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A Study on Fingerprint (biometrics) Recognition

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Abstract: **Till now many algorithms are published for fingerprint recognition and these algorithms has different accuracy rate. This paper consists of information of about fingerprint (biometrics) recognition. The novel algorithm is considered for thinning process. Whole process of recognition is explained from image capturing to verification. The image captured is first converted to gray scale then image enrichment is done then thinning process take over charge which is main process then last process which is also equally important as thinning process is feature extraction which extracts ridge ending, bifurcation, and dot. The accuracy depends on the result of the three main process namely pre-processing, thinning process and feature extraction.**

Keywords: **Arch, loop, whorl, Preprocessing, Thinning Process, Feature Extraction, Ridge.**

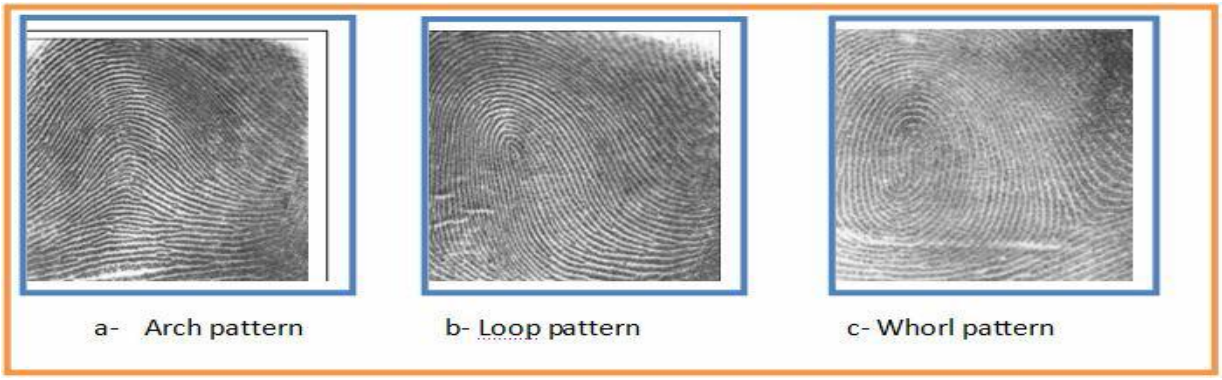
I. INTRODUCTION

The term biometric arrived from the Greek words *bios* means life and metrikos which means to measure. The body characteristics such as face, eyes, hand, finger, irisor voice are used for recognition process. Today thewide variety of the applications uses this method for verification purpose to confirm the identity of the person. Earlier, passwords and ID cards were used to let access to secure systems but these methods can easily be breached and person still remain unknown after doing the crime [1]. There are different types of biometrics methods like Physical:- which mainly deals with fingerprint, facial, hand geometry, iris, retina, DNA. Behavioral:-which mainly deals with voice and signature recognition. Fingerprint recognition is one of the commonly usedmethod for personal identification. Fingerprint ridges starts forming in newly developing baby at third to fourth month of development stage. The ridges formed can be seenon the skin of thumbs and fingers. The fingerprint is formed on skin so while picking some object it avoids slippage. As per accuracy ratio misidentification rate is 1/1000 and this is universally accepted for application.

II. FINGERPRINT RECOGNITION

In a fingerprint image the dark lines which are seen are called ridges and the white area between the ridges is named valleys as it's like river valley between two mountains.

Fig I: shows the three mainbasic different patterns seen in the fingerprints



- Arch: - It is one type of ridge which is seen like entering from one side and rises in middle forming a arc and exit from other side.
- Loop: - It's like ridge entering from one side of finger then forming a curve and exiting from the same side through where it entered.
- Whorl:-ridges which form a circle like structure in fingerprint are whorls.

About 65 percent of the total population has loops, 30 percent have whorls, and 5 percent have arches [3].

