INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact factor: 6.078
(Volume 6, Issue 4)
Available online at: www.ijariit.com

Fingerprint matching algorithm using multipoint minutiae matching algorithm using SVM approach

Gurwinder Singh
sunnyguri9588@gmail.com
Adesh Institute of Engineering and Technology, Faridkot, Punjab

Puneet Jain
puneetjain988@gmail.com
Adesh Institute of Engineering and Technology, Faridkot, Punjab

ABSTRACT

Fingerprints are considered as an interesting distinguishing proof of an individual and because of simple access it"s the best and one of the quickest strategies utilized in biometric recognizable proof frameworks. They are exceptional, so secure and solid to utilize and doesn't change for one out of a lifetime. What's more, next to these things unique finger impression acknowledgment exceptionally utilizing particulars coordinating system is modest, dependable and precise up to an agreeable point of confinement. In the proposed system a fingerprint matching algorithm is developed by multi point minutiae matching with the help of SVM Algorithm. Performance of the proposed system is evaluated on various parameters and compared with existing system.

Keywords— Minutiae matching, security, SVM Approach, Fingerprint matching.

1. INTRODUCTION

Fingerprints are considered as a phenomenal recognizing verification of a man and as a result of basic get the best and one of the speediest systems used as a piece of biometric ID structures. They are exceptional, so secure and strong to use and does not change for one in a lifetime. Besides, to these things interesting finger impression affirmation uncommonly using particulars planning technique is poor, strong and correct up to a worthy cut-off focuses.

In this manner, exceptional check affirmation is all around for the most part used as a piece of both normal resident and logical applications. This can be complexity and other biometric gadgets can then one of a kind stamp affirmation device will hold the best bit of the pie and are most shown ones besides. Besides, it is speedier than other biometric devices and in addition, as it demands less attention.

2. FINGERPRINT RECOGNITION

The details organizing strategy for one of a kind stamp affirmation which can be disconnected into two sub-spaces: one can be named exceptional stamp check and other one can be named special finger impression ID figure 1. Moreover, by using a substitute methodology from manual approach for one of a kind stamp affirmation, it can be expressed that this strategy structure as "Modified Fingerprint Recognition System (MFRS), which is coded using MATLAB (cross section inquire about office).

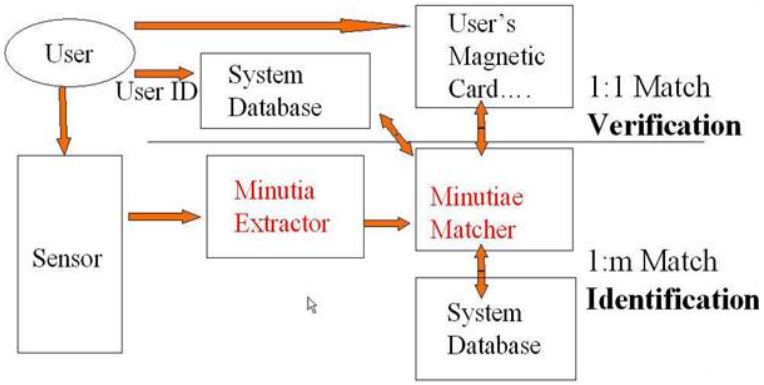

Fig 1: Verification and Identification

Finger impression confirmation is the last walk of special finger impression affirmation used to check the identity or say validness of one individual by his exceptional finger impression. In this instrument what to be done is that there ought to be a customer who will give his finger impression nearby his outstanding recognizing proof number. By and by, the structure will look for his finger impression using the outstanding recognizing confirmation number and if the extraordinary check facilitates then result will make sure by and large negative. On a very basic level, it relies upon diagram control of AFAS (Automatic Fingerprint Authentication System).

One of a kind check unmistakable evidence deals with deciding the identity of a man by his finger impression without learning of the character of the person. In this system, generally a gigantic database is secured and the finger impression taken by the customer is facilitated with the whole database fingerprints. Its usages can be found in criminal examination cases and it is arranged in the arrangement rule of AFAS (Automatic Fingerprint Authentication System).

