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Virtual Studies of Twins by Diverse Computational Techniques

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***Abstract*—** Biometric matching system is an automatic pattern recognition system that recognize a person determining the authenticity of a specific physiological and behavioral characters possessed by that person. It is the science and technology of measuring and analyzing biological data of human body extracting a feature set from the acquired data. In this present research study accurately determine the finger print recognition by using different advanced computational techniques. This can prove to the ability of proposed the method to recognize the twins by natural as well as in-vitro fertilization. It deals with the similarities and differences in personalities of the selected twins. Fingerprint matching is the process used to determine whether two sets of fingerprint ridge detail come from the same finger. There exist multiple algorithms that do fingerprint matching in many different ways. Some methods involve matching minutiae points between the two images, while others look for similarities in the bigger structure of the fingerprint. This study give us some clues and shows the various aspects of personality are differently subjected. The capability of biometric techniques to distinguish between the two birth features of multiple reasons. This research also shows an important concept in twin study can also be applied to how people with the naturally and in-vitro might respond to the same environment.

Keywords: *Biometric, Computational studies, Finger Print, In-vitro fertilization, Twins.*

I .INTRODUCTION

Biometric technologies are the science of detecting and recognizing human characteristics using technologies that measure and analyze individual biological data. The way we are genetically composed, creates identifiable traits that can uniquely represent us as individuals. There are two types of twins: monozygotic (or identical) and dizygotic (or non-identical). Monozygotic twins are a result of a single fertilized egg that splits into two cells, each one giving origin to one individual. Dizygotic twins are a result of two different fertilized eggs. Monozygotic twins have the same deoxyribonucleic acid (DNA) and, therefore, they cannot be distinguished using DNA [1]. Thus, it is necessary to use other forms of identification for monozygotic twins. Recognition using biometric traits is now a well accepted and proven method. A biometric characteristic is a detectable biological or behavioral characteristic of an individual that is distinguishable and repeatable. Some examples include fingerprints, face, palm prints, iris, retina, and voice. The similar appearances of identical twins may also give them a greater incentive to commit fraud than average persons. Imagine a scenario where you have an identical twin brother/sister, and he/she has health insurance but you do not, and you get sick.[2] A biometric system relies on the distinctiveness of the biometric characteristics to perform the recognition. While many biometric techniques are extremely accurate, some variations in sensing data, noise, etc. can cause the system performance to drop significantly. We could say it is more difficult to discriminate identical twins than unrelated persons because of their genetic similarity. Although identical twins cannot be distinguished from each other using DNA, some of the biometric modalities, such as fingerprints, iris, and palm prints, can still be used to distinguish them [3]. Some experiments show that face and voice, can be used to distinguish identical twins. Due to the difficulty in obtaining a large biometric database of identical twins.[4] .Just as DNA can be used to identify individuals except for identical twins, some biometric traits such as fingerprints and iris prints are distinctive even among identical twins.[5] Extensive research has been done on fingerprints in humans. Two of the fundamentally important conclusions that have risen from research are, a person's fingerprint will not naturally change structure after about one year after birth and the fingerprints of individuals are unique. Even the fingerprints in twins are not the same. In practice two humans with the same fingerprint have never been found.[6].In this project we propose a method for fingerprint matching based on minutiae matching. However, unlike conventional minutiae matching algorithms our algorithm also takes into account region and line structures that exist between minutiae pairs.[7] This allows for more structural information of the fingerprint to be accounted for thus resulting in stronger certainty of matching minutiae. Also, since most of the region analysis is preprocessed it does not make the algorithm slower.[8] The algorithm for matching was not created; however, the process in which the regional data is obtained is explained in this paper. Evidence from the testing of the preprocessed images gives stronger assurance that using such data could lead to faster and stronger matches[9].

II. FINGER PRINT MATCHING SYSTEM

Fingerprints are one of the most mature biometric technologies and are considered legitimate proofs of evidence in courts of law all over the world. In recent times, more and more civilian and commercial applications are either using or actively considering using fingerprint-based identification because of the availability of inexpensive and compact solid state scanners as well as its superior and proven matching performance over other biometric technologies. A fingerprint is believed to be unique to each person .Even the fingerprints of identical twins are different.

- Fingerprint Acquisition: How to acquire fingerprint images and how to represent them in a proper machine-readable format.
- Fingerprint Verification: To determine whether two fingerprints are from the same finger.
- Fingerprint Identification: To search for a query fingerprint in a database.

Stages of finger print matching system as shown in fig:1

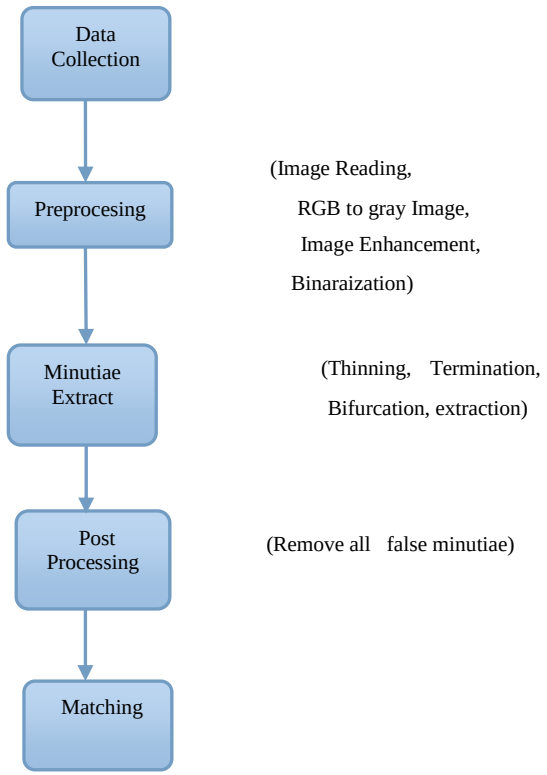

Fig:1 Fingerprint maching system

A. *Data Collection*

Fingerprint images are captured using the inkless fingerprint sensor (scanner). The resolution of the scanned images is within the acceptable values (500dpi), while the size is about 300×300 and is in JPG format.