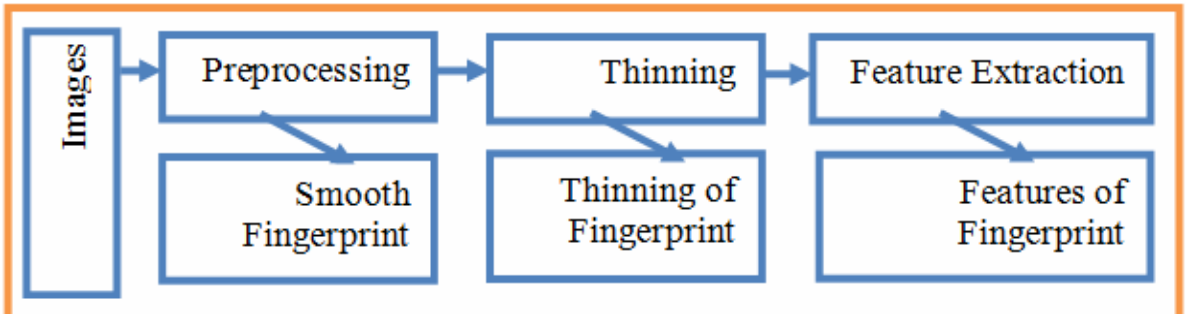
III. GENERAL METHODS

In order to achieve our goal of matching fingerprints we need to go throughfollowing steps:-

Step 1: -Collect fingerprint image of the person.
Step 2: -Go for image preprocessing.
Step 3: -Go for thinning process.
Step 4: -Go for feature extraction process.
Step 5: -Compare with the collected data
if data match
Then access the system
Else
Go to step 1
Step 6: -Test the implemented algorithm to check its accuracy [4].

IV. FLOW DIAGRAM

Fig II: - shows the flow of the main three processes:-



1. Preprocessing process

Pre-processing process is the process in which all initial steps are taken in consideration the main steps are stated below:-

a. Image acquisition.
b. Converting the input image into gray scale.
c. Removing the unwanted parts from the image.
d. Image is placed into exact position.
e. Noise removal operation is performed without effectingthe fingerprint pattern.
f. Image resizing is performed to give exact size.
g. Image enhancement.

2. Thinning Process

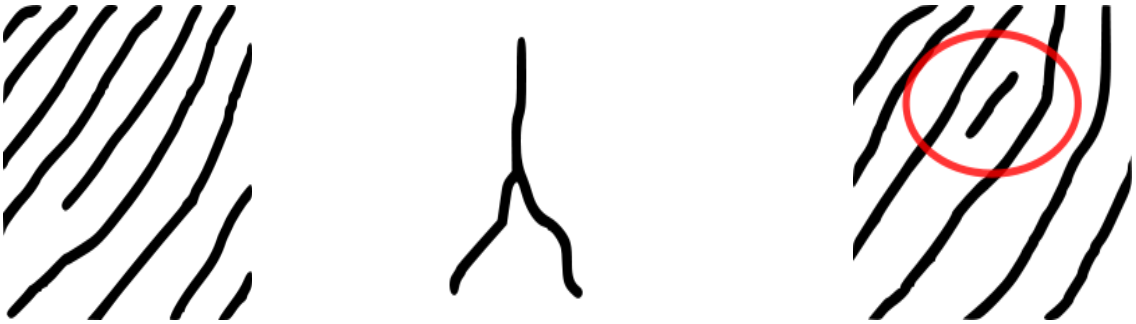
Thinning process is the process of reducing the thickness of the lines as much as possible without affecting the original image pattern. This is main process of fingerprint verification.
Fingerprint thinning process can achieve more performance if:

a. The lines of input fingerprint image to this process should be a single pixel as possible.
b. The lines of inputfingerprint image should not have any discontinuity as possible or should be minimal.
c. The lines of input fingerprint image should be adjusted to its center pixel as possible.
d. All redundancies and unwanted pixels should be removed before inputting to this process.
e. Performing the above steps can lead to more effective output of thinning process.

3. Feature Extraction Process

Feature extraction process which depends on the previous processes and it is the main part of the overall verification system in which it take out the required characteristics of the fingerprint pattern. Feature extraction process of fingerprint recognition system is very responsive process and concert delight required for characteristics of the Minutiae; this can be implemented by the use Minutiae detection, Minutiae enhancement and Minutia extraction. Minutiae in terms of fingerprint can be considered such as bifurcations, ridge endings and short ridge.

