GENDER CLASSIFICATION USING BIOMETRIC THUMB IMPRESSION

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Abstract : *Human being have unique and distinct characteristics which are helpful to distinguish one human being from another and thus acts as form of identification. Biometric allows us to identify individuals based on some anatomical structure of body such as fingerprints, face, hand- geometry ear and iris etc. Addition to this soft biometric traits such as gender ,age and eye color ,voice ,accent etc. soft biometric traits help to support traditional biometrics by adding some extra meaningful information. Gender identification plays a vital role in many application like human computer interaction, content based indexing ,decision making ,searching ,surveillance and demographic studies. There are three main steps involved that are preprocessing ,feature extraction and classification. Fingerprint based gender recognition is one of the best biometric technologies that can be used to monitor people without their cooperation.*

Keywords **- Fingerprint, Gender Identification, Neural network, Digital Image Processing, Pattern Recognition, Feature extraction etc.**

1.INTRODUCTION

The human attributes like voice, age, gender can be classified easily by human vision. Without knowing the prior information child can distinguish between parents. But computer vision is unable to identify gender and to solve this, the system 'Automated Gender Identification' helps out. The implementation of this concept using fingerprint is efficient as the density of ridges in female is more than that of male. The motif of ridges remain identical all around the life though shape and size of fingerprint changes according to the age of person. Gender identification of a person can be done efficiently based on the fingerprint, ridges of fingerprints which servers as the main feature it is noted that average ridge of females is more than that of males.The pattern of ridges remain same throughout the life though shape and size of fingerprint changes according to the age of person.

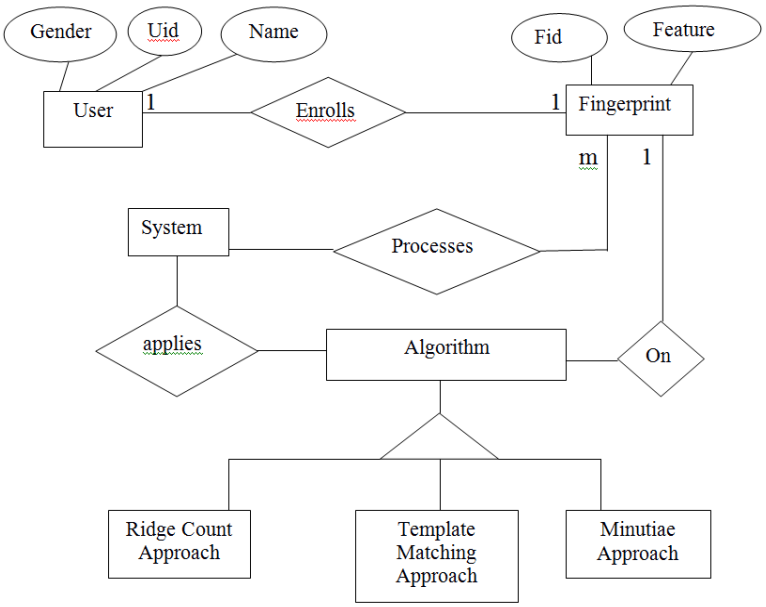
2. FUNCTIONAL REQUIREMENTS

1) Image Processing

Image processing has become very useful and important technology in modern era. It is used for remove impurities and quality of image. It allows use of complex algorithms and it make more sophisticated performance at simple tasks. Image filters are used to blur and sharpen the images. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as build up of noise and signal distortion during processing. Image processing can be done in multidimensional systems.

2) Gender Identification

This function requires processed image as input to perform further operations like ridge count, count of black pixel and white pixel, calculation of RTVTR. To implement this function proper and valid dataset is necessary to train the system and classification and prediction of gender.



3.ALGORITHMS

3.1 Minutiae approach

Minutiae is calculated based upon the number of breaks in the ridges of fingerprint. To calculate the breaks traverse horizontally from left to right. Minutiae count of female is less than that of male. The threshold frequency of minutiae count for female is 24 28 and for male is greater than 28.

