Touchless Fingerprint Recognition System

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*Abstract:-*Touch-based fingerprint technology causes distortion to the fingerprint features due to contact between the skin of the finger and sensor device. Touch-less fingerprint technique is used to solve this problem by avoiding contact between the finger and the surface of the sensor fingerprint recognition has variety of biometric security application. Each person has unique fingerprint characteristics in terms of minutia ,pore ,ridge and pattern. It is based on data acquisition methods fingerprint recognition method can be touch based or touch less, with later having advantage in terms or better hygenic, safety and stray fingerprints. In touch-less fingerprint recognition, fingerprints are acquired using a digital camera which has a high resolution. Such systems find applications in numerous fields such as secure access to laptops, computer system, cellular phones, banking, ATMs etc Receiving the simple appearance to overcome such problem ,it is important to focus more on the pre-processing steps. Human fingerprints are unique. Here we use several pre-processing steps on the binary images to enhance the image quality, which is then followed by minutia detection, depletion of feature extraction and false minutia final step is minutiae matching. The main process in touchless fingerprint recognition system is pre-processing & which is classified into four part & that are first normalization, second fingerprint segmentation, third fingerprint enhancement and last is core point detection.

Keywords: Touchless fingerprint, gabour filter, biometric, FAR, FRR

I. INTRODUCTION

The concept of finger identification is currently used by the users because of its dependable in comparision with other biometric systems available in the market. In touch based method, there is contact between the the skin of the finger & the surface of the plate which capture the image. This capturing image is not properly captured because there is problem of skin deformity and lack of pressure of finger on the plate of sensor. To reduce this problem the idea of utilizing a fingerprint sensing technology has been proposed the technique. It is called as touch-less fingerprint recognition system. The Touchless fingerprint technology requires no contact between the skin of the finger & the sensing area. Touch-less fingerprint accession is remote sensing technology to capture the ridge valley pattern which provides essential information for recognition, because of lack of contact between the finger & any rigid surface, the skin does not deform during the capture image & the repeatability of the measure is quite to assure. Digital camera is used to represent the fingerprint image. This Fingerprint images that are captured by using digital camera consist of certain conditions such as low contrast between the ridges & the valleys, defocus & motion blurriness. Fingerprints are not differentiated by ridges and furrows but by minutia which are abnormal points on the ridges. From the different type of minutia, out of that two are mostly significant and in heavy usage, one is called termination, which is the immediately ending of a ridge the other is called bifurcation. The point on the ridge from which two branches are formed, it is known as bifurcation.

II. FINGERPRINT

A fingerprint is the mirror image of one finger. It is an impression of the furrows and friction ridges on all parts of finger.the ridges and furross present good similarities in each, like paralalism and average width.

Fingerprint are not distinguished by their ridge and furrows, but by features called minutiae ,which are some abnormal points on the ridges.there are two types of minutiae represended below.

1. The abrupt end of a ridge(ridge ending)
2. A single ridge that divides into two ridges(ridge bifurcation).

III. MINUTIAE EXTRACTION

Image enhancement, binarization

Flowestimate & filtering

Thinning & Minutiae detection
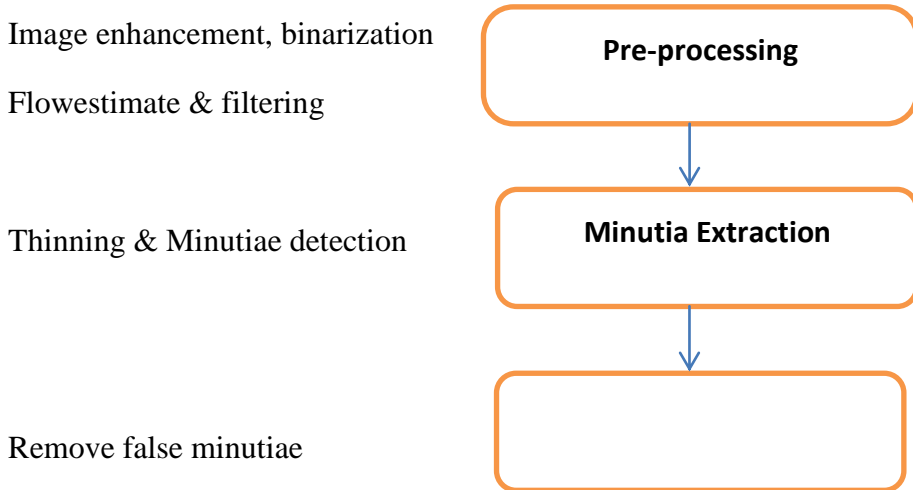
Remove false minutiae

