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An Enhance Fingerprints Recognition System Using Haralick Features

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Abstract:

Biometrics is an recent effective technology used for personnel identification or verification there exists two major approaches of fingerprint (FP) recognition are image based and minutiae based. In the proposed work Haralick features for extracted and stored in MS excel.K-Nearest Neighbour Rule is used for template matching.The verification of a person using FP can be performed by matching the new acquired pattern with the already stored features. The minimum distance between the existing pattern and the new pattern can be found using NN rule. This paper may gives a better accuracy and save the execution time.

Index Terms:Nearest Neighbour Rule,Euclidean Distance,Haralick Features.

1. INTRODUCTION

A novel fingerprints recognition is done based on biometrics. Fingerprints are the biometrics features mostly used for identification. Fingerprint is the most widely used biometric features in identification tasks for the usability and the reliability of the systems[4].It also used many applications for example, ID cards, access control,forensic identification etc.In the new era, digital tools and usergenerated content websites,such as youtube, which gives an sharing, storage and massive distribution of multimedia providing professional solution for various kinds of the users.Also in recent years,portable devices which are used to interact with the physical objects like packaging, magazines, identity documents,banknotes etc[9].Also biometric technologies are playing an important role in various security

applications. Since biometric indicators cannot be easily stolenor shared compared with the traditional methods of the security.Fingerprints is one of the highest levels in reliability and extensively used by forensic experts in criminal investigations[6]. In recent years portable devices (smart phones, tablets) are also used to interact with physical objects. Fingerprints identification system is facing numerous requirements related to identification accuracy, complexity, privacy, security and memory storage[9]. To address this trade-off between these requirements the fingerprints recognition using Haralick features are used.

Most of the fingerprints were based on feature of minutiae and is actually defined by ridge ending and ridge bifurcation.Fingerprints were also used widely in personal authentication and also latent fingerprints matching has played a critical role in identifying suspects and criminals.Latent fingerprints is defined the fingerprints lifted from the wall or the surface of an objects which may inadvertently touched or handled by the person in a crime scenes[5]. Latent fingerprints which always has of poor quality of ridge structure contains the background noise and non-linear distortion.By these factors the latent identification accuracy is much lower than that of exemplar fingerprints.They were mainly characterised by the elements of minutiae and pores.The issueswhich affecting the quality of images ,also some problems in performance in matching process for large databases and also while identification the searching process become slow it may take much time.

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In this proposed work Haralick features are used for feature extraction and K-Nearest Neighbour Rule using Euclidean Distance used for template matching.By this process this may save time during execution and also gives the better accuracy.This algorithm which save much time when compared to other methods.To verify the choice of resolution and its relationship to accurate fingerprint recognition by combining state-of-artminutiae based method and the pore based method proposed for evaluating accuracy according to the equal error rate (EER).The experiments could be done by dividing all fingers into three groups according to the types of fingers(i.e., thumb,index finger and middle finger).If the fingerprints images has the low resolution there is difficult to identify the original one hence for that challenges (AFRS) Automated Fingerprint Recognition System can be used and can reliably be extracted from low resolution.It depends upon number of minutiae and pores and the ridge width on different kinds of fingers on different genders,as well as the test of comparative accuracy will help to find high resolution in fingerprint recognition.The processing time becomes unacceptably long when the size of the database reaches the order of tens or hundreds of thousands.The usual way to improve the performance in these cases are using a threshold to reduce the rate of penetration in the databases during the search process. K-NN algorithm also used tofind out the scalability problem and the accuracy loss.They are classified into two types, Local and Global. Global which use the information of the entire minutia at once.Local which find by the nearest neighbour and the fixed ratio.To speed-up the searching processing fingerprints identification problem.Fingerprint classification a difficult pattern recognition problem due to translation, rotation of fingerprints and noises in fingerprint images. To overcome the difficulty in small interclass variation and large intraclass variations in the fingerprint patterns Haralick features matching system has been used.Fingerprints identification system used for the protection and distribution monitoring. Haralick features technique is used to achieve the better trade-off between the performance based, security and thecomplexity.To provide secure system it is a reasonable alternative in those application that require content relatedmanagement tracking,tracingand monitoring. It also has the advantages of high Complexity of identification where fingerprints resemble an analogy with random codes, invasive character of embedding.There may two problems to speed up the searching process they are 1.fingerprint classification which consists of translation and rotation andnoises 2.Indexing which may given by age, race, geographic location.To estimate the translation, rotation and also problem in point pattern matching using algorithm of generalized K-Nearest Neighbour Rule.This rule is normally used for detecting lines in image processing.The Nearest Neighbour rule can be mainly generalized for point pattern matching.The advantage of the K-NN algorithm, the identification of the searching process which may reject many false fingerprints which has the same finger as the given fingerprint and can save lot of searching time.

