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FINGERPRINT BASED GENDER CLASSIFICATION USING ANN

Mr. G.S.Wedpathak¹, Ms.Dipali G. Kadam², Ms.Kiran G. Kadam³,
Ms.Ankita R. Mhetre⁴,Ms. Vidya K. Jankar⁵
^{1,2,3,4,5} CSE ,AITRC,Vita

Abstract— In the era of technology and science, a gender classification have immense value. Fingerprint based gender classification helps to analyze the data in easy way and help to sort out the data. Now a days finger print based gender classification is seen in civilian, industrial, commercial, and unique Id of nation as AADHAR card. As the fingerprints are unique, gender classification helps to minimize the large data. It is utilized by using simple scanner which is available in affordable prices.

This review study introduces various methods of fingerprint based gender classification, its limitations and strengths. After having study of this review we can try to increase the efficiency which will help for further research work also. This paper will help to design and develop an efficient algorithm for the fingerprint based intelligent gender identification system and after testing the samples, the performance efficiency of the proposed system found to be 88% for female and 78 % for male.

Keywords - Fingerprint, Biometric, Pattern Recognition, Authentication, Ridge, DWT, RTVTR, Gender, Classification.

I. INTRODUCTION

A fingerprint is epidermis of finger consist of the pattern of interleaved ridges and valleys. The endpoints and bifurcation points of ridges are called minutiae. Fingerprint minutiae patterns of ridges are determined as unique through the combination of genetic and environment factors. This is the reason, the fingerprint minutiae patterns of the identical twins are different. Also the ridge pattern of each fingerprint remain unchanged from birth to till death. The gender classification and identification based biometric applications are designed for:

- A. E-commerce:- like, personal authentication or identification for network, e-records security, e-commerce, Internet access, online banking and ATMs, credit cards, physical access control of peripherals, cellular phones access, PDAs, medical records management, library access and virtual learning etc.
- B. E-Governance:- like, Digital signature or steganography, national ID cards, driver's licenses, border travel control, passport control, and welfare-disbursement etc.

C. Forensic applications:- such as corpse identification, criminal investigation, terrorist identification, parenthood determination, and missing children. Many social and organizational communications and services today depend on gender of person performs the role. Fingerprint classification is an important preprocessing and verification step in fingerprint identification. In this research, it investigates the problem of gender classification from fingerprint. The work has been motivated by studies in anthropometry, biometric characteristic, and pattern recognition suggesting that it is possible to distinguish between male and female fingerprints.

II. BACKGROUND

A fingerprint is epidermis of finger consist of the pattern of interleaved ridges and valleys. The endpoints and bifurcation points of ridges are called minutiae. Fingerprint minutiae patterns of ridges are determined as unique through the combination of genetic and environment factors. This is the reason; the fingerprint minutiae patterns of the identical twins are different. Also the ridge pattern of each fingerprint remains unchanged from birth to till death.

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III. METHOD AND EQUATIONS

A. Enhancement

The performance of minutiae extraction algorithms and fingerprint recognition technique relies heavily on the quality of the input fingerprint images. Since the fingerprint images acquired from sensors or other media are not assured with perfect quality; In practice, due to skin conditions (e.g. wet or dry, cuts and bruises), sensor noise, incorrect finger pressure, and inherently low quality fingers (e.g. elderly people, manual workers), a significant percentage of fingerprint images is of poor quality. The importance of fingerprint enhancement algorithm is to improve the clarity of the ridge structures in the recoverable region and mark the unrecoverable region for further processing. Here, Histogram equalization was employed.

B. Image Binarization

Fingerprint Image binarization is to transform the 8-bit Gray fingerprint image (Gray-scale) to a 1-bit image with 0-value for ridges and 1-value for valleys (binary). After the operation, ridges in the fingerprint are highlighted with black color while valleys are white. A locally adaptive binarization method is performed to binarize the fingerprint image. Such a named method comes from the mechanism of transforming a pixel value to 1 if the value is larger than the mean intensity value of the current block to which the pixel belongs.

C. Segmentation

Only a Region of Interest (ROI) is useful to be recognized for each fingerprint image. The image area without effective ridges and valleys is first discarded since it only holds background information. Then the bound of the remaining effective area is sketched out since the minutiae in the bound region are confusing with those spurious minutiae that are generated when the ridges are out of the sensor. Locating the reference point i.e., ROI is an essential step that can influence the matching accuracy. Two major methods are commonly employed, one is Complex filters and the other is Poincare index analysis. The anomaly associated with Poincare index is that it does not detect the arch type fingerprint. So in the course of this work, Complex filters was used.

D. Thinning

Ridge Thinning is to eliminate the redundant pixels of ridges till the ridges are just one pixel wide. An iterative, parallel thinning algorithm was used. In each scan of the full fingerprint image, the algorithm marks down redundant pixels in each small image window (3x3). And finally removes all those marked pixels after several scans. It is used to remove selected foreground from binary images. It is related to hit and miss transformation (i.e they can contain both one's and zero's)

E. Minutiae

After the fingerprint ridge thinning, marking minutia points were identified, Crossing Number (CN) concept was used for minutiae extraction. Ridge ending is commonly termed as minutiae point and pattern. They form are unique with every finger print. The thinned image is analyzed to spot minutiae points

F. Artificial Neural Network (ANN)

Prior to classification at all, the network needs to be trained. The neural network training done is as shown in Figure 3 while Figures 4a – 4d showed the classification interfaces.

