Study of Rotation Oriented Fingerprint Authentication

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Abstract: *In biometric the fingerprint is the main method used for authentication. The main aim of fingerprint authentication is to improve accuracy and efficiency. Fingerprint recognition is mainly based on the minutiae feature but when fingerprint image contain rotation and noise then it increases the various issues. This paper describes the survey done on the rotation oriented fingerprint image in twentieth first century and various methods used for orientation estimation and this paper also describe various issues and how to overcome from these issues.*

Keywords: *Minutiae, Gradient, Gabor, Model*

1. INTRODUCTION OF FINGERPRINT AUTHENTICATION

Biometric is in the past, present and future. In past few years, pin number and password are used for the authentication process [1] but in present era there are lot of work is done on the fingerprint authentication. Biometric should be categorized in physiological characteristics and behavioral characteristics. Fingerprint identification is one of the most successful method for differentiate between two persons. Even identical twin do not have same fingerprint. Minutiae points differentiate two persons identification. Now a days, minutiae based approach is mainly used for fingerprint authentication. To reduce the complexity the classes based on curve pattern is also used for authentication [2].the rotated and noise contain fingerprint image increases the false accept rate and false reject rate.

The normal fingerprint and rotated fingerprint image are shown in figure 1(a) and figure 1(b)[1]

Fig1. *(a) Normal Fingerprint Image, (b) Rotated Fingerprint Image*

2. SURVEY

Fingerprint authentication is the oldest and successful technology in biometric. The fingerprint recognition firstly recognizes in 1684 when Nehemiah grew published the paper which define ridge, furrow, and pore structure in fingerprint. Then after this, in 1888 sir Francis Galton show the research done in minutiae features of fingerprint image [2].then in the twentieth century lot of research is done in fingerprint authentication but not on rotation oriented fingerprint image. In the last few years, lot of work done in oriented fingerprint image.

The latest works done on oriented fingerprint image are as follows

In 2011, C.Kammini, S.Asadi, K.Ellant [3] developed the scale and rotation independent fingerprint recognition. In this method no preprocessing operation like fingerprint enhancement, thinning, etc are done and fractal feature has been proposed. By doing this research it is described that fractal features are independent of variation in scale and rotation The fractal is mainly extracted by the gray scale fingerprint images In this there is low is computational complexity as compared to the other.

 In 2012, R.Mandi, S.Lokhande [4] defines the rotation invariant fingerprint identification system. This algorithm is very useful to identify two fingerprint images of the same individual which are misaligned by small transformation such as rotation or scaling. In that algorithm the all pre processing operations are used. After minutiae extraction in this the maximum correlation should be found. The maximum correlation shows that the input image is match with database image. By using this algorithm the false accept rate and false reject rate are defined by threshold value. The main advantage of this system is completely based on scanner. Thus it is cheaper as compared to other process.

In 2013, M.Mathuria, M.Cotia [5] does the fingerprint classification based on orientation estimation. In this paper describe the gradient based approach used to describe the orientation estimation which mainly defines the rotation of ridges and minutiae. By doing this the efficiency of fingerprint image should be increased.

Later in present year, 2014 R. Lakshaman, Selvaperumal,Chow Hin [6] define the integrated fingerprint recognition using image morphology and Neural Network. In this preprocessing is done using 2d median and wiener filter. After pre processing is done on fingerprint image then orientation field methodology is used (OFM).this OFM used to show the directional properties of image. This gives high robustness to noise and many environmental factors.

3. ORIENTATION ESTIMATION TECHNIQUE

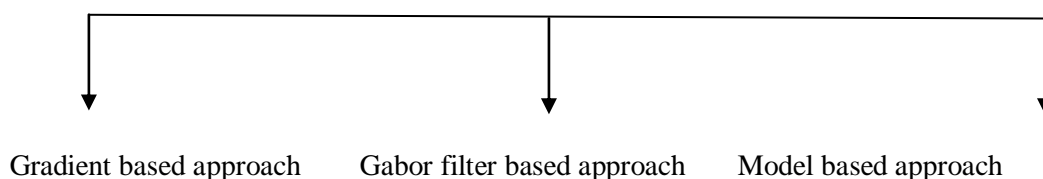The various orientation estimation techniques are as follows and shown in figure 2:-

Gradient based approach   Gabor filter based approach   Model based approach

Fig2. *Various approaches used for fingerprint orientation estimation for authentication*

3.1. Gradient Based Approach

The gradient based approach for orientation estimation is very popular but the disadvantage of this that it is not suitable for noise or poor quality image. This approach use derivatives which is spatial and temporal partial derivatives [5]. This derivatives use to estimate the rotated fingerprint image flow at every position in the image.

