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IMPLEMENTATION OF HAND VEIN STRUCTURE AUTHENTICATION BASED SYSTEM

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Abstract- Biometric authentication provides a high security and reliable approach to be used in security access system. However, this authentication method has not been widely implemented in a resource-constrained embedded system. In this project, we investigate a method of personal authentication based on infrared vein pattern in the back of the hand. A biometric feature is extracted from the vein pattern image and then matched for personal authentication. The algorithm consists of four modules: image capturing, image pre-processing, feature extraction, and the authentication module. Attach the IR web camera to the doer, automatically when any person open the doer camera will capture the back hand vein of images, using hough threshold method thinning images, which is use to reduce the error segmentation problem. Then Minutiae feature extraction include different point. Housdroff Distance is technique measuring of two images .If that image is match then only the doer is open otherwise it not. This system directly recognizes the shapes of the vein pattern by ensuring their Line-Segment Hausdorff Distance.
Keywords- Authentication, Jpeg to gray, Median filter Hausdorff distance.

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Introduction

A biometric feature provides a high security access system. Traditional method uses PIN number, password, key, and etc to identify a person is unreliable and provide a low level security. It provides more reliable feature than the password based authentication system as biometric characteristic cannot be lost or forgotten, biometric feature are difficult to replicate, and require the person to be present for the authentication process.

Many biometric such as face, finger print, iris and voice have been developed. But here verification using vein pattern is less developed. Biometric authentication is perform in insecure because of information leakage issue, so overcome this the implementation of biometric hand vein authentication.

Hand vein patterns are the vast network of blood vessels underneath a person's skin. The vein patterns are unique individual and are stable over a long period of time It is invisible to human eye that way its avoid the external distortion and it is not easy to replicate the vein patterns as compared to other biometric traits.

Due to the uniqueness, stability, and high resistance to criminal tampering, vein pattern offers a more secure and reliable traits for biometric authentication system. This paper investigates a method of personal authentication.

The recognition system of back hand vein is composed of four stages: 1. obtaining the image of back of hand vein; 2.extracting the vein pattern from the vein images of back of hand; 3. getting the features from the vein pattern; 4. The matching schemes.

I concerns about the second stage . During this project the main task to extract the shape of vein pattern. Here we use one proposed local threshold method for hand vein pattern.

System Architecture

The rest of the paper is organized as follows. Section II describes the methodologies which covers the explanation of each the algorithm used in the system. III.The Image extraction ,Image matching are given in section IV, and conclusions are made in section V.

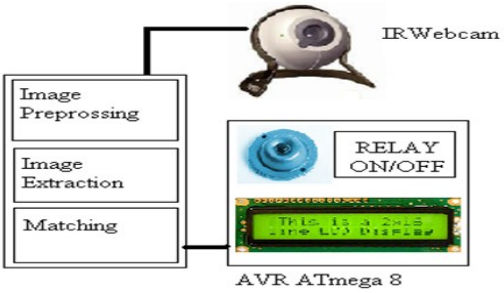

Fig. 1- hand vein structure authentication

I. Image Capturing Module

An array of infrared light-emitting diode (LED) and a thermal camera modified from a webcam was used to capture the vein pattern in our system. By illuminate the infrared light beam at the backside of the hand, the vein pattern in the back of the hand can be captured using a modified webcam with an attached IR filter. In the resulting images, as hemoglobin in the blood absorbs the infrared light, the vein patterns captured as shadow and appear darker. Figure illustrates example of infrared vein image in the back hand captured in our system.

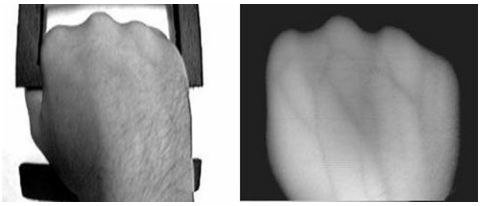

Fig. 2-Visible light image, IR image

Image captured in colored jpeg format, 320 pixels width and 240 pixels height in size, with 24 bits per pixels.

II. Image Pre-Processing Module

As illustrated in Figure, the raw vein image captured from the camera will be enhanced through several image pre-processing stages before the minutiae feature extraction can be done. This section will discuss on each sub image pre-processing modules.

1. Color to Grayscale and jpeg to bmp Conversion

By converting the color image to grayscale image, the image size can be reduced from 24 bits per pixel (colored image) to 8 bits per pixel (grayscale image). The conversion from jpeg format to bmp format is necessary because manipulating images in bmp format is much easier than it is in the jpeg format. Figure 6 (a) shows the resulting image.