IV. FIGURES

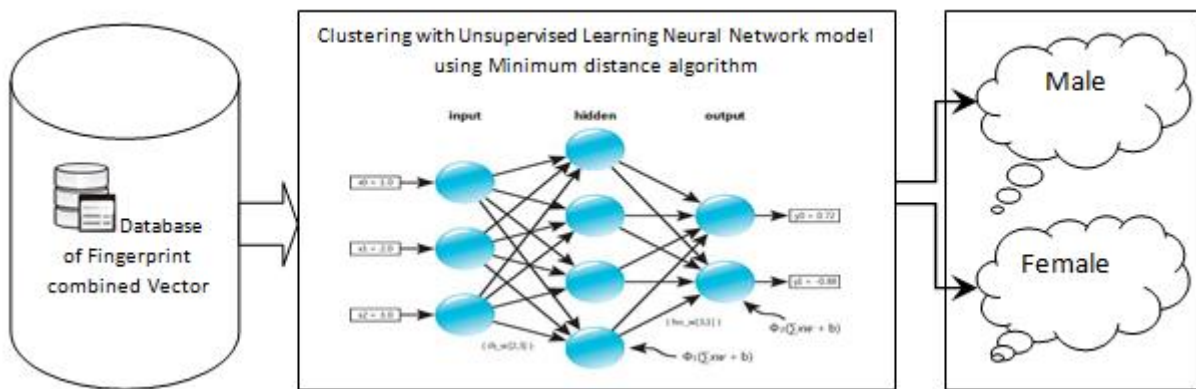


Figure.1 Unsupervised learning using Neural Network Training mode applied to tuples of combined vectors

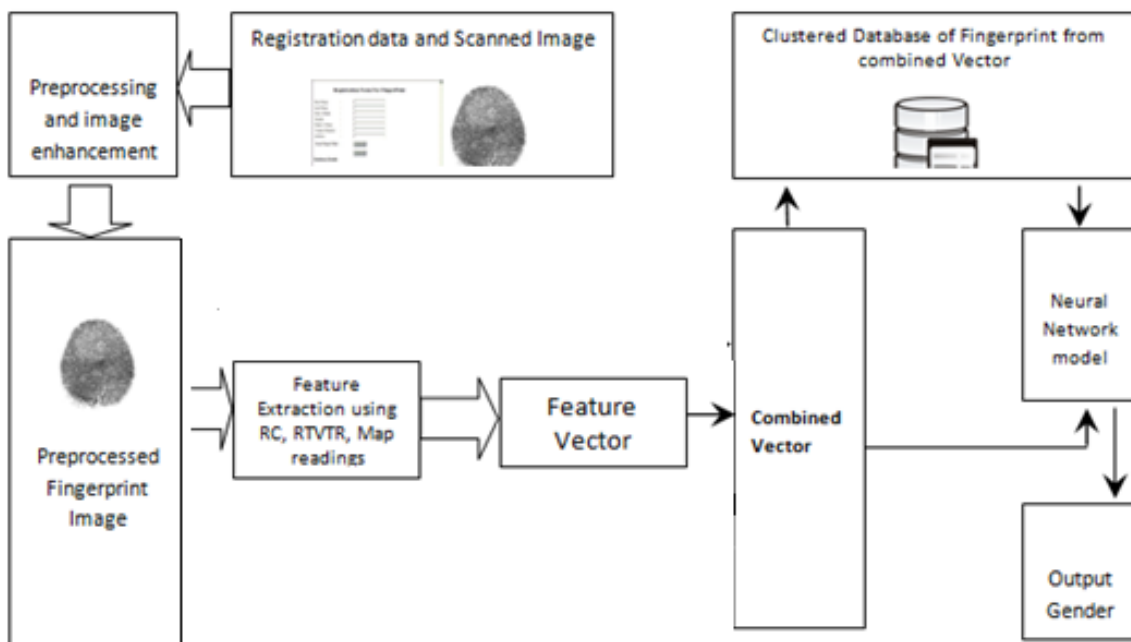


Figure.2 Fingerprints are acquired real time.

V. CONCLUSION

As the fingerprints are unique for individuals in the universe, it gives a unique identification and there is no doubt that fingerprint evidence is most acceptable and reliable evidence. Most of the traditional methods used in identification of gender gave the satisfactory results but an efficient attempt is needed to give effective results with higher accuracy. Clarity of Image, Frequency domain analysis, singular value decomposition techniques etc. will play a very important role to increase the efficiency and still there is a scope to work on this to improve the results.

VI. FUTURE WORK

In future, the work will be extended by combining spatial domain and frequency domain approaches to find different parameters like age, rural, urban people. Also different features which will help in gender classifications which will be more accurate and suitable for all types of application. We can also use different frequency domain approaches or else can use the different combination of methods which gives improved result. It should be recalled that for age classification we can use RTVTR. The age classification and the blood classification can be done in future. The scope of our project is wide in recognizing the suspects in criminal activity.

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