جمهوريه العراق

وزاره التعليم العالي والبحث العلمي

جامعه القادسية

كليه علوم الحاسوب وتكنلوجيا المعلومات

قسم الحاسوب\الدراسة الصباحية

Vein Palm Recognition

مشروع بحث تخرج

مقدم الى كليه علوم الحاسوب وتكنلوجيا المعلومات –جامعه القادسية

وهو جزء من متطلبات نيل درجه البكالوريوس في علوم الحاسوب

من قبل الطلاب

قاسم عبد الحسين هادي محمد عبد العزيز حيدر

مرتضى اصيعيصع عبد

اشراف الأستاذ

م . م محمد حمزه عبد

٢٠١٦.....٢٠١٧

بسم الله الرحمن الرحيم

﴿رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ وَأَنْ أَعْمَلَ صَالِحًا تَرْضَاهُ وَأَصْلِحْ لِي فِي ذُرِّيَّتِي إِنِّي تُبْتُ إِلَيْكَ وَإِنِّي مِنَ الْمُسْلِمِينَ﴾

صدق الله العلي العظيم

(الأحقاف – ١٥)

(الاهداء)

الى معلم البشرية ... السراج المنير والهادي البشير الرسول الاعظم

(محمد بن عبد الله صلى الله عليه واله وسلم)

الى رموز العزة زهور الجنة

الى شهداء العراق وشهداء الحشد الشعبي

الى من تتسابق الكلمات لتخرج معبره عن مكنون ذاتها

من علموني وعانوا الصعاب لأصل الى ما انا فيه

وعندما تكسوني الهموم اسبح في بحر حنانهم ليخففوا من الأمي

والدي ووالدتي

الى من ملكوني عبدا بعد ان علموني...اساتذتي

الى اخوتي واخواتي الذين مدوا لي يد العون ...

اقدم ثمرة تعبي مع حبي واحترامي ..

الشكر والتقدير. . .

أشكر الله العلي القدير الذي أنعم عليَّ بنعمة العقل والدين. القائل في محكم التنزيل "وَفَوْقَ كُلِّ ذِي عِلْمٍ عَلِيمٌ" سورة يوسف آية ٧٦ .... صدق الله العلي العظيم.

وقال رسول الله (صلي الله عليه وال سلم)": ((من صنع إليكم معروفاً فكافئوه، فإن لم تجدوا ما تكافئونه به فادعوا له حتى تروا أنكم كافأتموه)) صدق رسول الله

وأثني ثناء حسناً وفاءً وتقديراً وإعترافاً مني بالجميل أتقدم بجزيل الشكر لأولئك المخلصين الذين لم يألوا جهداً في مساعدتي في مجال البحث العلمي، وأخص بالذكر أستاذي الفاضل المحترم ((م.م محمد حمزة عبد)) على هذه الدراسة وصاحب الفضل في توجيهي ومساعدتي في تجميع المادة البحثية، فجزاه الله كل خير, وأخيراً ،أتقدم بجزيل شكري إلى كل من مدوا لي يد العون والمساعدة في إخراج هذه الدراسة على أكمل وجه .

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1.1 Introduction

Vein matching, also called vascular technology is a technique of biometric identification through the analysis of the patterns of blood vessels visible from the surface of the skin. Though used by the Federal Bureau of Investigation and the Central Intelligence Agency, this method of identification is still in development and has not yet been universally adopted by crime labs as it is not considered as reliable as more established techniques, such as fingerprinting. However, it can be used in conjunction with existing forensic data in support of a conclusion.

While other types of biometric scanners are more popular for security systems, Vascular scanners are growing in popularity. Fingerprint scanners are more frequently used, but Naito says they generally do not provide enough data points for critical verification decisions. Since fingerprint scanners require direct contact of the finger with the scanner, dry or abraded skin can interfere with the reliability of the system. Skin diseases, such as psoriasis can also limit the accuracy of the scanner, not to mention direct contact with the scanner can result in need for more frequent cleaning and higher risk of equipment damage. Vascular scanners do not require contact with the scanner, and since the information they read is on the inside of the body, skin conditions do not affect the accuracy of the reading. Vascular scanners also work with extreme speed, scanning in less than a second. As they scan, they capture the unique pattern veins take as they branch through the hand. Compared to the Retinal Scanner, which is more accurate than the vascular scanner, the retinal scanner has much lower popularity, because of its intrusive nature. which is able to identify an individual to a high degree of accuracy by using the biological characteristics of the human body, is currently being focused on as the most reliable means of personal identification. Within this field, "vein authentication", which uses image recognition and optical

technology to scan the normally invisible vein pattern of the palm, back of the hand, fingers, etc .