By keeping similar conditions, finally all finger impression issues either affirmation or recognizing verification all start with a comparative technique of remarkable finger impression affirmation and rely upon a particularly described portrayal of a stamp. Concerning the affirmations to the degree the fingerprints are unique, it is conceivable to use 1 to 1 check or 1 to unmistakable confirmation case, both will start with a comparative technique with some immediate and basic steps.

3. LITERATURE SURVEY

S M Mohsen [2004] depicted another special measurement mark organizing the use of a certain data feature, and a acquired fingerprint picture is often regarded by reducing its size and having a specific fingerprint interface for a broad fingerprint knowledge base. The findings obtained have been compared, and several various approaches have also enhanced the recognition process in depth in terms of memory and time.

Koichi Ito [2006] suggested an efficient integrated mark identification equation incorporating the phase-based image coordination and the highlight-based coordination. The use of the Fourier stage data from individual marking images made possible to obtain a sincere acknowledgment of feebly shiny, low quality photographs with distinctive marks. Exploratory tests using two separate fingerprint image databases show the successful acceptance of the proposed calculations as well as the efficiency of the calculations based on the mill specifics and standard stage based calculations.

Minwei [2009] introduced a safeguarded character confirmation foundation dependent on unique recognizable evidence that could in some degree improve safety. The protocol to establish digital confirmation was provided due to the single mark, birth date, age, address etc. The comparison copy for the independent proof document was the ID card, the second character ID card for example. In each separate text, the biometric information has been hidden, not placed into the biometric database, which remarkably promotes the protection of AFIS (Automated Fingerprint Recognition System). The breakthrough to create the special, identifiable proof structure is discussed in this paper. The identifying details on the label also provides an additional time to check the individual ID document. The personality test based on the specific fingerprint is evidence of greater health.

Shahram Mohammadi [2009] implemented a new technique of extraction in which the separate highlights are autonomous of step and turn of the individual mark, and in the meantime, preparation can be carried out substantially more effectively and more accurately. Under this new approach, the highlights are translated into polar directions as a matter of primary significance for each particular symbol, the reference point and the reference path. The technique was more suitable for continuous implementations because of the fast and precise technique and the limited amount of highlights omitted and the efficiency of teamwork practices.

Ravi. J [2009] predicted a Minutia Score Matching (FRMSM) fingerprint recognition. The block filter was used to decrease fingerprint and analyze the picture on the limit in order to jelly the essence of the picture and concentrate the specifics of the decreased image. The bogus coordinating ratio was best found compared to the actual estimate.

Ms. S. Malathi [2010] implemented a new approach to use the unfinished original SIFT co-ordination strategy and co-ordinated it via an updated point planning process. The author has demonstrated using Neuro research database that the methodology suggested reveals a better view while organizing full print versus partial printing.

4. PROPOSED METHODOLOGY

A fingerprint recognition system constitutes of fingerprint acquiring device, minutia extractor and minutia matcher. The proposed system works in the following steps:

(a) Improvement of Fingerprint Image

The improvement of the fingerprint image is to explain the image for easy further operations. Sinces the unique images from sensors or different media are not guaranteed with flawless quality, these upgrade strategies are exceptionally valuable to keep the difference between edges and wrinkles and to interface the false breakage purposes of the edges due to a lack of ink measurement.

(b) Fourier transform

In this case, we divide the image into separate small processing blocks that are 32 by 32 pixels, followed by the Fourier transformation according to the formula:

$$F(u,v) = \sum_{x=0}^{M-1} \sum_{y=0}^{N-1} f(x,y) \times exp\left\{-j2\pi \times \left(\frac{ux}{M} + \frac{vy}{N}\right)\right\}$$

For u = 0, 1, 2, ..., 31 and v=0, 1, 2, ..., 31

In order to boost these limited computing blocks by their key frequencies, The FFT of the block multiplied a number of times by its size.

