Finger print Recognization

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Introduction

Finger print recognization system is under biometric application used to increase the user security.

Generally the biometric systems operating in two modes,

- **Verification**
- **Identification.**

- **Verification:** The person to claim identity through an Number(identification number), user name etc...the system then gathers the input data and compares it in priviously stored data then give the result related data. if the data not related to template data it it simply denied.
- **Identification:**

  If the input data matches any of the template data sets, the system

OBJECTIVE

- The system processes the data and collects the identifying features of the fingerprint. Next, it compares this information to previously stored information from various fingerprints. After making the comparison, the system determines if the input image matches the data of a fingerprint already in the database.

A few different processing methods are used to extract the identifying

FINGERPRINT

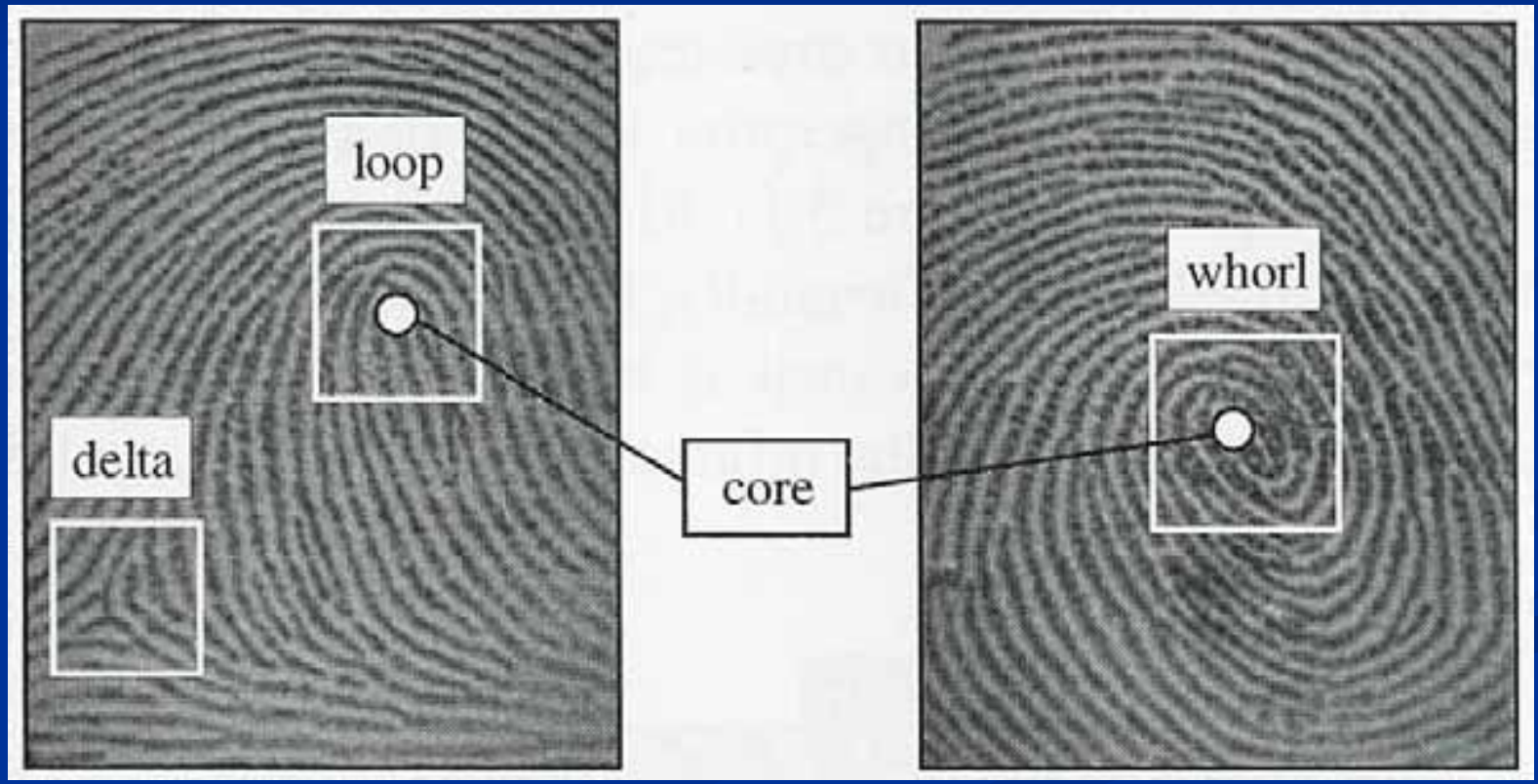
A fingerprint pattern is comprised of a sequence of R**idges and Valleys**.

