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Fingerprint Recognition by Minutiae Points for Airport Security

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ABSTRACT
For identifying the individual person and authorizing the person Fingerprint recognition are used. Many matching algorithm are used for identifying Fingerprint of an individual. In which the minutiae points are founded and marked as the Fingerprint template for easy and efficient marking of the minutiae points. Improving the quality of Minutiae points image processing is done. So that we can mark the minutiae points from the scanned fingerprint to the stored template and person is identify.

Keywords: fingerprint image processing, minutiae extraction, fingerprint matching, matching score

I. INTRODUCTION

Air travel plays a vital role in day-to-day life. In which many business class people and passengers used to travel around the world. In which many smuggling and forgery are done by smugglers. To avoid this fingerprint verification technology is being used in the proposed system to identifying the individuals AFIS (Automatic Fingerprint Identification System) is used to identifying the individual automatically in the Airport to provide security.

II. METHODS AND MATERIAL

A. Template Extraction:
In this process the individuals Fingerprint image is scanned and marked with minutiae points and store in to the Database along with the passenger personal details.

B. Image Processing :
The acquiring template from the passenger being done for Image Processing for improving the quality and easy mapping of minutiae points.

1. Histogram Equalization

Histogram Equalization is used for improving the quality of image which is Blurred, Distorted.

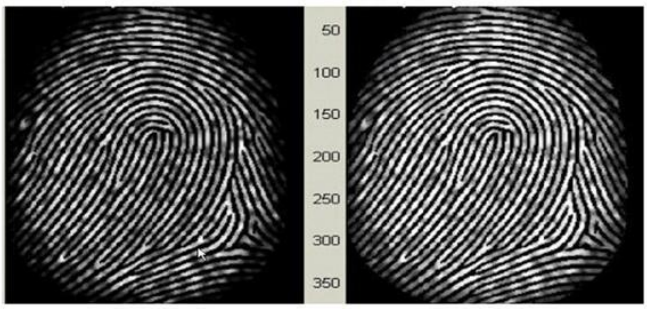

Figure1: Histogram equalization done for the input fingerprint image

2. ROI

Region of Interest is the method which is used to specifically crop the template which is of good quality i.e. the remaining regions other than the fingerprint core image is omitted.

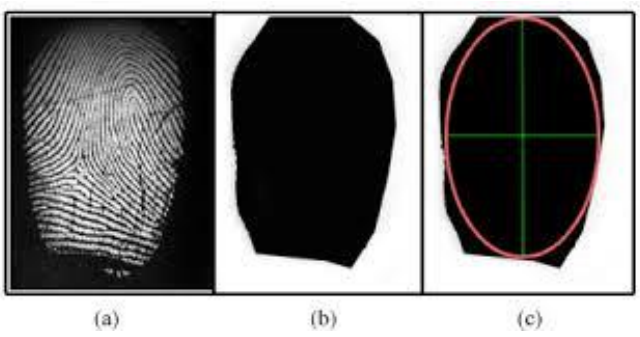

Figure2: (a) Fingerprint image with distorted region, (b) fingerprint image region is taken in black region. (c) Region of interest is mapped on the fingerprint image

Figure 3.Region of interest is mapped on the template image

3. Ridge Thinning

Ridge Thinning is the one which is used for reducing the width of the ridges so that marking the minutiae points will be made easy.

Figure 4. (a)The original input image. (b) The ridge thinning processed image

C. Fingerprint Verification

In the Fingerprint verification process the template which is being stored in the Database is matched with the user's Scanned image. The matching is done based on minutiae points with the help of Threshold values and the value range is with which matching process is done. The match precent is greater than the threshold value than the fingerprint is accepted or else the person is marked as unauthorized.

MATCHING ALGOITHM

In the matching algorithm the Fingerprint image of the input is matches for the Minutiae points in the template image

The matching process begins with the by Hough transformation of the Fingerprint image. And the input image is transformed to improve the matching similarity score of the matching process. The matching can be done with the help of mapping the input image to that of template image.