(c) Fingerprint Image Binarization

The Fingerprint Image Binarization will turn the Gray Finger Print Figure 8-bit into a 1-bit image with a 0-edge approximation and a 1-bit wrinkle figure. During the procedure the outlines of the individual fingerprint are highlighted by dark coloring when the wrinkles are light.

(d) Fingerprint Image Segmentation

All things considering, the exclusive area of interest (ROI) is important for a single picture of a label. The images collection lacking convincing edges and wrinkles is disposed of first as it includes only the essential material. The boundary of the staying viable zone is then outlined as the details in the bonded area are mistaken for these fake details which are created when the edges are out of the sensor.

(e) Fingerprint Ridge Thinning

Ridge Thinning removes redundant frame pixels until only one pixel wide is created using an iterative, parallel algorithm. The algorithm labels redundant pixels in each scan in the complete fingerprint picture (3x3). Then then, after many scans, eliminates all those labelled pixels.

(f) Minutiae Marking

Upon fingerprint dilution, it is fairly easy to mark precise marks. However, it is still no trivial task since at least one specific case evokes my caution during the minute marking stage. For a 3x3 frame, if the middle pixel is 1 and it has exactly 3 one-value neighbours, then the middle pixel is a branch of the surface. If the central pixel is 1 and the neighbor has only one value, the central pixel is a rim ending.

(g) False Minutia Removal

The fingerprint image can not be fully healed during the preprocessing period. Different types of false data are produced at this point because of inadequate ink or too much encryption. False splits caused by inadequate ink and the cross-relation between the ridges happens by over-inking. Some of the previous techniques also introduce a few falsified details. These kinds of incorrect data are not entirely gone. In order to keep the fingerprint recognition method accurate, all sorts of incorrect information must be omitted.

(h) Match stage

The two similar descriptions are generally not precisely the same because of the minor deformations and often incorrect quantization. The algorithm to suit the associated complex patterns will be elastic.

The minute matching elastic is carried out by holding a bounding box around each detailed design. If the matching details are in the rectangle box and the path difference among them is so tiny, the two details are known as pairs of matched minutes. Every detail in the sample picture has one corresponding detail or has no corresponding detail.

5. RESULTS AND DISCUSSION

The proposed system is implemented in MATLAB R202a for which a GUI is created. Fingerprints of 8 different persons with 8 thumb impressions of each have been taken up. Each thumb impression of an individual is matched with other thumb impressions of that individual. The accuracy is calculated at 0.20, 0.30 and 0.40 threshold values. The average %age accuracy for each individual is calculated at various threshold values and tabulated in table 1.

Table 1: %age accuracy of matching of fingerprints at varying threshold values

Person	Threshold =.20	Threshold=.30	Threshold=.40
Person1	75%	99%	89%
Person2	90%	99%	91%
Person3	88%	100%	87%
Person4	87%	100%	88%
Person5	85%	98%	91%
Person6	90%	99%	92%
Person7	86%	98%	90%
Person8	88%	98%	89%

The results of table 1 are represented graphically in figure 2. It has been observed that at threshold value 0 .30, proposed system gives better results than other two threshold values. When threshold value 0.20 The Maximum accuracy proposed by the system is 90% and minimum is 80% and threshold value 0.40 the maximum accuracy proposed by the system is 94% and minimum is 89%.

Below is the graphical representation of Table 1 in which Person 3 having the threshold value 0.30 has the 100% accuracy, Person 1 having the threshold value 0.20 has the 89% accuracy and Person 2 having the threshold value 0,40 has the 93% accuracy.