Minutiae count(female) < minutiae count (male)

1. Read input image from dataset collected from user .
2. Convert fingerprint image to matrix using bufferedImage class of java which contains 0 and 1 values represented as white pixel and black pixel respectively.
3. Store the image obtained by bufferedImage class into matrixIO (class in java) object.
4. Read matrixIO object using iterator
5. The matrix value 0 i.e. white pixel is considered as breakpoints and matrix value 1 i.e. black pixel is considered as join or continuous line.
6. Count number of zeros in matrix which implies

Number of zero(male) > number of zero (female)

7. Compare count with threshold.

3.2 Ridge density approach

1. Take image as input whose gender is to be identified in .jpg format.
2. Convert image into grayscale

In grayscale conversion we have to store image of fingerprint in buffer as
Byte buf [ ] = new buf [SIZE]
After that we have to convert this buffer into yuv frame. To convert buffer into yuv format we have java method as ,

Matrix m = ImageUtils.to420sp(buf)

For conversion purpose, we need matrix containing rows and column . Convert the colourful image into black and white using method of ARGB.

3. Divide image into two parts (yuv frame)

Here we have to divide yuv frame into y frame and uv frame.
Formulae for yuv frame are as follows:
uv = w * h/2
y = w * h

4. Apply Algorithm on yuv frame
5. In this stage, we have to make white pixel where we are getting continues black pixel that is we have to separate the ridges that are connected. After that we have to make that points as breakpoint and make that point.

3.3 Template Matching

1) Template matching

Input template matrix derived from dummy images with features. The featured matrix is symmetric in nature which contains pixel (black pixel and white pixel).
Dummy image ⟶ template matrix(based on feature).
Read input image of fingerprint to be analyzed from the dataset.

2) Load selected image into sourceafis engine. Sourceafis is java library.

3) Read matrix return by sourceafis which is actual feature matrix. It acts as wrapper.

4) Conditions:

Diagonal of matrix represents intersection points.

Vertical elements of matrix represents ridge points without breaks.
Centre element of diagonal of matrix is centre of fingerprint.

$$\text{Fingerprint centre} = \frac{\text{Ridge count(vertical)}}{2}$$

5) Compare left and right part of matrix then decide whether it is loop or whorl.

6) Compare the matrix values to decide the symmetric or asymmetric nature based on values.

Symmetric matrix represents whorls.
Asymmetric matrix represents loops.

4. CONCLUSION

This experiment is carried on different fingerprints. Gender Identification is very important task to improve the biometric systems .It plays important role in areas like surveillance and demographic studies, computer interaction, searching, decision making, content based indexing. Using ridge count has given the accuracy of 96% and ratio of black pixel and white pixel is 74.34%. In future, the work will be extended to build hybrid and multi model biometric system to find different parameters like age group, blood group, skin color, hair color. Data science is an interdisciplinary field that uses scientific methods and systems to extract knowledge and insights from data in various form, both structure and unstructured, similar to data mining. This goal can be achieved from this implementation of project. Fingerprint patterns are the most important part of this project which is the main input to the project.

5.ACKNOWLEDGMENT

We would like to express our sincere gratitude to our HoD Dr.S.N.Zaware, for her continuos support for the project study and related research research, for motivation. Her gratitude helped us in all the tme of research and writing of this paper and we re thankful to her.

REFERENCES

[1] K. Zuiderveld: Contrast Limited Adaptive Histogram Equalization. In: P. Heckbert: Graphics Germs IV, Academic Press 1994, ISBN 0-12-336155-9.

[2] S. G. Mallat A Theory for Multiresolution Singnal Decomposition: The Wavelet Representation In IEEE Transactions on Pattern Analysis and Machine Intelligence archive, Volume 11 Issue 7,July -1989, Page 647-693.

[3] Verma M., Agarwal S. Fingerprint Based Male-Female Classification. In Proceedings of the International Workshop on Computational Intelligence in Security for Information Systems CISIS08. Advancesin Soft Computing, vol 53.Springer, Berlin, Heidelberg.

[4] Yu ,S., Tan, T. Huang , K. Jia, K. Wu, X: A study on gait based gender classification. IEEE Trans. Image Proc. 18(8), 1905-1910 , 2009.

[5] S. S. Gornale , Geetha C D , Analysis Of Fingerprint Image For Gender Classification Using Special and Frequency Domain Analysis, 2013.