In a fingerprint image, the **ridges** appear as **dark lines** while the **valleys** are the **light** areas between the ridges.

The fingerprint image will have one or more regions where the ridge lines have a distinctive shape. These shapes are usually characterized by areas of high curvature or frequent ridge endings and are known as singular regions.

The three basic types of these singular regions are

loop, delta, and whorl.



- The project will be proceeded by using Matching techniques

There are two types of Finger print Matching techniques

Minutiae Based

Image Based

MINUTIAE

In this project we are implementing the Minutiae matching technique

It is first necessary to apply several pre-processing steps to the original fingerprint image to produce consistent results

Such steps generally include

- **Binarization**
- **Noise removal**
- **Thinning**

Binarization

- Image binarization is the process of turning a **grayscale image to a black and white image**.
- In a gray-scale image, a pixel can take on 256 different intensity values while each pixel is assigned to be either black or white in a black and white image.
- This conversion from gray-scale to black and white is performed by applying a threshold value to the image.

A critical component in the binarization process is choosing a correct value for the threshold.

The threshold values used in this study were selected empirically by trial and error.

Original Image

Image Following Binarization

- After binarization, another major pre-processing technique applied to the image is thinning, which reduces the thickness of all ridge lines

This **thinning** method to be done with **Block Filtering method** attempts to preserve the outermost pixels along each ridge

This is done with the following steps.

- **Step One: ridge width reduction**

This step involves applying a **morphological process** to the image to reduce the width of the ridges

Morphological is a means of changing a stem to adjust its meaning to fit its syntactic and communicational context

Two basic morphological processes are

- Erosion

Dilation A dilation process is used to thicken the area of the valleys in the fingerprint.

Erosion:

Erosion thins objects in a binary image (ridge)

In this project we are using the Dilation

Original gray level image

Image found after applying

valley dilation

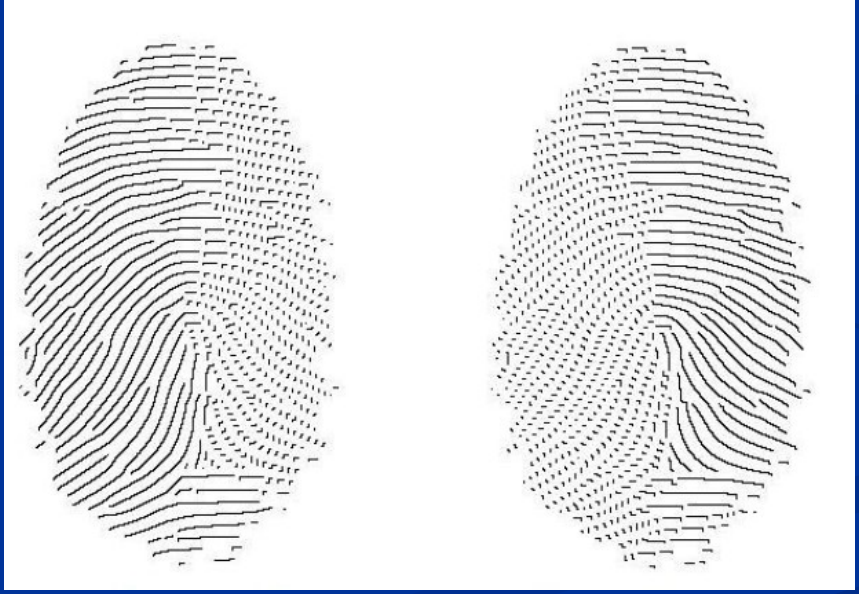
Step Two: passage of block filter

The next step involves performing a pixel-by pixel scan for black pixels across the entire image