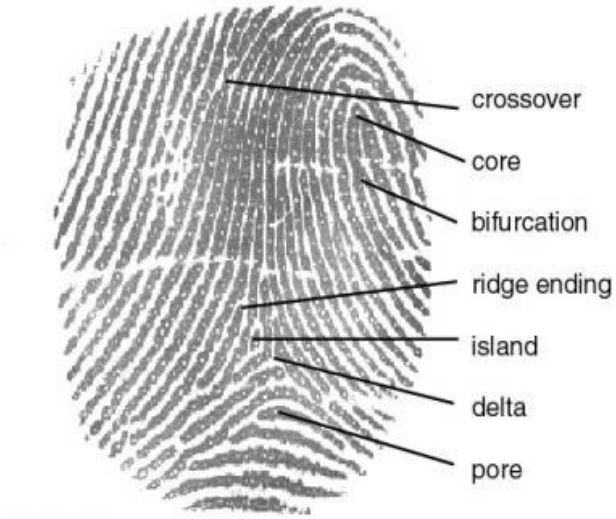

Figure 1

Fig.1 Fingerprints Patterns

Fingerprints are fully formed at about seven months of development and finger ridge configurations do not change throughout the life of an individual except due to accidents such as bruises and cuts on the fingertips (Babler, 1991). The challenges for fingerprints identificationare given byunrelated persons of the same race have very little generic similarity in their fingerprints.Parent and child have some similarity asthey share half the genes.Siblings also have more similarity.The maximum similarity is observedas monozygotic (identical) twins.

2. RELATED WORK

There may the availability of a variety of fingerprint acquisition devices and the advent of thousands of advanced fingerprint algorithms such algorithm use the fingerprints features that can also divided by three types they are 1.singular points and the global ridge patterns are the macro details of the fingerprints for example deltas and the many ofcores.2.galton features namely ridge endings and bifurcations.This type which is also used in automated finger print recognition system (AFRS) 3 dimensional attributes of ridge also has of sweat pores ,ridge contours and ridge edge features provides quantitative data which gives supports for more account and robust fingerprint recognition .

Resolution which is one of the main parameters that may affect the quality of digital fingerprints Image. Resolution of the fingerprints image which could be defined by three factors 1.Numberof pixels 2.Fingerprintsimages3.measured area of fingerprints.

The resolution can be evaluated in terms of minutiae and pores. Here we apply the state-of-art algorithms. Increasing the fingerprint image resolution can provides more fine details on fingerprint for fingerprints matching. It is worth mentioning that noise caused by the skin condition or the amount of pressure applied by the finger also plays an important role in recognition performance of AFRS (Automated fingerprints recognition system) due to the influence of quality of images of the fingerprints.

For the high resolution there should conduct of three ways 1.Analysis of the minimum resolution for pore extraction 2.The statistical number of minutiae and pores3.Analysis of the ridge width on the different kinds of fingers (thumb, index finger and the middle finger). By analysing these tests of the comparative accuracy which may gives the reference resolution of 800 dpi.

The proposed method for selecting a reference resolution for the high resolution in Automatic fingerprints recognition system (AFRS) based on the minutiae and the pores. Some researchers also been done to speed up the searching for fingerprints identification problems. These attempts has of two techniques (i.e.) fingerprint classification and indexing. Fingerprints classification is difficult pattern recognition problem due to translations or rotations and also the noises in the fingerprints images. Also there is a problem in fingerprint classification system which could be very difficult in the large intra class variation and the small interclass variation. Then the Indexing techniqueis based on fingerprint classification or the demographic. Demographic is given by age, race and geographic location.

3. PREPROCESSING

The pre-processing of fingerprint the scanned images uses this Binarization to convert the gray scale image into binary image by fixing the threshold range. The pixel ranges from above and below the threshold are set to zero and one.

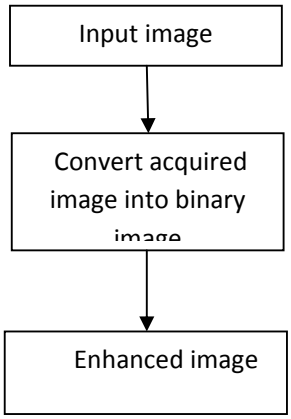

Fig.2 Fingerprints Image Processing

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After this process we can get the result as bright and dark images, for easy way of removing the noise and unwanted from the input data. Then we can proceeds the next because the Binarized image is very clear.The binarized image is then enhanced and to reduce the thickness of all ridge lines to a single pixel width to extract minutiae points effectively. By this process we can get better and accurate enhanced fingerprint image.

Enhancing the image does not change the location and orientation of minutiae points compared to original fingerprint which ensures accurate estimation of minutiae points. Here all noise is eliminated and now the image is ready. Enhanced image process preserves beyond the pixels by placing white pixels at the boundary of the minutia image, as a result of first some rows and last some rows, first some and last some columns are allocate a value as one.