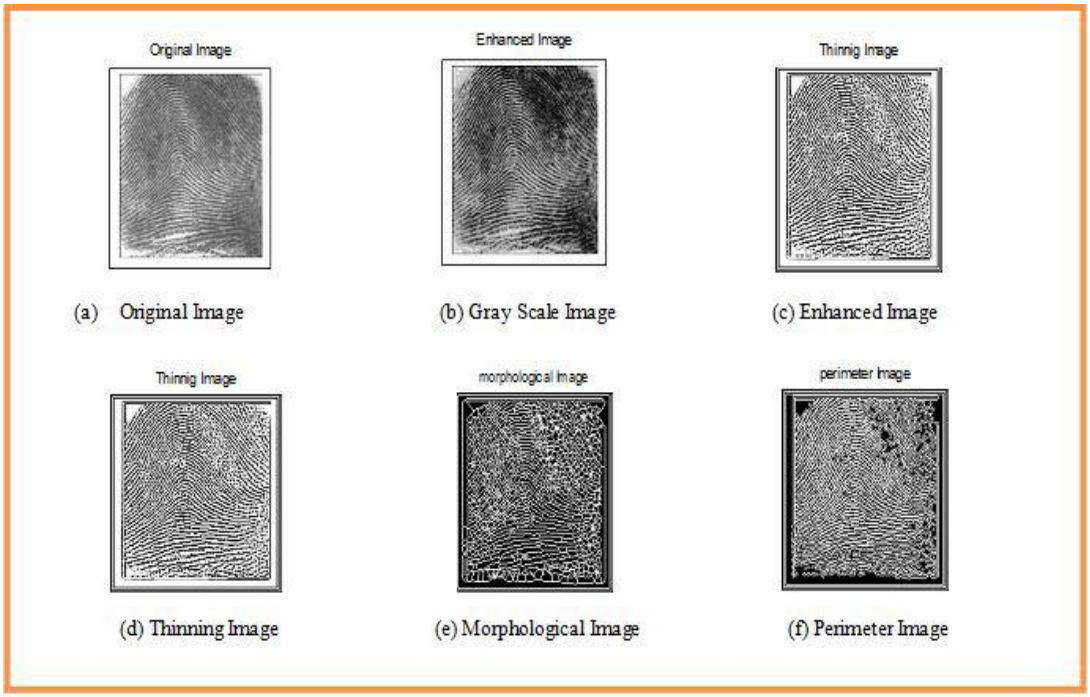
Fig III: shows three main characteristics:



Ridge Ending **Bifurcation** **Short Ridge (Dot)**

- **Ridge ending**: - It is ends of the ridges which are important as the length can't be same for all ridges.
- **Bifurcation:** - This is like ridges splitting into two parts from one ridge.
- **Short ridge**:-It's like small ridges which are considered as a dot while extraction process.

Fig 4:- The processing of the image which contains the arc like structure in the fingerprints



V. ADVATAGES

- Very high accuracy.
- Is the most economical biometric PC user authentication technique.
- it is one of the most developed biometrics
- Easy to use.
- Small storage space required for the biometric template, reducing the size of the database memory required.
- It is standardized.

VI. DISADVANTAGES

- For some people it is very disturbing, because there is a chance of criminal identification.
- It can make mistakes with the dryness or dirt on the finger's skin and also the fingerprint changes as per age.
- Image capturing rate is 500 dots per inch (dpi) and resolution is 8 bits per pixel. Therefore the total space required approximately is 240 Kb. So compress of image is to be done and compression factor should be high around 10.

VII. APPLICATION

- National ID cards, electronic commerce, organizations and banking operations.
- Law Enforcement.
- Authorize Entry Devices for Buildings.
- Computer Network Access.
- ATM authorization.
- And in many other fields this method is successfully implemented for authentication purpose.

VIII. CONCLUSION

From the above result we can conclude that fingerprint is universally accepted for security purpose as it possess higher security then other measures like signature, voice etc. The mismatch of fingerprint can be avoided if the level of dryness and dirt is less. Also the use of high definition camera can lead to better result.

Accuracy:

Male – Female:-

Females have low image quality in comparison with male subjects.

Right Hand – Left Hand:-

Left hand fingerprint quality is lower than right hand.

By Age of Subject:-

Image Quality degrade as person's age increases.

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