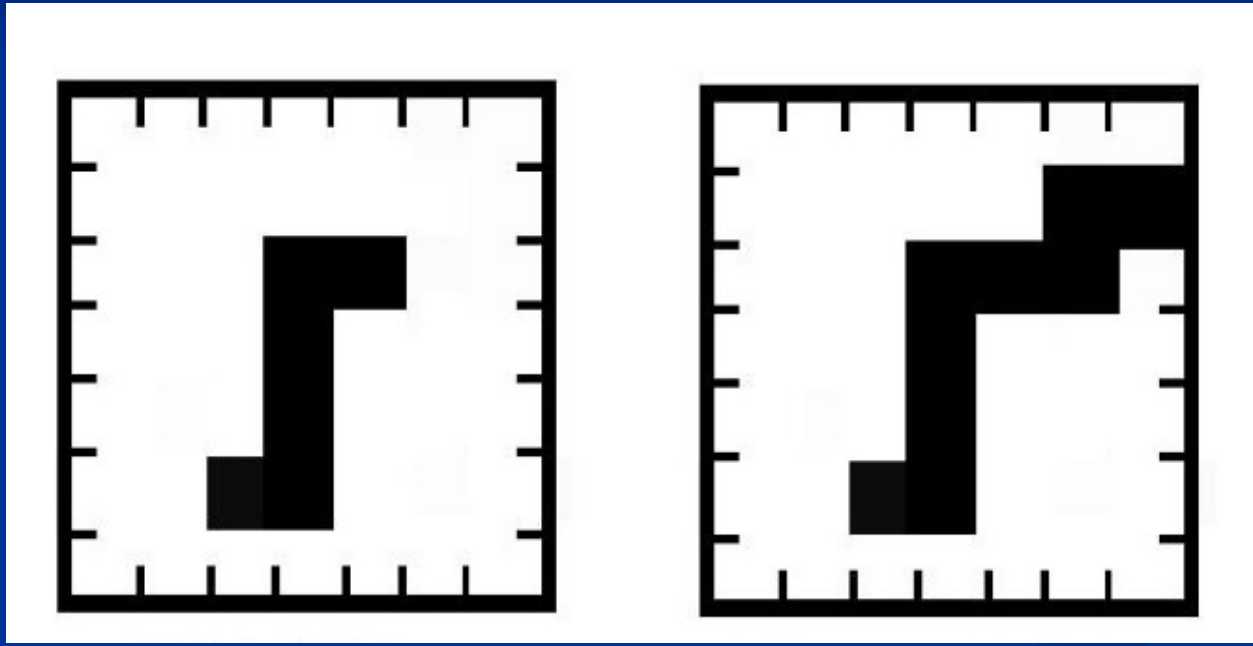
Note that in MATLAB, image rows are numbered in increasing order beginning with the very top of the image as row one.

Similarly, columns are numbered in increasing order beginning with the leftmost side of

The left to right scan continues until it covers the entire image. Next, a similar scan is performed across the image from right to left beginning at the pixel in row one and the last column.



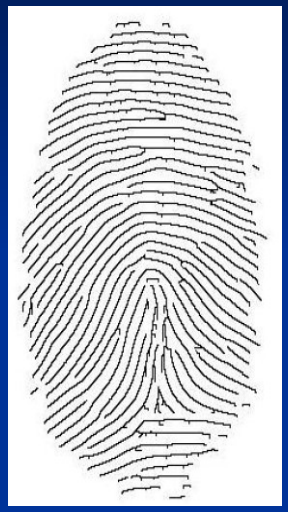
Step Three: removal of isolated noise



Step Four: scan combination

A value of **two** means that the pixel from each scan was white, while a value of **zero** indicates the pixel from each scan was black. Meanwhile, a value of one means that the pixel from one scan was black while the same pixel from the other scan was white.

As a result, the new matrix needs to be adjusted to represent a valid binary image containing only zeros and ones. Specifically, all zeros and ones are assigned a value of zero (black pixel),