4.FEATURE EXTRACTION

4.1 Haralick Feature Extraction:

We first describe the work on the computation of the Haralicktexture features The Haralick Texture Features has of14 features. In our implementation we optimize the first 13 Haralick Texture Features and do not compute Feature number 14 (Maximum Correlation Coefficient).

$$f_1 = \sum_{i=1}^{Ng}\sum_{j=1}^{Ng} P(i,j)^2 \quad [1]$$

$$f_2 = \sum_{k=0}^{Ng-1} k^2 \left(\sum_{i=1}^{Ng}\sum_{j=1}^{Ng} P(i,j) \right)_{(i-j)=k} \quad [2]$$

$$f_3 = \frac{1}{\delta^2} \sum_{i=1}^{Ng}\sum_{j=1}^{Ng} (i,j)P_{(i,j)} - \mu^2 \quad [3]$$

$$f_4 = \sum_{i=1}^{Ng}\sum_{j=1}^{Ng} (1-\mu)^2 P(i,j) \quad [4]$$

$$f_5 = \sum_{i=1}^{Ng}\sum_{j=1}^{Ng} \frac{P_{(i,j)}}{1+(i-j)^2} \quad [5]$$

$$f_6 = \sum_{k=0}^{2Ng-2} K\, P_{x+y}(k) \quad [6]$$

$$f_7 = \sum_{k=0}^{2Ng-2} (k-f_6)^2 P_{x+y}(k) \quad [7]$$

$$f_8 = \sum_{k=0}^{2Ng-2} P_{x+y}(k) \log[P_{x+y}(k)] \quad [8]$$

$$f_9 = \sum_{i=1}^{Ng}\sum_{j=1}^{Ng} P_{(i,j)} \log[P_{(i,j)}] \quad [9]$$

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Ng-1 Ng-1

$$f_{10=}\sum\left[P_{[x-y]}(k)\left(k-\sum lP_{[x-y]}(k^2)\right)\right] \quad [10]$$

k=.0i=.0

Ng-1

$$f_{11=}\sum P[x-y](k)\log[P_{[x-y]}(k)] \quad [11]$$

k=0

$f_{9=}HXY1$

$$F_{12=}\frac{\qquad}{H}. \quad [12]$$

$$F_{13=}1\text{-}\exp[-2|HXY2\text{-}f_9|] \quad [13]$$

Ng Ngk=i+j

$$F_{14=}P_{x+y}(k)=\sum\sum P_{(i,j)} \quad 2Ng\text{-}2 \quad [14]$$

I=1 j=1 K=2,3

Most of the features (1-13) have a visual meaning.The feature list is suited for the common case, symmetric, asymmetric and co-variance matrices. Our matrices are always symmetric, so we could simplify some equations based on common results for row wise and column wise computations.Features from (1-13) are angular moment, contrast, variance, inverse difference, sum difference, sum of variance, sum of entropy, entropy, difference of variance, difference entropy and Information measurement II are unchanged as the rest of the definitions. Most of the features (1)-(4), (6)-(8) and (10)-(13) depend on other features and intermediate results. To avoid costly computations, we calculate these results only once.The complex dependency of the computation sequence is shown. It contains preferred sequence of intermediate results and feature computation.

From the below diagram the processing of the fingerprints identification system could be given .In the image pre-processing image could be binarized and enhanced to get a clear image. In feature extraction here we are using Haralick Feature Extraction. Then the matching process has been done with the storage template of the fingerprints database images.

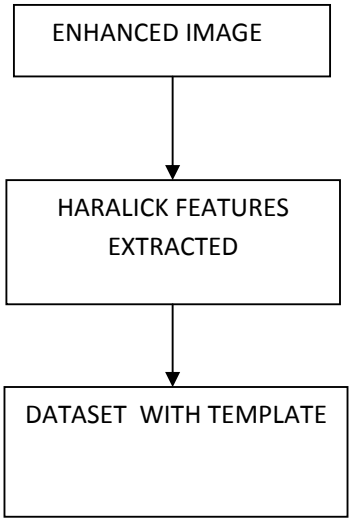

Fig.3 Feature Extraction Phase

5. CLASSIFIER

In the classifier part we had used the 1.K-Nearest Neighbour Rule using Euclidean distance for better accuracy and also save the time during the execution. Euclidean distance which is bydefault in K-NN classifier 2. K-NN Algorithm is given.

5.1K-Nearest Neighbour Rule:

KNN classifier is best suited for classifying persons based on their images due to its lesser execution time and better accuracy. KNN classifier has a faster execution time.

The simplest classification scheme is a nearest neighbour classification in the image space. Under this scheme an image in the test set is recognized by assigning to the label of the closest point in the learning set, where distance are measured in image space.