Fig. Minutiae Extraction

In this figuer,we are exlpain the method for synthesizing a finger print image. This method classified as following three stages:

a. pre-processing
b. minutiae extraction &
c. matching.

In pre-processing, we are improve the fingerprint image by enhancement process   which is follwed by segmentation, thinning, binarization, minutiae marking & remove of false minutie.In minutie extraction; we extract the minutie and ridge information of each fingerprint using gabour filter. Finally we save & match the template by using minimum distance classifier distance which s correlation based method.
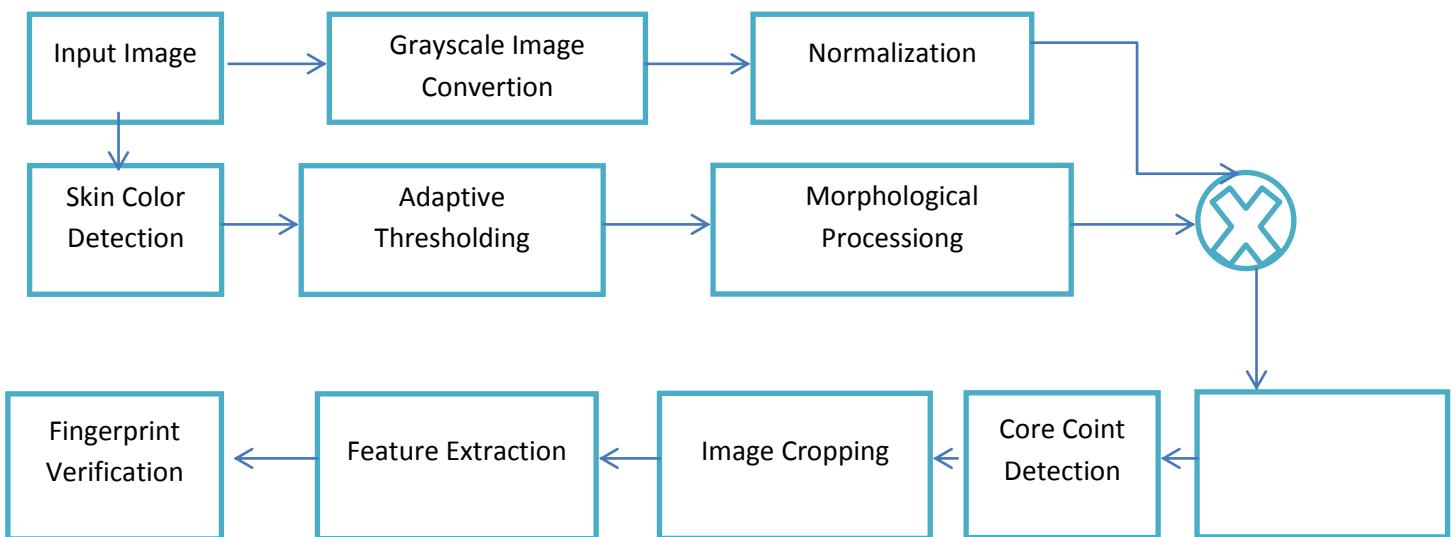
IV. ALGORITHM

Fig: Algorithm Steps Used In Touch-less Fingerprint Recognition System

In Touchless Fingerprint Recognition System we are using algorithm and the steps of algorithm are given below:

1. Normalization
2. Fingerprint Segmentation
3. Fingerprint Enhancement
4. Core Point Detection

A. Normalization:-

Preprocessing is the first step of normalization. In the first way, normalization is done so as to minimize the non uniform lighting problem. By changing the fluid range of the pel intencity values can be done. It calculates the mean and variance of a capture image and thus elliminate the difference of the illumination.The fingerprint image is captured by using camera are in the format of RGB, so it will convert to grayscale image is completed and that grayscale image has 256 different gray level which are sufficient for recognition of natural objects.