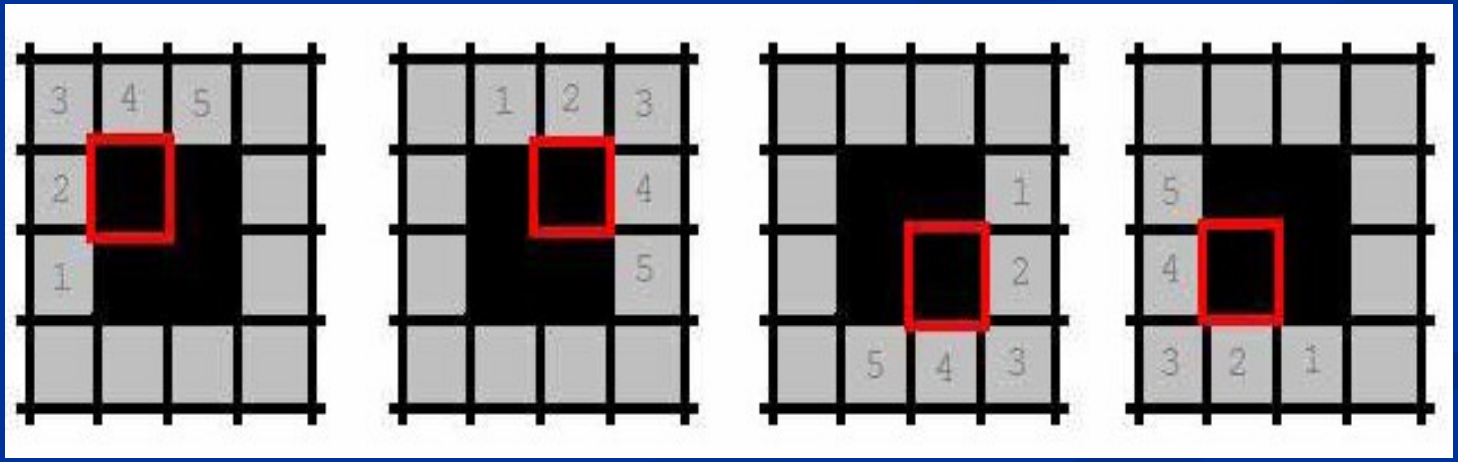


Combined image from both scans as stated above

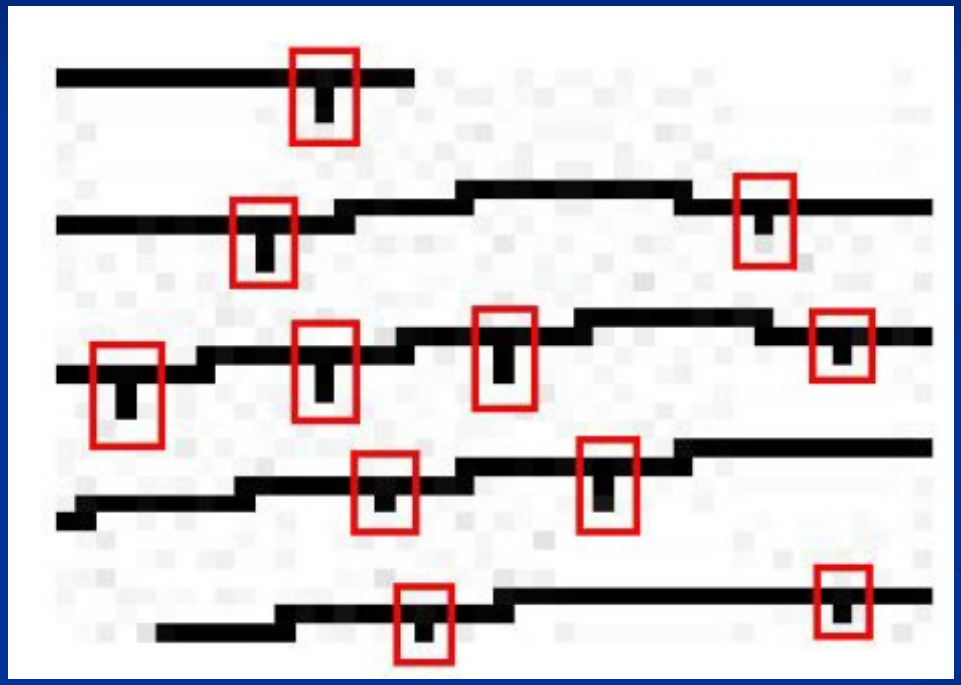
Step Five: elimination of one pixel from two-by-two squares of black