The Euclidean distance metric is used to determine the closeness between the data points in K-NN. A distance is assigned between all the pixels in a dataset. Distance is defined by the Euclidean distance between two pixels. The Euclidean distance is given by:

$$d(x,y)=\sqrt{(x_1-y_1)^2(x_n-y_n)}$$

This Euclidean distance is by default in a KNN classifier. But the distance between two features can be measured based on one of the distance cosine and correlation.

5.2 K-NN Algorithm:

The k-nearest neighbour algorithm (k-NN) is a method for classifying objects based on training examples in the feature space.The k-nearest neighbour algorithm is amongst the simplest of all machine learning algorithms, an object can classified by majority types of its neighbours, and the object has been assigned to the class most common of its k nearest neighbours (k is a positive integer, typically small). If k = 1 then the object is assigned to the class of its nearest neighbour.

1. Each data pixel value within the data set has a class label in the set, Class = {c1, ...cn}.

2. The data points', k-closest neighbours (k being the number of neighbours) are then found by analyzing the distance matrix.

3. The k-closest data points are then analyzed to determine which class label is the most common among the set.

4. the most common class label is then assigned to the data point being analyzed.

In the Figure .4the new fp image can be given as an input image. The image is then extracted using Haralick features then minimum distance could be found in the dataset then finally the matched image can be displayed.

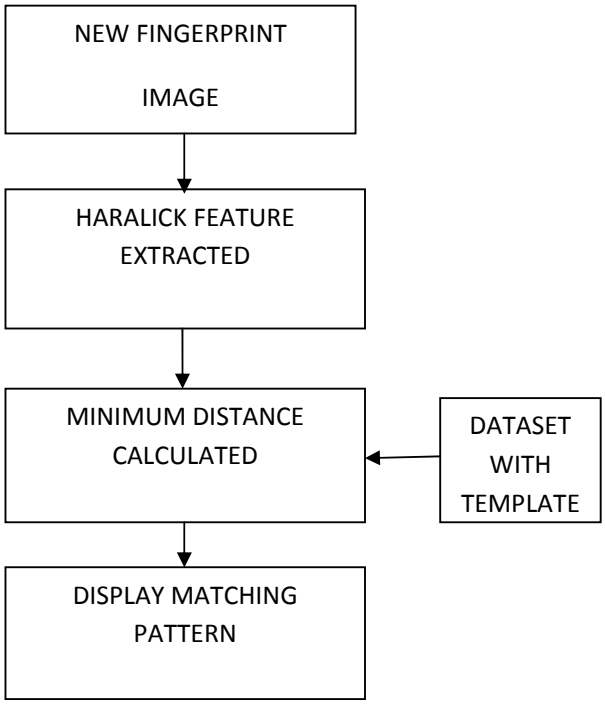

Fig .4 Fingerprints recognition system

6.EXPERIMENTAL RESULTS

These approaches then tested on different databases fingerprint of different persons feature extraction tool fingerprint with Haralick Features. The fingerprint images are taken from databases.It consists of the two different phases for the fingerprints recognition,

1.Two images per person are used for enhance the fingerprint verification system, for each individual. For these images we have to set their file format in jpg and the size of the fingerprint images should be same. The total number of images is extracted using Haralick features and stored in MS excel. 2.K-Nearest Neighbour Rule is used for template matching. The verification of a person

using fp can be performed by matching the new acquired pattern with the already stored features. The minimum distance between the existing pattern and the new pattern can be found byKNN rule. .

In the experiment fingerprint images given or calculated by the Haralick feature as a feature extractor and check the accuracy with KNN distance metrics like cosine and correlation. For all these experiments True Positives and False Negatives are calculated. From the presented results it is evident that the introduction of fusion for fingerprint images increases the Accuracy at the feature extraction level. Accuracy for fingerprints is calculated as:

Accuracy $=\frac{TP+TN}{P+N}$ where TP is stands for true positive and TN stands for true negative P and N are the total of columns P and N are calculated as:

P=TP+FN and N=FP+TN.

7. CONCLUSION

We have presented a fingerprint method by using Haralick Features as the feature extraction and also used the classifier as the K-Nearest Neighbour Rule used for template matching which gives a better accuracy and also saves the execution time. Hence, in this paper we had provided the matching process would find out the similar images by comparing with the input image. The feature we had used which may reduces the error because the classifier K-NN gives the best accuracy avoids noise and unwanted backgrounds and reduce the searching time.

References:

[1]Crystal Bertoncini, Kevin Rudd, Bryan Nousian, Member, IEEE, and Mark Hinders

[2]D. Zhang, fellow, IEEE, Feng.L, Qijun Zhao, Student Member, IEEE, Guangming Lu, and Nan Luo.

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