Real Time Recognition System Using Finger-Vein

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Abstract – The demand for simple, convenient, and high security authentication systems for protecting private information's stored in mobile devices has steadily increased with the development of consumer electronics. The personal information's can be protected in the form of biometrics which uses human physiological or behavioral features for personal identification. In this paper, we propose real time finger-vein recognition using image processing. Here we have implemented this system using MATLAB and equipped with finger -vein recognition algorithm.

Keywords – Image aquisition device; Finger- vein recognition; Image processing; Biometric pattern.

I. INTRODUCTION

In general our personal information's are protected using PINs and Passwords that can be easily implemented but is vulnerable to the risk of exposure and being forgotten. Now days the biometric system has become more popular and alternative to traditional Passwords and PINs. In most existing biometric system, it have high complexity in time or space or both and thus not suitable for mobile devices. There is a long list of available biometric patterns, and many such systems have been developed and implemented, including face, iris, finger print, palm print, hand shape, voice, signature and gait. These biometric patterns are susceptible to forge and they can be copied and used to create artifacts that can look like currently available biometric pattern. To reduce these difficulties many researches have sought to improve reliability and frustrate spoofers by developing biometrics that is highly individuating and more secured. Biometric systems need to be cost efficient and easy to implement in consumer electronics applications. The finger-vein is a promising pattern for personal identification in terms of its security and convenience. Finger-vein is a unique physiological biometric for identifying individuals based on the physical characteristics and attributes of the vein pattern in the human finger. The deoxidized haemoglobin in the vein vessels absorbs light having a wavelength in the near-infrared area. When an infrared ray image is captured only the blood vessel pattern containing the deoxidized haemoglobin are visible as a series of dark lines. Based on this feature, the vein authentication device translates the black lines of the infrared ray image, and then matches it with the previously registered pattern of the individual. Compared with other biometric patterns, the finger-vein has the following advantages: 1) The vein is hidden inside the body and is mostly invisible to human eyes, so it is difficult to forge or steal.2) The non-invasive and contactless capture of finger-veins ensures both convenience and hygiene for the user, and is thus more acceptable.3) The finger-vein pattern can only be taken from a live body.

II. OUTLINE OF THE SYSTEM

The system consists of three hardware modules: Image acquisition module (IR module), Software module-image processing using MATLAB. The structure diagram of the system is shown in Fig. 1.

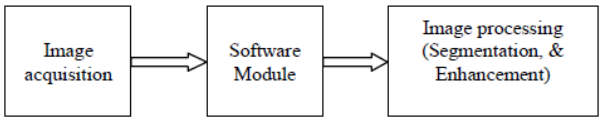


Fig . 1: Hardware Diagram

The image acquisition module is used to collect finger-vein images. The MATLAB is used to execute the finger-vein recognition algorithm. The human machine communication module (LCD) is used to display recognition results. The proposed finger-vein recognition algorithm contains two stages: the enrollment stage and the verification stage. Both stages start with finger-vein image pre-processing, image segmentation, alignment, and enhancement. For the enrollment stage, after the pre-processing and the

feature Extraction step, the finger-vein template database is built. For the verification stage, the input finger-vein image is matched with the corresponding template after its features are extracted.

III. COMPONENT DESCRIPTION

IMAGE ACQUISITION DEVICE:

To develop a finger vein image (Near infra-red image) it is necessary to develop special devices which do not affect the ambient temperature. Usually, finger-vein images can be captured based on Light transmission or Light reflection. To get a better image here we use Light transmission. The modules here we use are: Web Camera by removing IR filter. