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Soft computing analysis of human behavior by finger prints images

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Abstract
In the present paper we try to introduce some new fuzzy based simulated by analyzing the finger prints images of various age group, through the images of fingerprints we can get the production of human behavior. The Fuzzy logic plays very important role and used as a tool for prediction of some uncertain information and disease too. Throughout this paper we propose the utilization of extended fuzzy rule for more flexible description of knowledge and consideration of uncertainty and lack of confidence in processing the image of finger prints.

Keywords: fuzzy sets, bidirectional memory, fuzzy membership function, eigen values, eigen metrics principal component analysis etc.

Introduction
Human fingerprints have been discovered on a large number of archaeological artifacts and historical items, Although these findings provide evidence to show that ancient people were aware of the individuality of fingerprints, such awareness does not appear to have any scientific basis It was not until the late sixteenth century that the modern scientific fingerprint technique was first initiated. In this paper we discuss the study on the ridge, furrow, and pore structure Since then, a number of fingerprint ridge characteristics were identified and characterized Starting in 1809, Thomas Bewick began to use his fingerprint as his trademark which is believed to be one of the most important milestones in the scientific study of fingerprint recognition Purkinje, in 1823, proposed the first fingerprint classification scheme, which classified fingerprints into nine categories. This paper contains the knowledge accumulated from the study and practice of palmistry from the past decade. It is not complete, but there is a system to it and a basis of moving from logic to intuition and from intuition to logic. The key to the information in the fingerprint is the knowledge and his skill at interpreting the lines and shape of the fingerprint the lines of the fingerprint are not stagnant or fixed. They are constantly changing and reforming. The mounts become bigger and smaller depending on the momentary energy levels. If the nerves leading to the fingerprint are cut, the lines disappear. The lines are not present just because that is the way the hand folds; rather, the lines of the fingerprint are alive and vibrant in their own right. They can best be described as a bio-computer readout of energy patterns. The headline represents the mental body, the heart line the emotional body, and the lifeline the general vitality and movement of overall energy. My approach to palmistry is to examine the mental, emotional, psychological and spiritual make-up of subjects as indicated by the lines and shape of their fingerprints. This approach helps them to understand tendencies and habits; to see blocks, shortcomings, talents and advantages; and to see where they are in terms of enlightenment. I look for tendencies and patterns, how they react in certain situations. All this helps them to understand their nature and is thus very valuable. Biometric authentication has been receiving extensive attenuation over the past decades with the increasing demand in automated personal identification. Biometric is to identify the individual using physiogalcal or behavioral charters tic such as finger print, face recogonatation is the most popular method and successfully used in many application.

Fingertips
The fingertips usually will be either square, rounded or pointed or even a mixture of these. Square tips signify a practical, realistic, rather down to-earth person who likes method and order, especially if born in the Star Sign of Capricorn, Taurus or Virgo. Pointed tips are fairly rare because they are the hallmark of a person not interested in the material, practical side of life, preferring to live in a world of fantasy, imagination idealism and dreams. They usually possess poetic, musical or artistic abilities but, as they lack drive and practical application, they seldom do much about using them Rounded tips give a nice balance between the square-tipped realist and the pointed-tipped dreamer. These belong to the average person who appreciates the finer things of life but who also recognizes the need to attend to the practical necessities of day-today living.

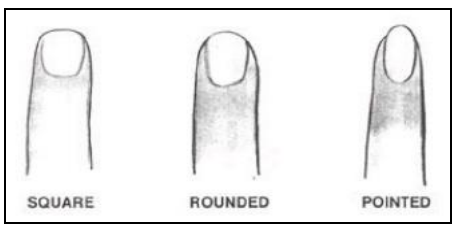

Fig 1

Lifestyle information

The Grille

The grille is a point at which the energies of the hand dissipate. If grilles enmesh the entirety of the hand, the power of its bearer is constantly drained by vexations and imagined slights. If a grille appears on the mount, it saps or thwarts the qualities of the mount, e.g. such a mar on the Mount of Apollo will forever dash the attainment of any true success in life.

The Cross

Crosses denote troubles, disappointment, danger, and when Found on lines, the harm to the bearer may be.

The Star

The star is a symbol of great and sudden brilliance in a person's life. This brilliance is often arbitrary and unexpected, and is always an event that the individual can exercise little control over. A star on the mounts will naturally denote great proficiency with the mount's corresponding traits, yet these traits may consume some of the other bearer's qualities.

The Island

The Island is always a negative sign, save for some systems in determining an individual's fecundity. It is often a sign of some hereditary evil, such as a heart condition or intemperance with spirits, but it may just as easily represent non-congenital emotional stress or a dire pecuniary situation.

The Square

The square is almost always a beneficent symbol. It denotes an especial significance when covering an area that is experiencing turmoil, such as chained, broken, or dotted lines.

The Circle

The circle is a very rare marking in chiromancy, and little is said about it. example the fingerprints of tobacco smokers contain traces of continue, a nicotine metabolite; they also contain traces of nicotine itself; however that may be ambiguous as its presence may be caused by mere contact of the finger with a tobacco product, a fingerprint of a smoker becomes fluorescent nonsmoker's fingerprint stays dark. The same approach is investigated to be used for identifying heavy coffee Drinkers, cannabis smokers, and users of various other drugs.

Types of Fingerprints

Henry‘s describes the four types of pattern groupings (arch, loop, whorl, composite) and their interpretations are as follows:

1. Arch: In arches, the ridges of the finger run continuous from one side of the finger to the other with no recurring. There are two sub-groups that further define the arch pattern.

2. Plain Arch: This pattern has a consistency of flow to it. It starts on one side of the finger, and then the ridge cascades upward slightly, almost resembling a wave out on the ocean. The plain arch then continues its journey along the finger to the other side. The plain arch is the simplest of the fingerprint patterns to discern.

Tented Arch: This pattern is similar to the plain arch in that it starts on one side of the finger and flows out in a similar pattern to the other side. However, the difference in the tented arch lies in the ridges in the center, which are not continuous as in the case of the plain arch. The ridges, which adjoin each other in the center, converge and thrust upward, giving the impression of a pitched tent.

3. Loop: In loops, the ridges make a backward turn but do not twist. This backward turn, or loop, is differentiated by how the loop flows on the hand and not how it flows on the card on which the imprint is taken. The imprint on the fingerprint card is similar to the reverse image we see when we look in the mirror at ourselves. There are two sub-groups that Henry identified in this category:

Radial Loop: These are loops that flow toward the radius bone of the Hand or, in other words, when the downward slope of the Loop is from the direction of the little finger toward the Thumb of the hand.

Ulnar Loop: These are loops that flow toward the ulna bone of the hand or in other words, when the downward slope of the loop is from the direction of the thumb toward the little finger of the hand.

4. Whorls: In whorls, there are patterns in which there are two or more deltas (first ridge nearest the divergence point of two type lines) and there exists a re-curve preceding each delta. There are four sub-groups of whorls:

Plain Whorl: In these whorls, the ridges make a turn of one complete circuit and, therefore, are circular or spiral in shape. The plain whorl is the simplest form of whorl and the most common. There are at least two deltas and a ridge whose circuit may be spiral, oval or circular in shape.

Central Pocket: In these whorls, one or more of the simple reserves of the plain whorl reserves a second time.

Double Loop: In these whorls, there are two separate loop formations. In each of these formations, there are two entirely separate and distinct sets of shoulders and deltas.

Accidental: Whorl in these whorls, the composition of the pattern is derived from two distinct types of patterns with at least two deltas. Whorls which contain ridges matching the characteristics of a particular whorl sub grouping are classified as accidental whorls.

5. Composites In composites, there are patterns found in fingerprints which are combinations of arch, loop and whorl. Henry subdivided the composites into four subgroups.

Central Pocket Loop: These loops re-curve a second time forming a pocket within the loop.

Twinned Loop: Also referred to as the Double Loop, these loops consist of two separate loop formations.

Lateral Pockets Loop: These loops are similar to the Twinned Loop except that their ridges bend sharply down on one side before recurring, actually forming a pocket. The F.B.I. finds it too difficult to locate these two loops, and classifies both kinds as Double Loops.

Accidental Loops: These loops are a combination of any two types of pattern with the exception on the plain arch that basically has no Pattern.

Fingerprint Representation and Feature Extraction:

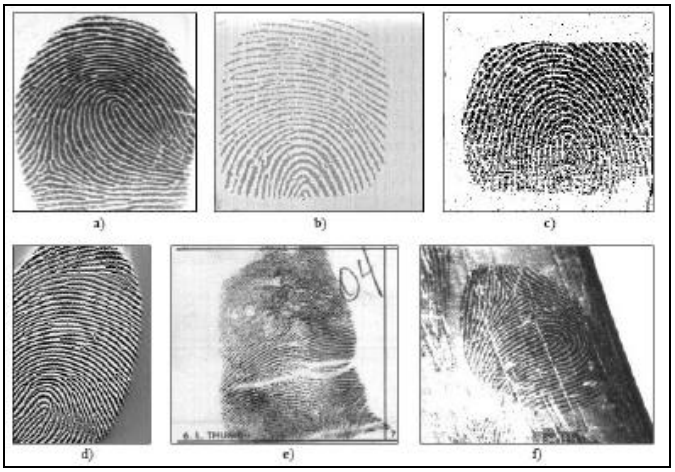

Fig 2

The representation issue constitutes the essence of fingerprint recognition system design and has far-reaching implications for the design of the rest of the system. The pixel intensity values in the fingerprint image are typically not invariant over the time of capture and there are anteed to determine salient features of the input fingerprint image that can discriminate between identities as well as remain invariant for a given individual. Thus the problem of representations to determine a measurement (feature) space in which the fingerprint images belonging to the same finger form a compact cluster and those belonging to different fingers occupy different portions of the space (low intra-class variation and high inter-class variations good fingerprint representation should have the following two properties, saliency and suitability. Saliency: Saliency means that a representation should contain distinctive information about the fingerprint.

Suitability

Suitability means that the representation can be easily extracted, stored in a compact fashion, and be useful for matching. Saliency and suitability properties are not generally correlated. A salient representation is not necessarily a suitable representation. In some biometrics applications, storage space is at a premium among the recognition systems using optical matching and correlation based matching. However, the utility of the systems using such representation schemes may be limited due to factors such as brightness variations, image quality variations, scars, and large global distortions present in the fingerprint image. An image-based representation preserves the maximum amount of information, finger devoid of any ridge structure. The fingerprint pattern, when analyzed at different scales, exhibits different types of features. At the global level, the ridge line flow delineates a pattern similar to one of those shown in. Singular points, called loop and delta (denoted as squares and triangles, respectively in are a sort of control points around which the ridge lines are "wrapped" Singular points and coarse ridgeline shape are very important for fingerprint classification and indexing but their distinctiveness is not sufficient for accurate matching. External fingerprint shape, orientation image, and frequency image also belong to the set of features that can be detected at the global level.

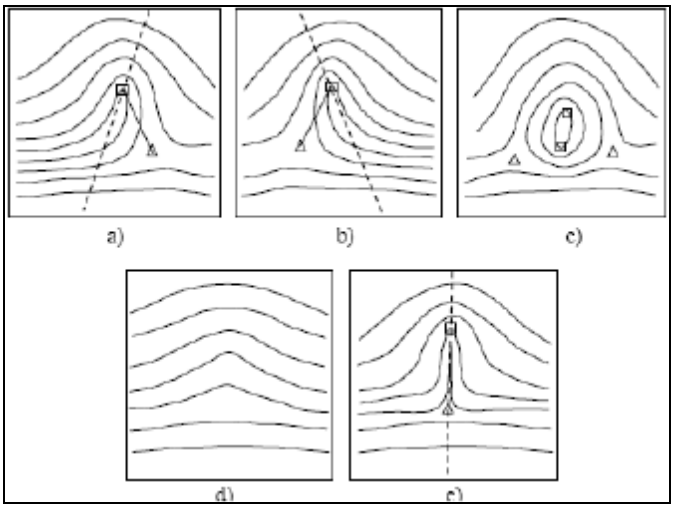

Fig 3

Subtitles

Figure- Fingerprint patterns as they appear at a coarse level: a) left loop; b) right loop; c) whorl; d) arch; and e)

Tented arch

Squares denote loop-type singular points, and triangles delta type singular points. These local ridge characteristics are not evenly distributed. Most of them depend heavily on the impression conditions and quality of fingerprints and are rarely observed in fingerprints. The two most prominent ridge characteristics. A ridge ending is defined as the ridge point where a ridge ends abruptly. A ridge bifurcation is defined as the ridge point where a ridge forks or diverges into branch ridges. Minutiae in fingerprints are generally stable and robust to fingerprint impression conditions. A ridge ending is defined as the ridge point where a ridge ends abruptly. A ridge division is defined as the ridge point where a ridge forks or diverges into branch ridges. Initiate in fingerprints are generally stable and robust to fingerprint impression conditions. Although a minutiae-based representation is charkas.

Fuzzy logic

Relationship from the standard data base through fuzzy membership function, and identify the actual diseases through fuzzy membership which is represented by the binary value (1) and if the symptoms is not retaliated with the standard

schema that shows false membership (0). The accuracy of this expert system depends on the accuracy of the data presented to it. However, measurement errors, organizational problems (misleading samples, sending them to the wrong laboratory, etc), or improper images of persons prior to examinations lead to imprecise and sometimes even totally incorrect data and Expert make mistakes, overlook important indications, or fail to carry out a complete analysis.

Definition and design of Fuzzy Relational Maps (FRMs)
In FCMs with the help of correlations between causal associations among concurrently active units. But in FRMs we divide the very causal associations into two disjoint units.

Definition 1: Let X be some set of objects, with elements noted as x. X = {x}.

Definition 2: A fuzzy set A in X is characterized by a membership function μA(x) which maps each point in X onto the real interval [0, 1]. As μA(x) =1, the "grade of membership" or true membership function of x in An increases.

Definition 3: A is EMPTY or Null iff for all x, μA(x) = 0.ie. False membership.

Definition 4: Index files and data dictionaries, store administrative information known ads meta data.

Fuzzy techniques for Fingerprint images data analysis
The knowledge acquisition system is capable of acquiring information on medical entities and relationship between the relationships is stored in terms of numerical values in the range 0 and the knowledge acquisition system is capable of acquiring information on image entities and relationship between the relationships is stored in terms of numerical values in the range 0 and 1.

Fuzzification of the fingerprint
Image analysis
A binary relationship is established for the symptoms of the Subject and takes the values between 0 and 1. These values Indicate the degree. In fuzzy set theory these binary is expressed in terms of membership function also takes values between 0 and 1.Fuzzy values is ranging from 0 and 1 represent the membership function of any image while the values 1 and 0 represent the confirmation of the image.

Fuzzy Modeling and Identification
Fuzzy logic models can be developed from expert knowledge or from process input-output data. In the first case, fuzzy models can be extracted from the expert knowledge of the process. The expert knowledge can be expressed in terms of linguistics, which is sometimes faulty and requires the model to be tuned. Therefore, identifying the processes a more attractive way using the help of expert knowledge. This process requires defining the model input variables and the determination of the fuzzy model type. There are two ways to develop a fuzzy model, the first beings based on defining the initial parameters of the model (membership functions) and selecting the rules construction method Neuro fuzzy algorithms are often used for the tuning of parameters). The second method is used if there is no knowledge about the process, when the rules and membership functions can be extracted directly from the data by clustering the input / output space