B. *Pre-processing*

Fingerprint pre-processing states that some operations are to be performed before extraction of the minutiae. This is done for making image more clearer and removing noise from the image so that it would be easier to extract the features from the image. Following the steps involved in pre-processing. They are finger image reading, RGB to Gray Image, Image enhancement and binaraization. Furthermore, the thinning algorithm can also eliminate some of the edge detail. Most missing edges take the form of gaps in an edge and are usually easily identified by a human. The problem is getting a computer to recognize them. In the course of the project we developed our own edge enhancement technique, which caught some of the simple gaps, however did not fill in the bigger or more complex ones. Regions are defined by the fingerprint edges that bound them. However, because of the nature of the fingerprint and current scanning technologies ridge detail can be missing from the scanned fingerprint. Therefore, I took part in the edge enhancement process by putting in some of the edges that were in the original picture but got dropped by the thinning process. A line is said to be strong if many points on the line are already in or near points in the existing edge detail. If the line is strong then it is most likely that the ridge was supposed to span the gap and therefore can be drawn in. Note that the image has been thinned it is easy to find endpoints in the image. Scan Image as explained in previous section: For each window: Find all the endpoints in the window For each endpoint pair Look at the line that goes through the points If the line is "strong". Draw the line between the points. Endpoints are merely pixels that only have one neighboring pixel and are not at the edge of the window.To evaluate the proposed algorithm, we performed experiment on the image shown in Fig :2.

Figure 2: Fingerprint Image

C. *Minutiae Extraction*

Following are the steps involved in minutiae extraction:

- Thinning

This process done on binary image by reducing all lines of fingerprint into thickness of one single pixel. After thinning process, the fingerprint image is in single pixel width where each ridge is thinned to centre pixel and there are no discontinuities. Once thinning process is completed, there will be no more pixel removal, and noise and singular pixels should be discarded.

- Termination and Bifurcation Extraction:

Extracting minutiae point we compute the number of one value of every 3x3 window.

- If the centroid is 1 and has only 1 one-valued neighbor, then the central pixel is a termination.
- If the central is 1 and has 3 one-value neighbors, then the central pixel is a bifurcation.
- If the central is 1 and has 2 one-value neighbors, then the central pixel is a usual pixel.

D. *Post Processing:*

The preprocessing stage does not totally heal the fingerprint image. It is the process which is performed after extraction of minutiae or feature from the fingerprint image.

E. *Matching:*

Fingerprint matching is the process which describes matching percentage/score between two fingerprint images.it is the final step of typical fingerprint recognition system. Gives the matched fingerprint if present. Minutiae are usually matched together by their distance relative to other minutiae around it. If multiple points in one image have similar distances between them then multiple points in another image then the points are said to match up. It is the idea of this paper to add the constraint that the regions and possibly edges between the minutiae should be the approximately the same as well. The most modern fingerprint matching technologies use minutiae matching. The idea being if you can find enough

minutiae in one image that have corresponding minutiae in another image then the images are most likely from the same fingerprint.

III. RESULT ANALYSIS

Basically, the matching algorithm that uses the regional data would have to take into account that the region count between two minutiae can be off by a certain threshold. A reasonable threshold to use would be 2 or 3 regions as this would work for most of the pairs of images. For both the sets of minutiae the average number of region difference and edge difference is between 1 and 3. This is a reasonable number because of errors that arrive from the initial input and the preprocessing algorithm. The result of minutiae pare 1 as shown in table 1.

Table:1 Results Minutiae Pair 1

Image	Regions Between Minutiae	Edges Between Minutiae
1.	12	18
2.	8	14
3.	10	17
4.	9	15

The Statistics outcome will be - Max Region Difference: 3 - Average Region Difference: 1.57 - Max Edge Difference: 4 - Average Edge Difference: 1.97. The result of minutiae pair 2 as shown in table 2.

Table:2 Result Minutiae Pair 2

Image	Regions Between Minutiae	Edges Between Minutiae
1.	6	10
2.	4	12
3.	5	9
4.	6	11

The statistics comparison will be- Max Region Difference: 2 - Average Region Difference: 1.39 - Max Edge Difference: 3 - Average Edge Difference: 1.72

CONCLUSION

In this paper, we have analyze about comparing naturally and in-virto fertilization twins. Although comparing twins have the same DNA, their biometric trait fingerprint are different. So the results also measured the values of region and edge difference between naturally and in-vitro fertilization twins.The matching algorithm would have to be both efficient in theory and the code that implements because the goal would be to make it run faster and more accurate then pre-existing software. Also more work can be done on the edge enhancing algorithm as it does not properly detect missing edges that are supposed to be curved. A way this can be accomplished is to take the edge orientation (the way an edge is curving) into consideration. Future work on this project would include the creating of a matching algorithm that uses the regional data created in this pre-processing system.

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