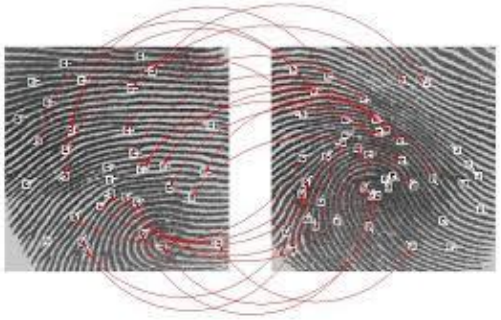

Figure 5.mapping of the template image with the fingerprint input image for minutiae points

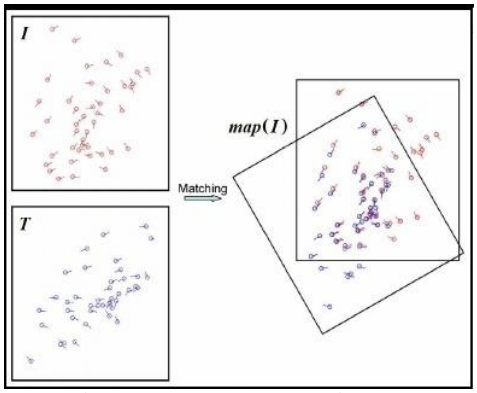

Figure 6. Mapping of the template image with the fingerprint input image

ROTATION AND DISPLACEMENT NORMALIZATION

In this method the rotation and the displacement have to be normalized in the fingerprint image template ad also for the input fingerprint image, this is done to perform high –efficient fingerprint matching. To normalize the rotation of the image, first the set of rotation for the template in the database with the angle range -50 to 50 with angle spacing 1 deg .the rotational angle of the input image to that of the template can be estimated by the similarity between the template image to that of the input image using band-limit phase only-correlation function. The displacement can be normalized by obtaining the peak location of the band-limit phase only-correlation between the template image and the input image.

Common region extraction:

This process is to extract the overlapping region of the template and the input image. The overlapping is done as the non-overlapping regions will become as uncorrelated .so to effectively calculate the region the projection of the x-axis and y-axis is done for the pixel value. Only the images with the same size are extracted for matching step.

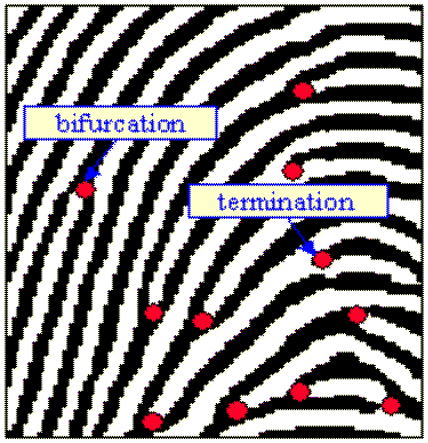

Figure 7. The bifurcation and the termination points on the template image

III. RESULTS AND DISCUSSION

MATCHING SCORE:

In a good quality Fingerprint image template there will be around 75-85 minutiae points and when considered in a blurred or latency Fingerprint image there will be around 30-40 minutiae points. The matching takes place between the stored template image and the scanned Fingerprint image for minutiae matching. The minutiae points in template is considered as T= {m1, m2,…mn} where m1,m2 are minutiae points on the template and in the scanned Fingerprint image the points considered as I={m1,mn} where m1,m2 are the minutiae points on the input image. The matching is done for these and returns as score S= (T, I).

MINUTIAE EXTRACTION PROCESS:

Fingerprint matching process, template image is pre-processed so that the extraction of the minutiae points can be done easily and efficiently. The extract extraction of the point is done with the help of pixel values that is "1" or "0"s. The minutiae point can be marked with the pixel point p with the help of neighbour value PI Algorithm uses cross number at point P,

P4	P3	P2
P5	P	P1
P6	P7	P8

Base on the CN value the Bifurcation and termination of minutiae points are marked

CN	Properties
1	Termination point
2	Bifurcation point

Figure 8. Fingerprint processing for image enhancement.

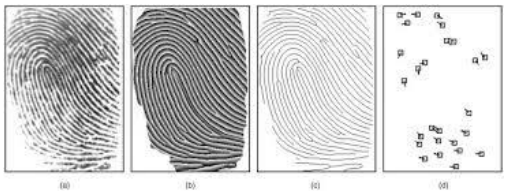

Figure 8. (a) The input image. (b) Histogram equalization done on the input image. (c) Ridge thinning is done to the processed image. (d) Bifurcation and termination points marked on the template.