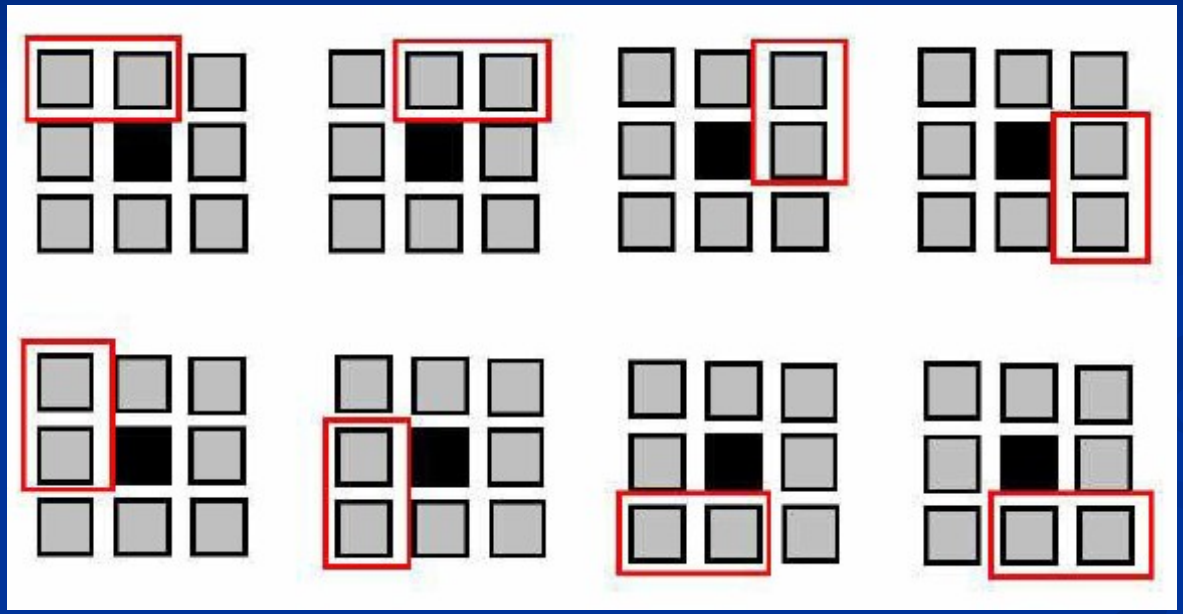
Next, a new scan is conducted on the combined image to detect two-by-two blocks of black pixels which represent a location where a ridge has not been thinned to a one-pixel width. It is likely that some of these two-by two blocks were created by the combination of the previous scans. This problem can be compensated for by changing one pixel within the block from black to white, which reduces the width at that particular point from two pixels to one. At the same time,

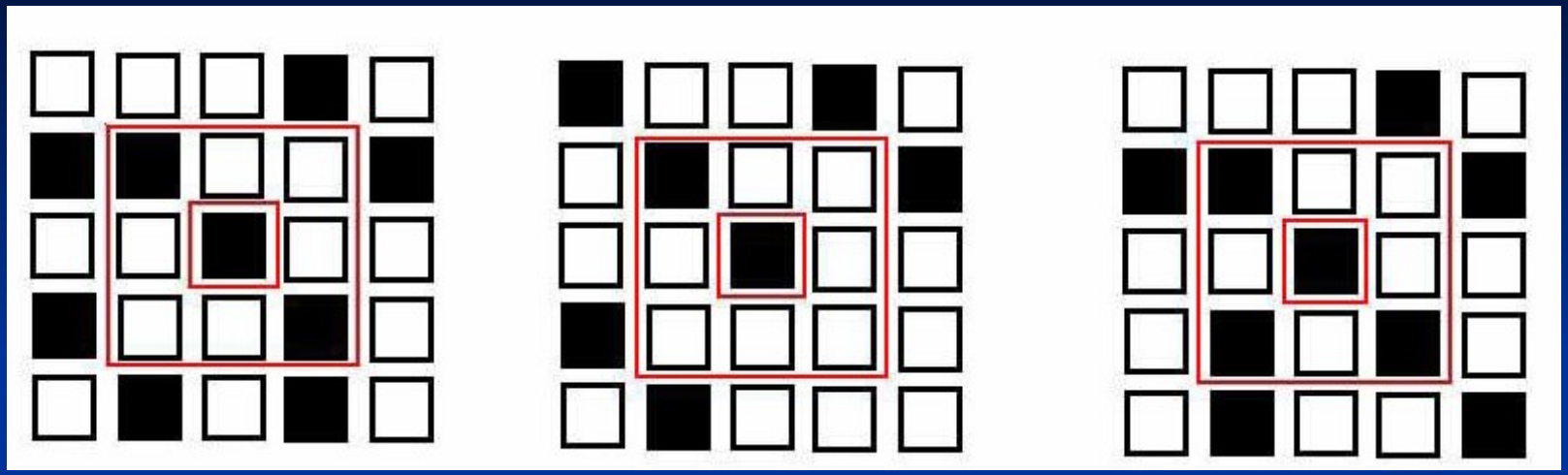
This operation can be performed by analyzing the pixels touching each individual black pixel. Note that each black pixel touches the three other black pixels within the two-by-two block. Therefore, there are only five other pixels that
contain useful information.