Error back propagation
Through the above output that is the fuzzified values taken by the various input images of fingerprints Identification Correlated :It is a complex partly uninvestigated process in which the knowledgebase expert system is obviously able to work with uncertain and imprecise set of possibilities so for that IF-THAN rule is followed

Fingerprint matching algorithm
Biometric authentication has been receiving extension attention over the past decades with increasing demands in automated personal identification. Biometric is to identify individual by using physiogacal or behavioral characteristics such as a fingerprints, face iris, retina, palm print, etc., Among all the Biometric techniques fingerprint technique, fingerprint recognition is the most popular method and its successful used in many applications. Fingerprints matching is usually performed at two different levels which is described as (1)Coarse level matching a fingerprint can be classified in to six main classes; fine level matching of two fingerprints is performed by extracting various features from the fingerprints images. Coarse level classification is adopted to reduce the search spaces and the complexity and it does not uniquely identify the fingerprints but it is helpful in determination when two fingerprints do not match. Example: The right loop image is only by the right loop images in the data bases of images. Fingerprints classifications techniques detect the singular points, core and delta point from the fingerprint image. Various approaches has been proposed for singular points detections such as uses of directional histogram in the neighborhood, the topological approaches on simulated fingerprints images and Fourier transform methods is used to reaches on the core points, fingerprints classification provides an important indexing mechanism in a fingerprint database. The automated classification and matching of the fingerprint images is a challenging problem in pattern recognition over the past decades. This paper we describes fingerprint classification algorithm. We tried to present the fingerprints images and directional images which are based on the pattern of the images.

Finger print recognitions algorithms
There is many algorithms is developed for fingerprint Recognitions system among them one of the most common is Principal Component Analysis (PCA).

Principal Component Analysis (PCA)
It is a technique used for reduce multidimensional data set to low dimensional data for analysis. It is used as a tool for analysis for mankind's predictive models. PCA involves the calculations of the Eigen values decompositions or singular values decompositions of a data set usually after main centering the data for each attribute. The result of a PCA are

usually discussed in terms of control loading. PCA is an orthogonal linear transformation which transform the data in to the coordinate systems such that the greatest variance by any projection of the data comes to lie on the first coordinate, PCA is also consider as a opium transform for a given data in terms of least square can be consider as a dimensional reduction in the data set by retaining those characteristic's of the data set which contribute most to the variance by keeping the lower order component and ignoring the higher order one such the lower order components as the most important aspect of the data Eigen fingers as a well-known principal component analysis based on fingerprint recognitions algorithm is developed by the researchers.

Fuzzy methodologies

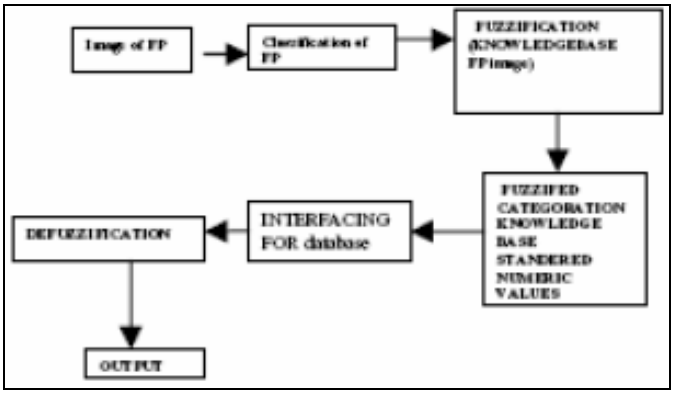

Fig 4

The training images are represents as a set of flattened vectors and assembled together in to single matrix, and stored in to the data base. The training images is projected in to the feature space known as finger space which is defined as a metric of Eigen vectors. Which take the variations between the images of the fingerprints? Projected and training images is also saved in to the database to identify the best fit with the help of database. The original algorithms is trained with the m images of the fingerprints of various persons usually consider the m=10, Suppose the total no of person is 100, The total no of images is defined as N= (m *.n) so the data set is very large which take much time for analysis and the results are also not accurate.