3.2. Gabor Filter Based Approach

This technique used to obtain a reliable orientation estimate even for corrupted image. In the other type of Gabor filter is the curved Gabor filter. This gives the choice of filter parameters which is very useful for enhanced image. In this process two orientation estimation techniques are combining and then curved regions are to be constructed [5]. They are mainly used to estimating of local ridge frequency.

3.3. Model Based Approach

In this approach firstly the combinational model is developed in which polynomial model is used. In combinational model define the orientation field but not for singular points whereas polynomial model improve the locally at each singular point [7].

4. ISSUES IN ROTATION ORIENTED FINGERPRINT IMAGE

➢ Rotated fingerprint image is difficult to match minutiae of two images. There co-ordinate locations are to be changed because of rotation [1].

➢ In rotated fingerprint image the edge detection should also be disturbed and ridge ending and bifurcation are not clearly defined [8].

➢ Rotated fingerprint image and noise image require more preprocessing steps.

➢ In 6 classes of fingerprint image, by orientation of fingerprint image the co-ordinate of 6 classes' i.e. arch, right loop, left loop, twin loop, and whorl should be changed. So if authentication is based on these classes then false reject rate and false accept rate should be increased.

➢ In poor quality fingerprint image, the ridge structure is not well defined. So it increases the difficulty in the detection of orientation estimation [9].

5. OVERCOME FROM THESE PROBLEM

➢ By using robust local feature the fingerprint image orientation problem should be resolved [1].

➢ The orientation problem also is solved by using rotation scaling transformation algorithm. In this the basic idea is to extract the number of minutiae then images are aligned using rotation metric [4].

➢ By using Gabor filter based technique, a reliable orientation done in poor quality image. The disadvantage of this technique is that this is not suitable for online fingerprint recognition [9].

➢ by doing image segmentation in foreground process and background process in which foreground process show the clear ridge and valley whereas background show the regions which is exterior or outside of the image. Thus background process does not contain any valid information for fingerprint authentication [10].

➢ in rotated fingerprint image the coarse alignment was done on two minutiae point, firstly point was the coarse of fingerprint and second was minutiae point have 50 pixel as compared from core. All core points were aligned to image center and then the images should be rotated. Thus in between core point line should be drawn and marked minutiae were aligned to the same angle [11].

6. CONCLUSION

In this paper, we have seen various surveys done on rotation oriented fingerprint image. Basically the fingerprint authentication starts in the seventieth century and lot of research done in twentieth and twentieth first century. Fingerprint authentication is the popular authentication method. This paper

describe that various issues and there overcome from these issues in rotation oriented fingerprint image

REFERENCES

[1] Madhuri and R. Mishra "Fingerprint recognition using robust local features" international journal of advanced research in computer science and software engg., Vol 2, issue 6, june 2012

[2] Divyanka T. Meva, C.K.Kumbharana,Amit D.Kothari "the study of neural network approach in fingerprint recognition" International journal of computer applications, Vol 40, No 11, feb 2012

[3] C. Komini, S. Asadi, K. Ellanti "Scale and Rotation Independent Fingerprint Recogntion" International journal of computer science and information technologies, Vol 2(4) 2011

[4] R.M.Mandi, S.S.Lokhande "Rotation-Invariant fingerprint identification system" international journal of electronics Communication and computer technology, Vol 2, issue 4, july 2012

[5] M.Mathuria,M.Cotia "Fingerprint classification based on orientation estimation " international journal of advanced research in computer science, issn no- 0976-5697, March 2013.

[6] R.Lakshaman,S.Selvaperumal,C.H.Mun "Intergrated fingerprint recognition using image morphology and naural network" International journal of advanced studies in computer science and engg., Vol 3 Issue 1,2014

[7] Jie Zhou, Jinwei Gu "A model based method for the computation of fingerprints orientation field" IEEE Transactions on image processing , Vol 13 No.6, june 2004.

[8] SR Patil, SR Suralkar "Neural Network based Fingerprint Classification". International Journal of Science and Research (IJSR), India Online ISSN: 2319-7064 Volume 2 Issue 1, January 2013.

[9] Hamsa A Abdullah "Fingerprint identification system using neural network" Nahrain University, college of engg. Journal, Vol 15, No. 2, 2012 pp 234-244

[10] N. Singla, S. Sharma"Biometric fingerprint identification using artificial neural network" international journal of advanced research in computer science & Technology, Vol 2, Issue 1 Jan-March 2014.

[11] C.I.Watson, P.J.Grother, D.P.Casaent "Distortion-tolerant filter for elastic-distorted fingerprint matching".

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