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جمهورية العراق
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قسم الوسائط المتعددة

Vein Palm Recognition

مشروع بحث تخرج

مقدم الى كلية علوم الحاسوب وتكنولوجيا المعلومات – جامعة القادسية

وهو جزء من متطلبات نيل درجة البكالوريوس في علوم الحاسوب

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بسم الله الرحمن الرحيم

(ربِ أوزعني ان أشكر نعمتك التي أنعمت علي وعلى والدي وان اعمل صالحاً ترضاه وأصلح لي في ذريتي اني تبت اليك وأني من المسلمين)

الاحقاف(15)

الاهداء

الى معلم البشرية ... السراج المنير والهادي المنير الرسول الأعظم
(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 معبرة عن مكنون ذاتها
من علموني وعانوا الصعاب لأصل الى ما انا في
وعندما تكسوني الهموم اسبح في بحر حنانهم ليخففوا من الامي
والدي ووالدتي

الى من ملكوني عبدا بعد ان علموني .... اساتذتي
الى اخوتي وأخواتي الذين مدوا لي يد العون...
اقدم ثمرة تعبي مع حبي واحترامي...

الشكر والتقدير

اشكر الله العلي القدير الذي انعم علي بنعمة العقل والدين القائل في محكم التنزيل

"وفوق كل ذي علم عليم"سورة يوسف –اية 76.صدق الله العلي العظيم

وقال رسول الله صلى الله عليه واله وسلم ((من صنع اليكم معروفا فكافئوه فان لم تجدوا ما تكافئونه به فادعوا له حتى تروا انتكم كافأتموه)) صدق رسوا الله

واثني ثناء حسناً وفاءً وتقديراً واعترافاً مني بالجميل أتقدم يجزيل الشكر

لأولئك المخلصين الذين يألوا جهداً في مساعدتي في مجال البحث العلمي , واخص بالذكر استاذتي الفاضلة المحترمة

(م.م رشا فلاح كاظم) على هذه الدراسة وصاحبة الفضل في توجيهي ومساعدتي في تجميع المادة البحثية , فجزاها الله كل خير, وأخيرا , أتقدم بجزيل شكري الى كل من مدوا لي يد العون والمساعدة في اخراج هذه الدراسة على اكمل وجه.

Abstract

vein palm recognition performed by MATLAB language. this technique provides high level of security. This technique is work by two steps the first one is preprocessing and the second is feature extraction after that the matching will done between the input image and database images. This technique work by effect the infrared ray to the part of skin that to be agonizing the palm secure detect the structure of vein in blood vessels of the hand of high level of accuracy. After the infrared ray effect to the part of skin the blood vessels that return from hart will has a lowest level of oxygen this vein will appear in black pattern and the other will appear in white that will make easier to compared after this the record will done in sensor.

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Chapter one

introduction

this technique is also called ‘vascular technology’ , Vein matching is a technique that we use to identified persons based of blood vessels, this blood vessels is a huge network of branches under skin ,blood vessels network is different between peoples there for the depending on it give better security. The development and internet and the electronic business is the must use in the 21 century there for the level of security must be high so the security according to physical biometric must give the highest level of security.

Chapter two

2-1 vein palm

recognition technique that don’t need to be directed contact to the part of user body that wanted to identification. The other security technique like palm-print care about the case of finger must be not dirty or hurt or skin disease of person so that the direct contact is not always give the accuracy identification, in this case the scanner need always be cleaning to give the highest accuracy of identification. But in other side the scanner of vein palm don’t must be contact with the skin so it don’t effected by the skin if it dirty or has a special disease. this technique care about inside the skin that it always clean this scanners is work in high speed, that is able to read the blood vessels branches in one second. We gain the image by: the palm secure detect the vein blood then the sensor will effect infrared ray to this vessels the vessels which return from heart will appear in black pattern the other area will be in white, the sensor will already record that.

2 – 2 literature of project

By Ajay Kumar application used in military and business. It's use database called CASIA. This method gave the more facility to improve the accuracy the vein vessels. The main stage of this :

- Preprocessing stage it's include segmentation and enhancement
- Feature extraction stage that include using LPP , LRT and ordinal representation
- Matching score generation by using cosine similarity
- Score combination using the four representation

On the other side Z.khanet application. at suggest counter code technique this technique based on palm print recognition. This technique give easy to use of

matching to database and score level fusion of multi spectral bunds in one step , and we can use this single methodology to extract the vein features and lines the main steps is :

- Preprocessing the hand images
- Identifying region of interest
- Counter code represented the derived of using of two stage filtering approach to extract only directional features
- Counter code which is binaries into efficient hash table structure. Offer this steps the result will appear of palm print of poly V database and CASIA database the counter code will achieve an EER reduction up to 50% compared with state of other methods.

2 – 3 Goal of project

The number of people how want to computition the computer system is grow up , that reason make increase of fairs from security level , so the security system is become wanted in houses and companies this technique is (vein palm recognition) to make this technique of security must be :

- Clean unit that don’t need to directly contact ,can be exist even in street
- Easy to use require the user effect to sensor
- Matching technique in high level of accuracy
- We use palm secure to mange of access to places that contain systems and personal devices or other secret information that we must keep it's secure

Chapter three

3-1 MATLAB

We used MATLAB language because of its high capability for mathematical operation, and it has a function to make easily to compare the complex mathematical. in this technique we use MATLAB version 2015 because there are an easy to using this language and the clarity of it and the highest speed to operation compared with other languages.