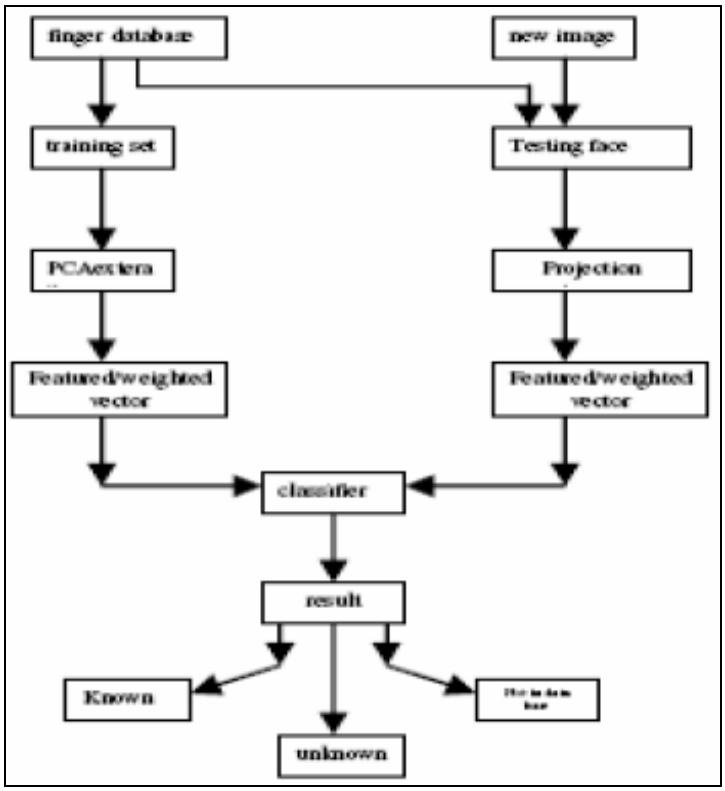

Fig 5

Modified Algorithms

Let assume the total no of fingerprint images in the training set is reduce in to N=(n *x) to N=(1* n.).The modified algorithms works as faster than previous one for the value m= 10, without compromising the accuracy of the algorithm which recognized the images of the fingerprints. Train (Image set N, M) Image set is a train images of each individual or person where each image is defined in W.H pixels. M is considered as a Eigen vectors which is required to generated in the following manner 1 Let S={S1,S2,S3,…..Sn } be the set of of images of individual fingerprint image. Find the mean image set defined as MS = {mS1, mS2, … … mSn} for using the nN =n mean image of fingerprint for finding the Eigen vectors.

2 Flatten each of those N images in to the W.H element vector which is defined in the matrix in a rows so the matrix contained N. W.H contains the Flattened images of the fingerprints.

3 Find the sum of all rows of the matrix and divide by N which defines the mean of Flattened images it is some times called as

WH element vector as ξ.

4 Subtract the average image ξ from the Flattened image in S than get the new matrix defined by δ =N X (WH)

5 Then Find the covariance matrix L be square matrix of order N ie. $L = \delta X \delta^T$ where δ^T be the transpose of δ^T

6 Than compute the N Eigen values and corresponding Eigen vectors of L, Let M represent the highest Eigen value vector and each contain N Eigen values, form Eigen vectors matrix.

7 Do a matrix multiplication of each selected M Eigen vectors against each row in δ and save in to the 1 X WH sized matrix as combined as M X WH element weight matrix in the data base. Save the train image ξ and Eigen Matrix also database. 8 Identify the Images of Fingerprint image: All images can be arrange in to the (W X H) pixel size than test for new image of fingerprint follow the following steps Load the saved Weight matrix, Eigen Matrix and the average Train images ξ from the database. Subtract the train image ξ from the image defined as D i.e. D = (Image – ξ.) Find the Dot Product of D against each Eigen Vectors in Eigen Matrix and find the Euclidean Distance between each of these values and the corresponding weighted vectors. If the minimum values of Euclidean distances (i) Less than the threshold value TL, than image is known than the name and identity is displayed with the image. Between the threshold value TL and TH than the image is unknown. Grater than threshold value TH i.e., The image is not in database.