Step Six: removal of unwanted spurs





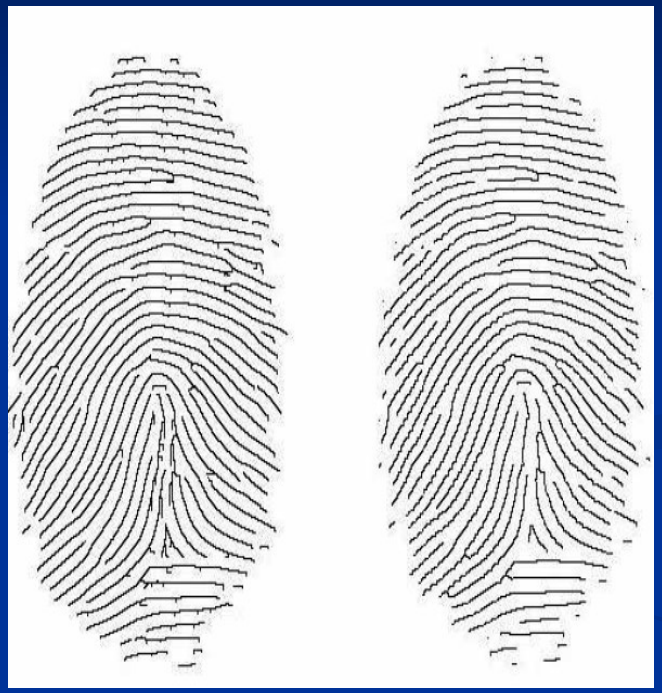


Crossing no=2 **Crossing no=1**

Crossing no=3

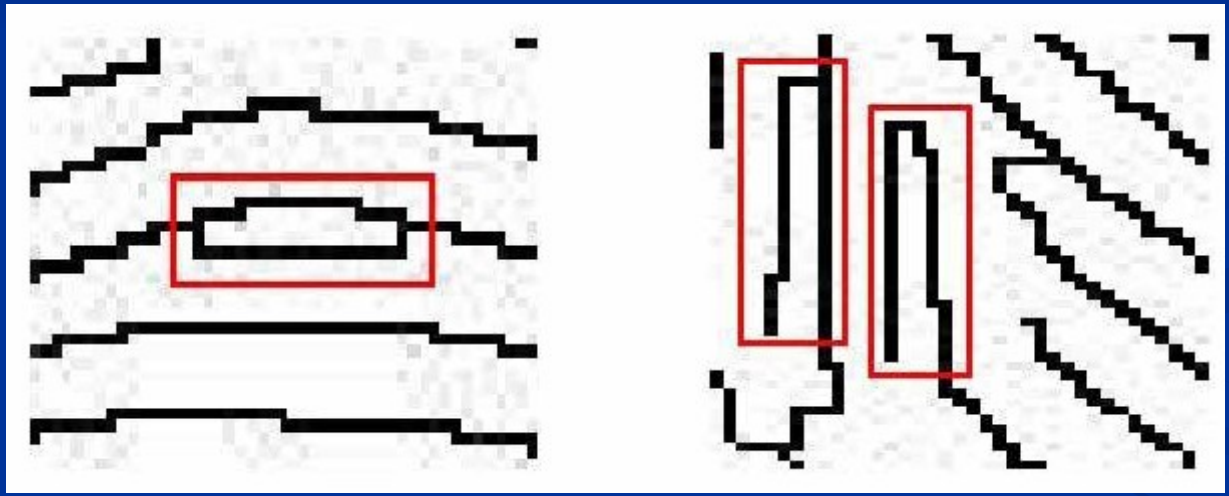
Intra ridge pixel **Termination minutia**