1.2 literature survey of project

Zhou, Ajay Kumar [1] which have been used for Forensic, Military based and online business applications. They have also used CASIA Dataset for analysis. This method helped to enhance the efficiency of feature extraction of palm vein patterns. The main steps involved are:

- Preprocessing stage which includes ROI segmentation and Image enhancement.
- Feature extraction and representation using Hessian, LRT, LPP and ordinal representation .
- Matching score generation using cosine similarity.
- Score combination using the four representations.

Z.khan et.al [2] proposed a Contour Code, a novel orientation and binary hash table based encoding for palm print recognition. It facilitates simultaneous matching to the database and score level fusion of the multispectral bands in a single step. Main advantage includes normalization of scores which is not required before fusion and this single methodology can be used for the extraction of both the line and vein features. Major steps involved are :

- Preprocessing hand images
- Identifying region of interest
- Contour Code representation derived using a two stage filtering approach to extract only directional features
- Contour Code which is binarized into an efficient hash table structure.

Multispectral palm print verification results on the Poly U and CASIA databases show that the Contour Code achieves an EER reduction up to 50%, compared to state-of-the-art methods.

1.3 Aim of project

Due to increasing concerns about security, some condominiums and homes have started using this system to enhance security and safety in daily life. For both of these applications, the combination of the following features provides the optimum system : a hygienic and contactless unit ideal for use in public places, user-friendly operation that requires the user to simply hold a palm over the sensor, and an authentication mechanism that makes impersonation difficult.
Palm Secure units are used to control access to places containing systems or machines that manage personal or other confidential information, such as machine rooms in companies and outsourcing centers where important customer data is kept.

1.4 Summary

In the first chapter we introduced vein palm which offers services and security to the user and we knew used the techniques for this purpose and then studied literature survey of project those who have worked in this area and what they have done to process the characteristics , matching and fund sources , and then we approached the aim of project as this project provides necessary for security applications homes , buildings and the discovery of the identity of persons.

2.1 Introduction

The development and popularity of computers and the Internet, particularly electronic commerce, have rendered biometrics-based automated human identification as very important and indispensable. Vein recognition is an automated human identification technology based on the vein pattern, which is the vast network of blood vessels under human hand skin. Compared with other biometrics technology, such as that using fingerprints, palm prints, and iris, palm–vein recognition, has the advantage of uniqueness and abundance of identity information, live body identification, counterfeiting difficulties, etc. These advantages confirm palm–vein recognition as a promising and effective technology with the merits of high accuracy and wide application range.Palm vein technologies are one of the up coming technologies which is highly secure. It is the world's first contactless personal identification system that uses the vein patterns in human palms to confirm a person's identity. It is highly secure because it uses information contained within the body and is also highly accurate because the pattern of veins in the palm is complex and unique to each individual. Moreover, its contact less feature gives it a hygienic advantage over other biometric authentication technologies. The palm secure works by capturing a person's vein pattern image while radiating it with near-infrared rays. The Palm Secure detects the structure of the pattern of veins on the palm of the human hand with the utmost precision. The sensor emits Near infrared beam towards the palm of the hand and the blood flowing through these back to the heart with reduced oxygen absorbs this radiation, causing the veins to appear as a black pattern. This pattern is recorded by the sensor and is stored in encrypted form in a database, on a token or on a smart card.

Veins are internal in the body and have wealth of differentiating features, assuming false identity through forgery is extremely difficult, thereby enabling an extremely high level of security. The Palm Secure technology is designed in such a way that it can only detect the vein pattern of living people. The scanning process is extremely fast and does not involve any contact meaning that Palm Secure meets the stringent hygienic requirements that are normally necessary for use in public environments .The opportunities to implement palm secure span a wide range of vertical markets, including security, financial/banking, healthcare, commercial enterprises and educational facilities.

2.2 Data Base

Palm and wrist vein images database are selected from "The Institute of Control and Information Engineering, Poznan University of Technology, Poland". During their research work, they gathered image database. Were used in training part and testing the palm and wrist vein recognition system, PUT Vein pattern database consists of 2400 images. Half of them collected from left and right palm, and another half collected from wrist for left and right of 50 volunteer of institute's student. The pictures of each person of palm and wrist region were taken in three sessions four images each one "palm and wrist" at least one week between each series. Images in the PUT database have 1280x960 resolution and are saved as 24-bit bitmap file image format.

2.3 Methodology of Palm-vein

We use many methods in the field of palm vein through which we can reach the desired results, methods can be used to extract palm–vein features and identify the identity of the person and these methods :

1.Extraction of principal orientation features

Palm–vein images contain significant continuous line-like characteristics,. Thus, texture-based coding methods can be used to extract palm–vein features. Among these texture-based coding methods, the orientation-based coding is one of the efficient representation methods of palm–vein images because of its high accuracy and robust illumination .The principal direction of the palm–vein image is used to classify all palm–vein images into specific bins. The orientation matrix is adopted to uniquely identify the input palm–vein image by one-to-one matching with the candidates in the corresponding bin.