Fingerprint Matching

Fingerprint matching is usually performed at two levels (1)coarse level matching and a fingerprint can be classified in to six main class.(2)Fine level matching A fingerprint is impression of the friction ridges of all or any part of the finger. A friction ridge is a raised portion of the epidermis on the palmer (palm) or digits (fingers and toes) or plantar (sole) skin, consisting of one or more connected ridge units of friction ridge skin. These ridges are sometimes known as "dermal ridges". Fingerprints may be deposited in natural secretions from the eccrine glands present in friction ridge skin secretions consisting primarily of water) or they may be made by ink or other contaminants transferred from the peaks of friction skin ridges to a relatively smooth surface such as a fingerprint card. The term fingerprint normally refers to impressions transferred from the pad on the last joint of fingers and thumbs, though fingerprint cards also typically record portions of lower joint areas of the fingers (which are also used to make identifications) Fingerprints as used for Identification

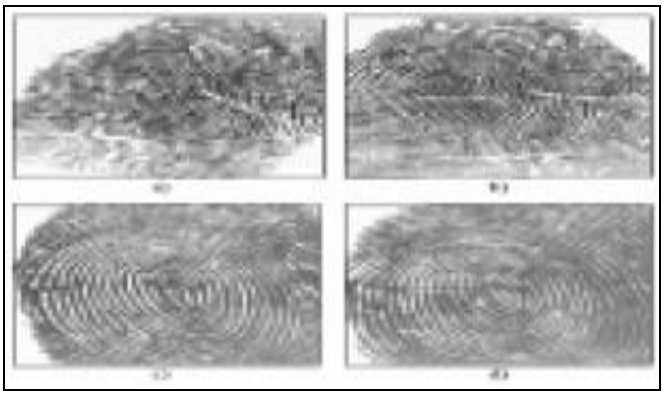

Fig 6

Figure Difficulty in fingerprint matching. Fingerprint images in a) and b) look different to an untrained eye but they are impressions of the same finger. Fingerprint images in c) and d) look similar to an untrained eye but they are from different fingers. Quantitative factor, which specifies that at least a certain number correlation-based matching: two fingerprint images are superimposed and the correlation(at the intensity level) between corresponding pixels is computed for different alignments (e.g., various displacements and rotations Minutiae matching essentially consists of finding the alignment between the template and the input minutiae sets that results in the maximum number of minutiae pairings; ridge feature-based matching: minutiae extraction is difficult in very low-quality fingerprint images, whereas other features of the fingerprint ridge pattern may be extracted more reliably than minutiae, even though their distinctiveness is generally lower.

Conclusion

Finger print images database equally distributed in to various lass (arch's, tented arches, left loop, right loop and whorl loop. The Finger print images different in size with eight bit per pixel so the resizing was applied to input fingerprint image. Finger print Recognition system is one of the best approaches for identification of person and can be used to increase the security of many real world applications. Finger print images analysis and classification systems based fuzzy rules for the representation of the knowledge utilized by the expert system. Fuzzy rules and fuzzy expert systems were used for problems solving where the input is provided in a constant and accurate manner by a set of sensors. Finger print images analysis where fuzzy inputs are the output of the imperfect process of feature extraction via image processing, conventional fuzzy rules and conventional rule evaluation methodologies are often inadequate and lead to extremely poor performance. This is a reasonable feature of a system that aims to incorporate uncertainty and lack of confidence in its operation;

probabilistic systems cannot provide meaningful or even reliable output in the case where insufficient input information is available. Experimental application of extended fuzzy rules, consideration of confidence in the process of Finger print images extraction and flexible rule evaluation provide for more robust operation in an uncertain environment. Thus, the resulting system outperforms its conventional predecessor in cases where the image processing component fails or the observed Finger print images analysis does not strictly comply to the specified rules by missing some optional.

Future Scope

Trying to introduce a new type of technology for security purpose.

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