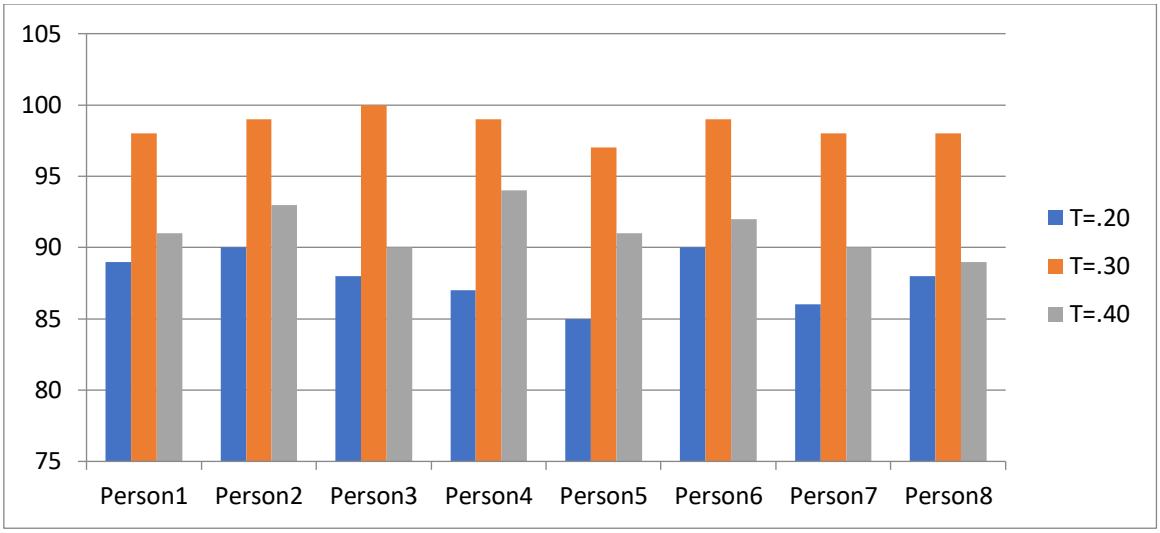

Fig. 2: Graph showing the Matching Rate for Original fingerprints.

It is the graphical representation of threshold values 0.20, 0.30, 0.40 having the different percentage accuracies in which threshold 0.30 has the maximum accuracy as compare to other threshold values 0.20 and 0.40.

FRR: The sample is paired with the remaining samples of the same digit to measure the artificial reject rate for an image database. The FRR or False Rejection rate is the likelihood that an authenticated user can not be reached by the device inappropriately because the biometric data is not aligned to a standard.

FAR (False Acceptance Rate): The first finger sample in the database is also matched with the first. The False Acceptation or FAR is a calculation of the likelihood that the biometric protection device acknowledges a non-authorized user's attempt to login inappropriately. Usually, a program FAR is defined as the relation between the number of false acceptances separated by the number of attempts to classify.

Table 2: FRR and FAR on Different Datasets with various threshold value

	Data set 1			Dataset 2		
	T=.20	T= .30	T=.40	T=.20	T=.30	T=.40
FRR	7%	0.004%	13%	6%	0.001%	16%
FAR	5%	0.0011%	12%	4%	0.0011%	13%

The table 2 represents FAR (False Acceptance Rate) and FRR (False Rejection Rate) on two datasets, on various threshold values which are 0.20, 0.30, .0 40. It is shown in table 2 that FRR and FAR is minimum is threshold is .30 and maximum is when threshold is .40.

6. CONCLUSION AND FUTURE SCOPE

For human identification, fingerprint is the most unique, durable and reliable feature. Minutiae-based fingerprints are also designed to solve correspondence problems and measurement of similarities. We used the fingerprint we extracted from the proposed model with the help of fingerprint acquisition devices. Three thinning algorithms are checked for minute extraction, and the morphological thinning process is finally provided with high efficiency and very good dilution accuracy. The proposed device has also been checked by applying noise to the fingerprint input images. The system's efficiency is calculated by three parameters: FRR(False Rejection Rate), FAR(False Acceptation Rate) and time. The system proposed is used for evaluating different 0.20, 0.30, 0.40 threshold values. This evaluates that there are better results at threshold value 0.30.

7. FUTURE SCOPE

In future, a large dataset can be tested for the proposed system. The objective of future research is to optimize the proposed algorithm for further decrease in FRR values and calculation times. To extract and match the details, the algorithm can be used quickly to improve the time results. By hybridizing other pattern recognition methods, the FRR ratio can also be increased.