3.2 Data Base

Palm and wrist vein images database are selected from “The Institute 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. We gain this images by: the palm secure

3-3 coding

In principle the database must be excised .

the phase of recognition system is in the following algorithm :

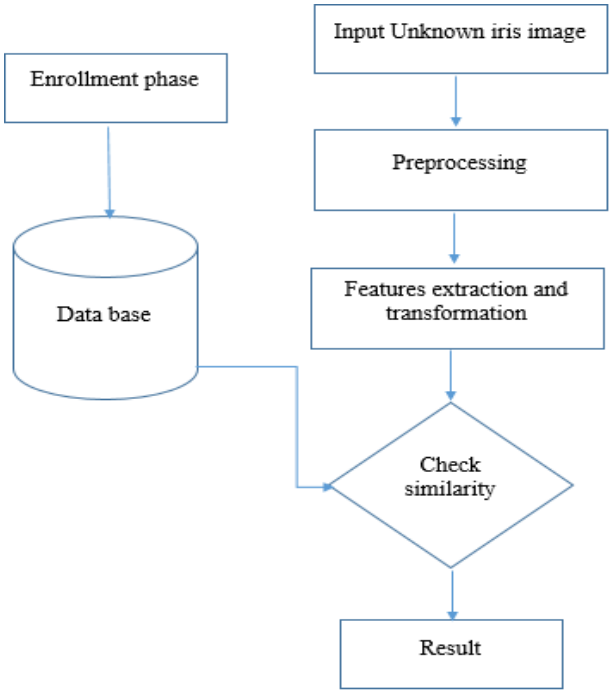

Figure no(2-1) verifying phase of recognition system

the previous algorithm mention how the recognition system operate.

The steps of system :

1- input the unknown image that wanted to add this in verification mode.

2- Preprocessing: include resize the given image then covert it to band gray to be ready to enhance.

Palm_image=imresize(palm_image[150 200]);

3- feature extraction and transformation : it's the must important phase in the recognition system it's include: Haar wavelet and .

4- check similarity: (Similarity measurement) between the input image and the image in database by using Euclidean_dis and cosine distance.

5- result: after matching the result will appear if the input image is according to image in database or not.

3-3-1 input image

Is a simplest phase its done by using palm secure to detect the structure of the vein in blood vessels then the sensor effect infrared ray to the palm of hand, the blood vessels which return from heart will appear in black pattern the other area will appear in white pattern, this pattern will already have recorded by the sensor and stored in encrypted form in a database.

3.3.2 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.

3.3.3 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).

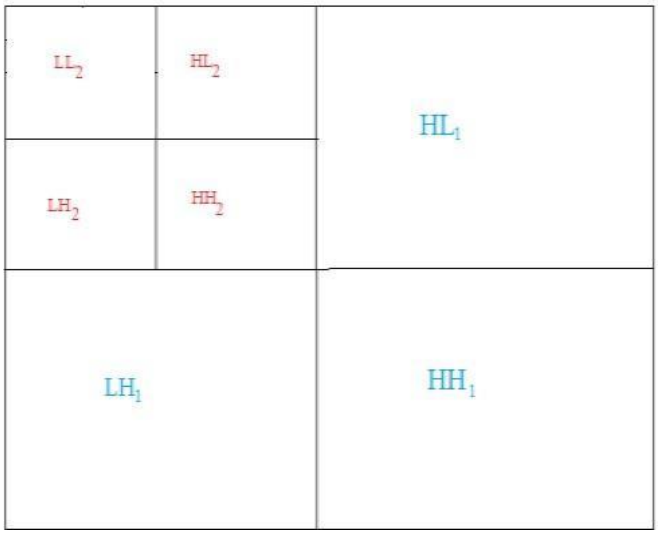

Figure no (2-2) structure of 2 level Wavelet decomposition

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.

3.3.4 Similarity measurment

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, X_1, and X_2 , with j dimensions , can be calculated as an equation
number (1) .

$$\text{Euclidean\_ dis}=\sqrt{\sum_1^i (x_{1j} - x_{2j})} \quad \text{Equation number (1)}$$

The Cosine distance measure the similarity between two vectors 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 vectors 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.

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

3-3-5 result

After matching the result will appear .the matching will be between the input image and one image in database because biometric system operate in verification made .the result will be either true if there is less different between two images ,or false if there is high different between these images .all this different will be appear in tables as vectors.

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Chapter four

4-1 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:

4-1-1 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.

4-1-2 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 .

4-1-3 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.

4-1-3-a 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.

4-1-3-b 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.

Chapter five

5-1 Conclusion

In this chapter we discussed first the data base about the project that consist of images about palm vein .we used MATLAB because of it capability for mathematical operation .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.

5-2 discussion and future work

5-2-1 discussion

After matching I found this technique is good technique of security but the result isn't the result I hope, the ratio of success is 20%, but, I can increase this ratio by using more algorithms in similarity measurement phase or by using another sensor.

5-2-2 future work

Vein palm recognition is developed daily, our plan for future:

1- Use more algorithms in extract feature
2- Use more algorithms in similarity measurement like using city block
3- Make vein palm recognition operate in other application like mobile device by adding sensor capable of send infrared ray.

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