2. Crop the bmp image

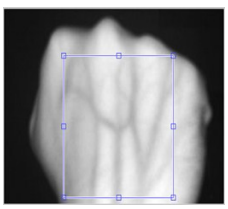

Fig. 3-

Histogram Equalization (Contrast Correction)

The vein image captured is having a low contrast which the vein pattern is not clearly distinguished from the surrounding parts. This is overcome by applying histogram equalization to the vein image to improve the contrast. Histogram equalization uses the original image's histogram and transforms it to have an equalized histogram. Equalization of the histogram causes a histogram with a mountain group closely together to "spread out" into a flat or equalized histogram. This makes the dark pixels appear darker and light pixels appear lighter. The output image after histogram equalization is illustrated in Figure.

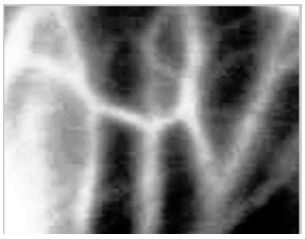

Fig. 4- Segmentation

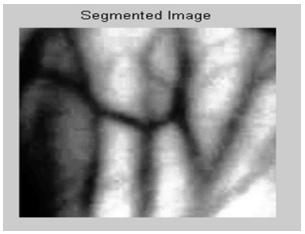

Fig. 5- Proposed Algorithm

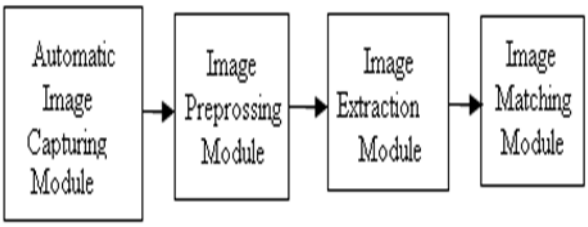

Fig. 6-

It converts the binary shapes obtained from vein detection or threshold from 1 pixel to foreground, 0 pixel to background. To decided whether an edge pixel p1 should be detected sider . Draw the circle using hough transformer within that sider. And find center of that circle, similarly, find all the center pixel within that object images , and connect all the central pixel, we will get the sharp thinning images, which is use to reduce the error segmentation problem.

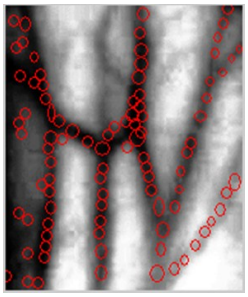

Fig. 7-

III. Feature Extraction Module

The feature extraction technique utilizes the minutiae features extracted from the vein patterns for recognition as proposed by Lingyu Wang, Graham Leedham , and David Siu-Yeung Cho . The minutiae points include bifurcation points and ending points. Similar to fingerprints, these feature points are used as a geometric representation of the shape of vein patterns.

The most widely used method for minutiae feature extraction in fingerprint biometric system is the cross number (CN) concept [8, 9]. Cross number is defined as number of transition from 0 to 1 (and vice versa) for the surrounding pixel around pixel P0, which is from P1 to P8 in a 3*3 window size as illustrated in Figure 5. Mathematically, cross number can be expressed by the following equation:

By using the property of cross number of a pixel as shown in Table I, the pixel can be classified as ridge ending point or bifurcation point. A template is then generated by storing the type as well as the x and y coordination of the minutiae point.

Figure 7 illustrated the minutiae point extracted from the vein pattern.

Table 1- Properties of Cross Number

CN	Property
0, 1	Isola ted point
2, 3	Ridge e nding point
4, 5	Connecting point
6, 7	Bifurcation point
8	Cros sing point

Authentication Module- Matching of Template

Attach the IR web camera to the doer, automatically when any person open the doer camera will capture the back hand of images ,convert it into grayscale image using proposed .It converts the binary shapes obtained from vein detection or thresholding from 1 pixel to foreground, 0 pixel to background. To decided whether an edge pixel p1 should be detected sider . Draw the circle within that sider. And find center of that circle, similarly, find all the center pixel within that object images , and connect all the central pixel, we will get the sharp thinning images, which is use to reduce the error segmentation problem .Then Minutiae feature extraction include different point. Housdroff Distance is technique measuring of two images .If that image is match then only the dore is open otherwise it not.

Limitations of Study

Only the authorized person are enter. But if anybody who want to meet you then the dore is not open . The person wait or call that person to open the dore.

Conclusions

This paper presents a biometric system that recognizes the shapes of the vein pattern in the back of the human hands captured using a thermal camera. Unlike other approaches, the system directly recognizes the shapes of the vein pattern using line segment Hausdorff distance. Preliminary testing results show that all the vein pattern images in the database have been correctly recognized, and it demonstrates the potential usefulness of such a system. Nevertheless, a number of research issues need to be addressed in the future. First of all, the clearness of the vein pattern in the image is affected by a number of factors such as ambient temperature, nearness of the vein to the skin etc. An investigation is needed into the impact of these factors on the quality of the vein pattern image. Secondly, more experiments need to be carried out using a larger image database for a thorough evaluation on the efficacy of hand vein pattern biometrics. Lastly, it is likely that the vein patterns will be used in conjunction with other biometrics in a multi-modal system.

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