B. Fingerprint Segmentation:-

Fingerprint segmentation is the process which is parallel with normalization and segmentation of fingerprint image is compulsory so as to reduce the size of the input image, to eliminate unnecessary background, which is noisy and to focus on area which is in favor of central part of fingerprint. The proposed fingerprint segmentation is also classified as follows:

1. Skin Colour Detection
2. Adaptive Thresholding
3. Morphological Processing

a. Skin Colour Detection:-

Detecting human skin tone is of most importance in numerous application such as video surveillance, face and fingerprint detection, human computer interaction. Based on the luminance present between ridge and valley present in our fingerprint image different skin colour is detected.

b. Adaptive Thresholding:-

Adaptive thresholding is the simplest way to segment way to segment objects from a background. If it is relatively uniform, then you can use the global threshold value to binarize the image by pixel intensity if there is large variation occur in the background intensity and adaptive thresholding may produce better result.

c. Morphological Processing:-

Morphology is defined as the image processing operation that process the images based on shapes. Its operations create a structuring element to an input image, which produced an output image of the same size.

C. Fingerprint Enhancement:-

Fingerprint enhancement algorithm, which can susceptively improve the clarity of ridge a furrow structures of input fingerprint images based on estimated local ridge orientation and frequency we have evaluated the performance of image enhancement algorithm using a goodness index of the extracted minutia. A fingerprint image enhancement algorithm receives an input image of fingerprint, on the given image set of intermediate steps are applied, finally gives the output as the enhanced image.

D. Core Point Detection:-

To differentiate the entries of singular points of the fingerprint image, SPs are points that can be consistently find in a fingerprint image and which is used as a registration point of view. Core points have special symmetry properties which makes them easy to identify also by humans. Typically there are two types of singular points.

- Core Point
- Delta Point

a. Core Point:

In fingerprint scanning and biometrics core point indicates the center area of a fingerprint. A fingerprint may have multiple cores or no cores or no cores. The core point may be one of several types of pattern including whorl and loop pattern.

b. Delta Point:-

The delta point is a pattern of a fingerprint that resembles the delta which is the greek letter. It's the point at nearest to the point of divergence of two type lines.

V. APPLICATIONS

1. Forensic Lab: In forensic lab touchless fingerprint can be used to find the identity of a dead person & it can also be used in criminal investigation by matching the fingerprint.
2. Bank lockers : large number of banks use keys based or password based locks for their lockers. we can implement locker system which is based on fingerprint based system using this project.
3. Access Control: In the field of the information security, access control is the selective restriction of access to other resource.
4. Issuing National ID Card such as ADHAR card and PAN card are the national ID card and it required the fingerprint of the person which can be acquired by touchless fingerprint system.

VI. ADVANTAGES AND DISADVANTAGES

Advantages:

1. No Latent Fingerprint: there is no distortion in the image of fingerprint acquired by using camera.
2. No Restriction on number of users:it does not limit the number of users using this recognition system. Many users can use fingerprint recognition system for verification.
3. Identification Accuracy of a person done by using touch less fingerprint recognition system is occur exactly and the percentage of accuracy is 100%.
4. Robust and reliable: This recognition system is reliable because the acquired image can not be altered.

Disadvantages:

1. The clarity of image acquired should be good if the image blurred then the fingerprint will not be recognized.
2. If the image is too bright then the ridges and valleys of finger print will not be properly visible.

VII. FUTURE SCOPE

It can be work on the raspberry pi using suitable platform and compilers and become useful in future.on some other critical areas and airports biometric attendance system can be implemented using this touch less fingerprint recognition. Rotated fingerprint can also be detected. Our project can be used in any employe management attendance system.

VIII. CONCLUSION

By using digital camera we take an image of thumb or finger and from that fingerprint is recognize easily. But for good result contrast & brightness must be good. In this paper gived the information of this system is used in different application, it includes, from the minutiae extraction.

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