2. Palm–vein classification

In existing literatures , the approaches for palm–vein identification assign all palm–vein images into one database. Therefore, during the identification process, the correct correspondence of an input palm–vein image is obtained by matching the input image with all the samples in the database. The searching method is called as the traditional method that demonstrates difficulty in meeting the real-time requirements of the palm–vein identification system, especially with a large database .To solve identified problems, a simple and useful classification method for palm–vein identification based on the principal direction features is proposed When used in the registration phase, the registration samples in the database are assigned into several bins. In the identification phase, the test sample is only required to match one-by-one with the samples in the corresponding .

3. Evaluation analysis

discusses the retrieval efficiency and the response time of the classification method . The proposed classification method is evaluated by the distribution of the palm–vein images, retrieval efficiency and accuracy, and the response time of the identification process.

3.1 Retrieval efficiency and retrieval accuracy.

In palm–vein identification for a large database, the unique identification of the input palm–vein image is a retrieval problem. In this study, retrieval refers to filtering out the bins of candidate palm–vein patterns for finer one-to-one matching in a given input palm–vein image, until the palm–vein image is identified. In one-to-one matching.

3.2 The response time of the identification process.

In the palm–vein identification process, the execution time lengthens as the number of samples in the database increases, resulting in the difficulty of meeting the requirement of the system in real-time Whether by the traditional or the proposed method, the response time of the identification process is the sum of the duration of pre-processing, feature extraction, and one-to-many matching.

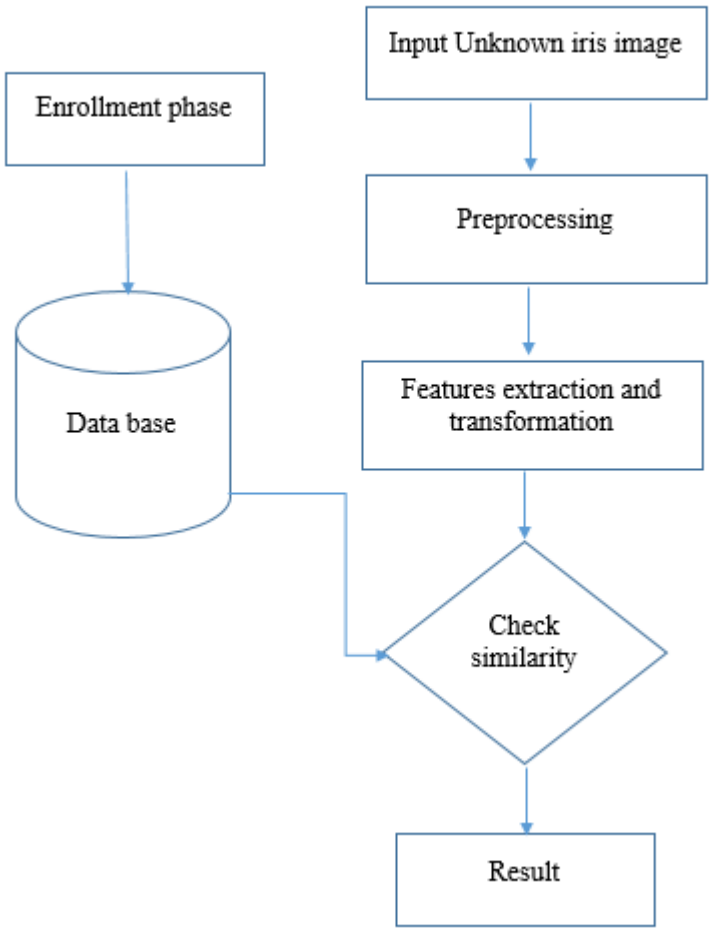

Figure no (2-1) verifying phase of recognition system

2.3.1 Preprocessing

The preprocessing phase used to obtain images which have normalized intensity and uniform size of all images in database, and depict only the most important part of palm and wrist vein images .In this phase vein palm images are scaled to the same size of 200 ×150 pixels and convert it into one band gray image to be ready for enhancement stage DFT in image processing used for the linear filter design. This method used in this proposed work

to enhance the vein to be darker than the background to extract the features from the structure of the vein. In this work two-dimensional DFT and IDFT are applied to get the images back and take the real part of the 0-255 gray level value.