Bifurcation minutia



Before removing spurs **After removing spurs**

Step Seven: removal of duplicate horizontal and duplicate vertical lines



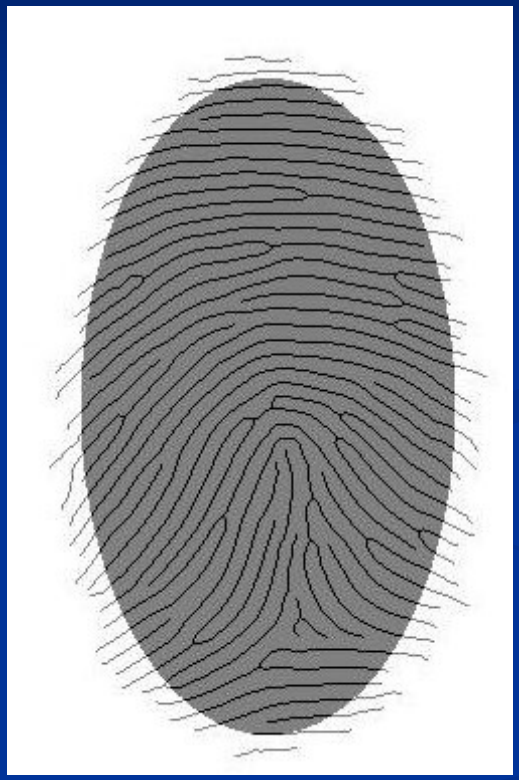
Thinned image from block filtering

Final Noise Removal

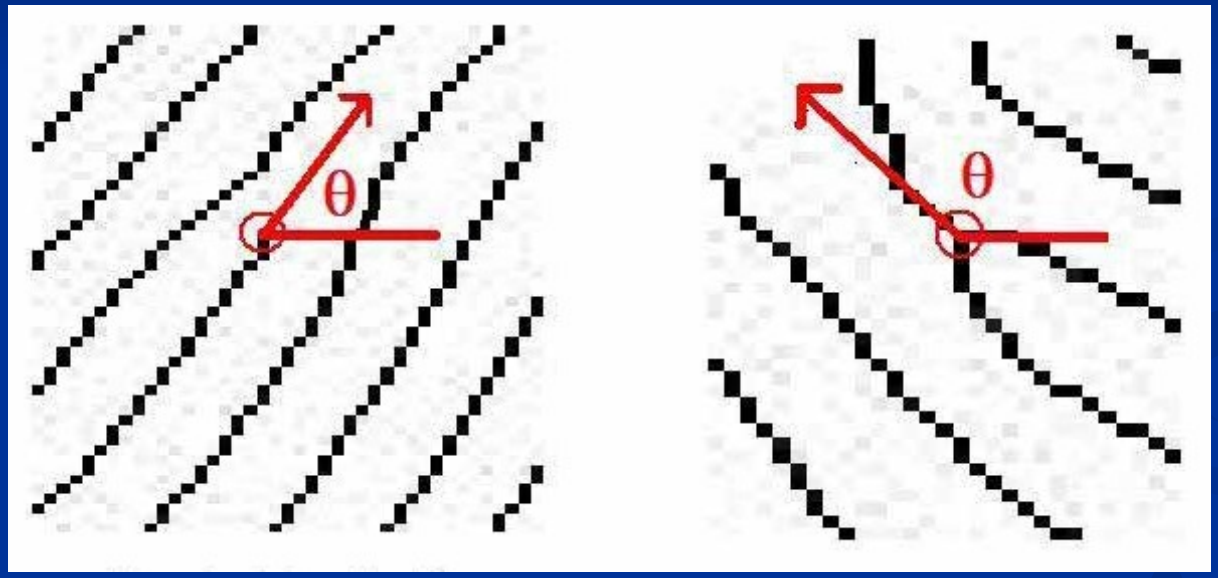
Impact of deleting short island segments

MINUTIAE EXTRACTION

- The minutiae information can be extracted and stored after the image pre-processing is complete. This information consists of the following for each minutia:
- • Location within the image
- • Orientation angle
- • Type (termination or bifurcation)



Ellipse generated to reject ridge endings along the boundaries of an ir



Termination angle **Bifurcation angle**

THANK YOU