

## Fingerprint Image Enhancement

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### Abstract

The most and widely used bio-identification system is fingerprint recognition system. It is popular because of the fact that fingerprints of human are unique. The fingerprints of even identical twins are different. The fingerprint of individual is unique and remains unchanged over lifetime. A fingerprint can be seen as smoothly varying pattern formed by alternating ridges and valleys on the surface of the finger. For example to make an image lighter or darker, or to increase or decrease contrast. There are various Techniques used for image enhancement, like Histogram Equalization Technique, Fourier Transform, Gaussian Anisotropic Filtering, Rotational filter etc. The every fingerprint has unique characteristics called minutiae, which is point where a arc track finish, traverse or twigs off. In this work a novel method for Fingerprint recognition is consider using a arrangement of Gabor Filters to enhance the image and Fast Fourier Transform (FFT). With eight different orientations of rotational filter, features of the fingerprint are extracting and are combined. Features are extracted from these frames in frequency domain. Final enhanced fingerprint is obtained the results of Rotational filter and frequency domain filtering. Binarization and Thinning follows next where the enhanced fingerprint is converted to binary and the ridges are thinned to one pixel width. This project is implemented using SCILAB/MATLAB.

**Keywords:** fingerprint image enhancement, FFT, minutia, rotational filter.

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### INTRODUCTION

Fingerprint is most widely used biometric identification because it is unique for every individual throughout the globe. Fingerprint Image Enhancement's goal is to improve the quality of fingerprint image and also to remove the noise.

### FINGERPRINT RECOGNITION

A fingerprint recognition system can be used for both verification and identification. In verification, the system compares AN input fingerprint to the "enrolled" fingerprint of a selected user to work out if they're from an equivalent finger (1:1 match). In identification, the

system compares AN input fingerprint with the prints of all registered users within the info to work out if the person is already well-known underneath a replica or false identity (1:N match). Police investigation multiple enrollments, within which an equivalent person obtains multiple credentials like a passport underneath completely different names, needs the identification practicality of fingerprints.

### THE ART OF FINGERPRINT RECOGNITION

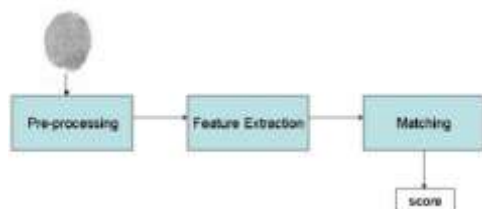
In this section provides a basic introduction of fingerprint recognition

systems as well as their main parts, and includes a brief description of algorithms and the most widely used techniques. A number of additional issues that are not in the scope of this book can be found in the main modules of a fingerprint verification system (Figure 1) are:

- a) **Fingerprint sensing:** In which the fingerprint of a private is non-inheritable by a Fingerprint scanner to supply a raw digital illustration.
- b) **Preprocessing:** In which the input fingerprint is enhanced and adapted to simplify the task of feature extraction.
- c) **Feature extraction:** In this extraction the fingerprint is further process to produce Discriminative property, also known as feature vectors.
- d) **Matching:** In matching the feature vector of the input fingerprint is compare beside one or more accessible templates.

The templates of approved users of the biometric system, also called clients, are usually stored in a database. Clients can claim an identity and their fingerprints can be checked against stored fingerprints.

The following Figure 1 shows Main module of a fingerprint verification system. The captured fingerprint will be goes the pre-processing phase then feature extraction after the feature extraction matching of fingerprint image.



**Fig.1.** Main Modules of a Fingerprint Verification System.

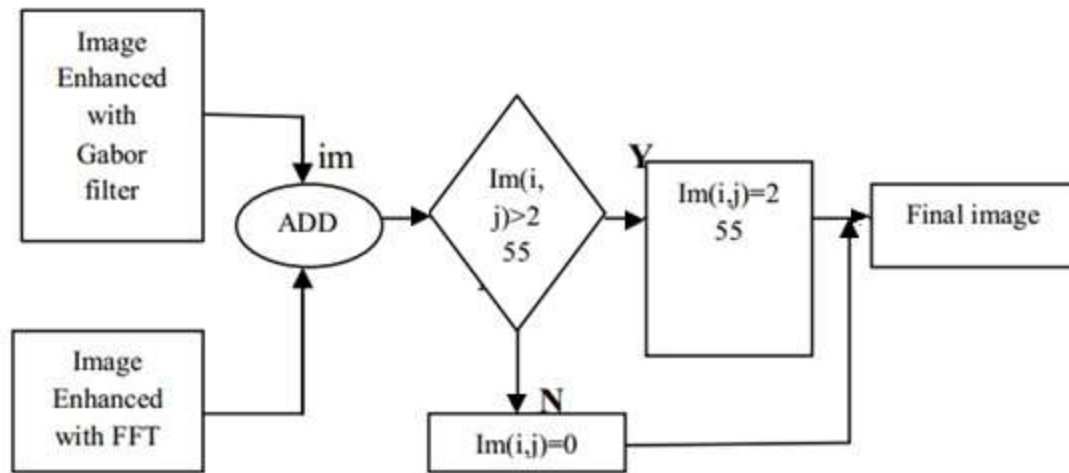
## ENHANCEMENT TECHNIQUES

From the previous sections is clear that both approaches present desirable features that can be combined to obtain better image enhancement results. Thus this project proposes to use a combination of Rotational filter Fourier

Transform and Gabor filtering to carry out the image enhancement task. In the final image with minutiae's detected in each stage is observed. Since we have the two enhanced images an algebraic sum is made pixel will be white, if in the two images the pixel is white too. In Figure 2 shows the Block diagram of proposed fingerprint enhancement method fig shows comparison of image with the help of Image enhancement with Gabor filter and image enhancement with FFT.

## SUMMARY

In this paper concept of fingerprint enhancement is introduced. Fingerprint Recognition system can be used for verification and identification, Enhancement techniques like Gabor filter and Image enhancement with FFT. The Art of Fingerprint Recognition is introduced. Problem identification and project objectives are described in next paper.



**Fig.2.** Block Diagram of Proposed Fingerprint Enhancement Method.

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