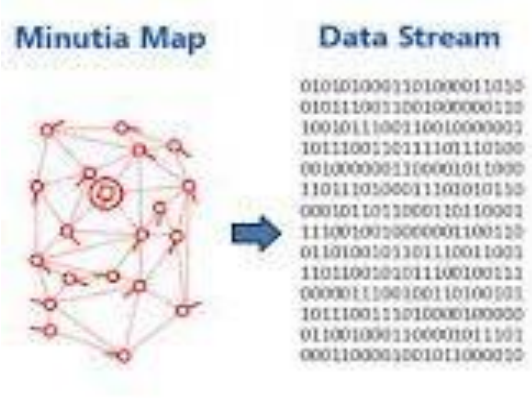

Figure 9. (A) The mapping of the fingerprint image is done upon the minutiae points. (b) The template is stored as stream as binary data in the database.

PROPOSED SYSTEM

In the proposed system the fingerprint matching is doe with the help of the minutiae points. The minutiae extraction is done with the help of the skeletonizing the fingerprint image and marking the minutiae points. The threshold value is set to check for the percentage of matching between the two fingerprint image templates .the matching algorithm used in the proposed system is to normalize the rotation and the displacement and in next step the common region extraction is done which is used to find the image that matches with the

input image by projecting the x and y pixel values.

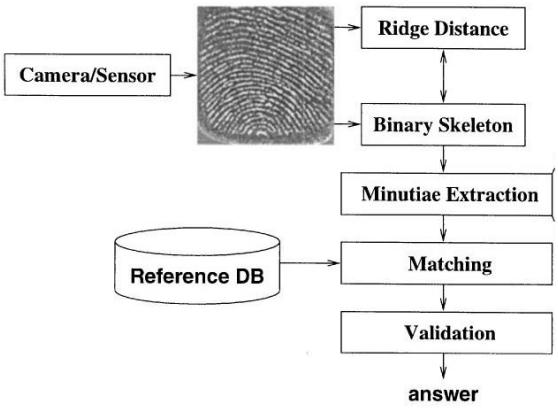

Figure 10. The fingerprint process of extraction and verification done in the proposed system

The proposed method uses the matching technique to identify the individual during the time of verification process. The process will be helpful in identifying the person when they board the flight the fingerprint matching can be done

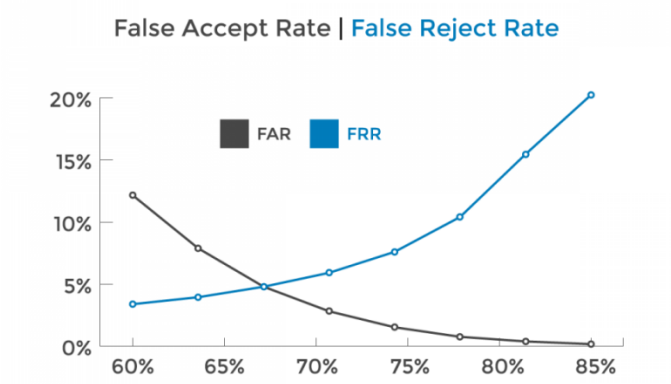

Figure 11. The false accepting rate and the false rejection rate

IV. CONCLUSION

The proposed system uses the fingerprint system to provide the security during the verification process this system will identify the individual at a very fast and efficient manner .the accuracy of the system is more when compared to other identifying process as the minutiae points are marked using the ridge thinning process , matching using the rotation and displacement process

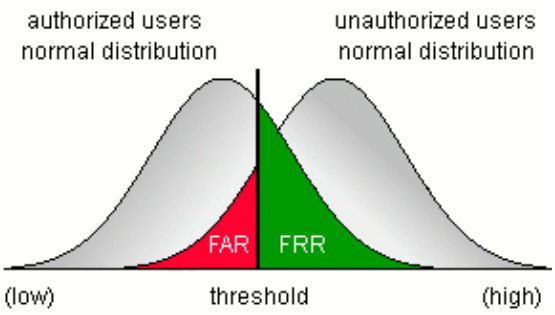

Figure 12. The unauthorized user and the authorized

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