2.3.2 Features extraction

In all pattern recognition system that most important phase is features extraction, because the features that extracted from each image who is belong to any person in the database can be consider as an ID, that used in identification phase. “The feature extraction phase represents a key component of any pattern recognition system. The second major part in enrollment phase is features extraction and transformation. After segment iris image and detect boundary of iris and pupil based on Hough transform and normalization the iris region. Now the iris images are ready to extract the features. By applying Haar Wavelet packets as well as the energy of the packets sub images to extract the features of texture. In this work the 2 levels wavelet packet decomposition of Haar wavelet transform are employed to extract the texture of unwrapped iris region image. In the Haar wavelet transformation method, low-pass filtering is calculated by averaging two adjacent pixel values, whereas the difference between two adjacent pixel values is signed for high-pass filtering. The Haar wavelet applies a pair of high pass and low-pass filters to image decomposition first in image columns and then in image rows independently. As a first result the image divided into four sub bands as the first level’s output of Haar wavelet. The four sub-bands are Low Low 1 (LL1) , High Low1 (HL1), Low High1 (LH1), and High High1 (HH1) . Up to two levels of decomposition are done to get the detail image. As shown in Figure number(2-2)

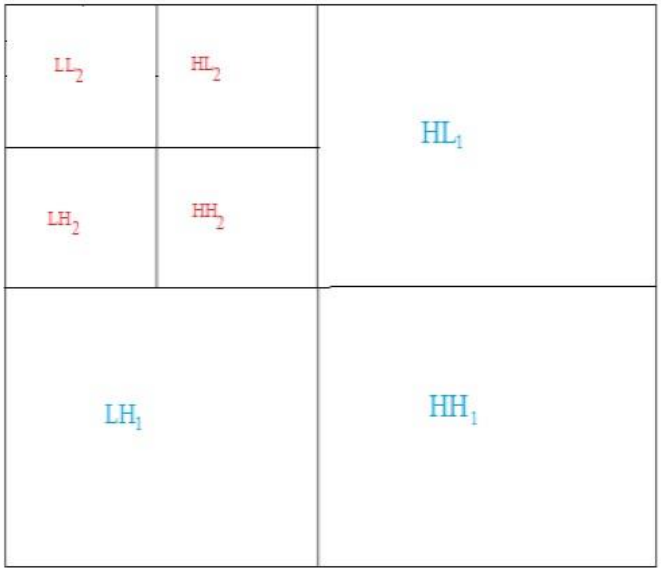

Figure no (2-2) structure of 2 level Wavelet decomposition

Principal component analysis (PCA) is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components (or sometimes, principal modes of variation). The number of principal components is less than or equal to the smaller of the number of original variables or the number of observations. This transformation is defined in such a way that the first principal component has the largest possible variance (that is, accounts for as much of the variability in the data as possible), and each succeeding component in turn has the highest variance possible under the constraint that it is orthogonal to the preceding components. The resulting vectors are an uncorrelated orthogonal basis set . PCA is sensitive to the relative scaling of the original variables .

2.3.3 Similarity measurement

A minimum distance classifications are used to check the similarity and dissimilarity between two patterns of different classes or two set of features in the same size. The smaller distance value between two patterns is a similar more than other patterns or classes. The classifier finds the distances between a query input vectors to all vectors of the data set of all database .In this paper work used Euclidean distance to measures the similarity between the input vein image "palm and wrist" and database [13].the Euclidean distance between two point, X1, and X2 , with j dimensions , can be calculated as an equation number (1) .

$$\text{Euclidean\_ dis}=\sqrt{\sum_1^j (X1j - X2j)} \qquad \text{Equation number (1)}$$

The Cosine distance measure the similarity between two vector with non-zero vector integer or Boolean component, in the space a point may be through of as a direction. The cosine measurement distance between two vector is an angle between point and vector that make. This angle's degree between 0 to 180, depend on how many dimensions the space has. Where the Cosine of 0 is 1 and it is less than one for any other angle in positive space. If we have two vectors with the same values a cosine similarity of 1,and two vectors at 90° have a similarity of 0, and two vectors diametrically opposed have a similarity of -1. The equation number (2) show the formula of Cosine distance .

$$\cos(A, B)\ \frac{A.B}{\|A\| \quad \|B\|} \qquad \text{Equation number (2)}$$

2.4 summary

In this chapter we discussed first the data base about the project that consist of images about palm vein .Then discussed the methodology that we used in this project , methods can be used to extract palm–vein features consist of three sections Extraction of principal orientation features, Palm–vein classification and Evaluation analysis . Then used the preprocessing that phase used to obtain images which have normalized intensity and uniform size of all images in database ,after that we extracted the features by using haar wavelet and PCA, then discussed the Similarity measurement by using Euclidean distance and Cosine distance.

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