8. REFERENCES

[1] Mohsen S. M., Farhan Z., Hashem M.M.A., "Automated fingerprint recognition: using minutiae matching technique for the large fingerprint database", ICECE, 2004, 28-30.
[2] Ito K., Morita A., Aoki T., Nakajima H.,"A Fingerprint Recognition Algorithm Combining Phase-Based Image Matching and Feature-Based Matching", ICB, 2006, LNCS 3832, 316–325.
[3] He M, Zhao H, "A Identity Authentication Based on Finger print Identification", Proceedings of the International Symposium on Web Information Systems and Applications, 2009, (22-24), 261-263.
[4] Mohammadi S., Frajzadeh A., "A Matching Algorithm of Minutiae for RealTime Fingerprint Identification System", International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering , 2009, 3(12), 251-258.
[5] Ravi J, Raja K. B., Venugopal. K. R, "Fingerprint Recognition using Minutia Score matching", International Journal of Engineering Science and Technology, 2009, 1(2), 35-42 .

[6] Malathi S., Meena C.,"Partial fingerprint matching based on SIFT Features", International Journal on Computer Science and Engineering, 2010, 2(4), 1411-1414.
[7] Thai L.H., Tam H.N.," Fingerprint recognition using standardized fingerprint model", IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 3, No 7, May 2010.
[8] Pathak P., "Image Compression Algorithms for Fingerprint System", International Journal of Computer Science Issues, 2010, 7(3), 25-32.
[9] Lavanya B N and Raja K B, "Performance Evaluation of Fingerprint Identification Based on DCT and DWT using Multiple Matching Techniques", International Journal of Computer Science Issues, 2011, 8 (6), 321-328.ma
[10] Madhuri , Mishra R, "Fingerprint Recognition using Robust Local Features", International Journal of Advanced Research in Computer Science and Software Engineering, 2012, 2(6), 124-131.
[11] Mudholkar S.S., Shende P.M., Sarode M.V., "Biometrics authentication technique for intrusion detection systems using fingerprint recognition", International Journal of Computer Science, Engineering and Information Technology, 2012, 2(1), 89-95.
[12] Kumar N, Verma P, "Fingerprint Image Enhancement and minutiae matching ", ISSN: 2231 – 6604 Volume 2, Issue 2, pp: 37-42 ©IJESET 2012,37-42
[13] Al-Ani M.S., "A Novel Thinning Algorithm for Fingerprint Recognition", International Journal of Engineering Sciences, 2013, 2(2), 43-48.
[14] Ashok D. K., Begum T.U.S, "A Comparative Study on Fingerprint Matching Algorithms for EVM", Journal of Computer Sciences and Applications, 2013, 1(4), 55-60.
[15] Garg M., Bansal H., "Fingerprint Recognition System using Minutiae Estimation", International Journal of Application or Innovation in Engineering & Management 2013, 2(5),ISSN 2319 – 4847.
[16] Liu F., Zhang D., Guo Z., "Distal-Inter phalangeal-Crease-Based User Authentication System", IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY 2013, 8(9) 213-219.
[17] L.K.Y., "Enhancing Fingerprint Recognition Using Minutiae-Based and Image-Based Matching Techniques", 2013 First International Conference on Artificial Intelligence, Modelling& Simulation.
[18] Mishra P., Shrivastava A.K., Saxena A., "Enhanced Thinning Based Finger Print Recognition", International Journal on Cybernetics & Informatics 2013, 2(2), 57-63.
[19] More S.,"An Idea for Smart Card Authentication Using Fingerprint Matching Algorithm", International Journal of Scientific and Research Publications, 2013, 3(3) , 123-130.
[20] Thanki R, Borisagar k,"Novel Approach for Fingerprint Recognition Using Sparse Representation", International Journal of Advanced Networking Applications (IJANA) ISSN No. : 0975-0290 2013,77-82
[21] Getzis I., "Authentication Using Minutiae Based FingerprintMatching Scheme for Smart Phones", International Journal of Computer Science and Information Technologies 2014, 5 (3), 2937-2939.

