm is to eliminate the redundant pixels in the image. Thinning process can be carried out with the help of parallel thinning algorithm. The redundant pixels are first stored in small image windows (3*3). Then the redundant pixels can be removed after several scans. But the parallel thinning algorithm is not a very efficient algorithm because it takes too much time. The binarization process is applied in the first step in the fingerprint impression because it contains the maximum grey intensity values. The parallel thinning algorithm is complex in nature. Thinning process can be done using the morphological thinning operator.

Minutiae extraction

Minutie marking is done in the minutiae extraction process .This step produces a better result when larger number of minutiae are detected. This step is applied after the image pre-processing step. It mainly works on the pixel value (1 or 0).There are two methods involved in the minutiae extraction process. The first method deals with value one and the second method deals with value zero. The binarization process is carried out with the help of mask. Minutiae are points in the fingerprint impression which has one neighbour or more than one neighbour. It is difficult to find out the orientation estimation in poor fingerprint impressions. Hence the enhancement algorithm is applied in the pre-processing step. We have used the anisotropic filter in order to enhance the poor quality fingerprint impression. This forms reliable algorithm and it helps in producing less error. The fingerprint verification stage works by re-examining the gray scale image by several stage. It also assigns on or two class labels which involves ridge bifurcation and ridge ending. The minutiae extraction result helps to provide better matching accuracy on database fingerprint impressions.

Image Segmentation

Segmentation can be of two types. They are region based and object based segmentation. Segmentation can be done till the desired object is detected. Segmentation can also be done to connect the broken paths. Segmentation can be useful in the field of computer process and automatic target acquisition. Segmentation in based on the discontinuity and similarity of the changes in the intensity of the edges. Segmentation can be done with the help of Thresholding, region growing and region splitting.

Point, line and Edge Detection

Edges pixels are the points where the intensity or the edges changes abruptly. Edge detectors such as Sobel filter are used to find these edge pixels. First order derivatives produce thick edges. Second order derivatives produce finer edges such as thin lines, isolated points and noise. The second order derivatives produce double edge response such as ramp and step intensity. The second order derivative also helps in determining the transition of images from light to dark or dark to light area. Edge detection can be performed in order to segment the images. Edge models works on the basis of the intensity profiles.

7. EXPERIMENTAL RESULTS

All the above process like preprocessing, extraction and segmentation are mentioned clearly. Matlab tool is used for simulation.

8. CONCLUSION

The goal of this thesis is to design a system of image matching. It is used in the application of fingerprint matching system. It is used to study the security impact of partial fingerprints on automatic fingerprint recognition systems and to develop an automatic system that can overcome the challenges presented by partial fingerprint matching. The proposed algorithm is implemented in MATLAB. The reliability of any automatic fingerprint system strongly relies on the precision obtained in the minutia extraction process. A number of factors are detrimental to the correct location of minutia. Among them, poor image quality is the most serious one. In this work, we have combined many methods to build a minutia extractor and a minutia matcher. The following concepts have been used- segmentation using Morphological operations. This proposed enhanced algorithm is able to overcome the drawbacks of spatial domain methods like thresholding, histogram equalization and frequency domain methods. The number of processes is used to match these images. This algorithm is able to get good contrasted image which increases the brightness of the low contrasted images. This algorithm is tested on different type of images.

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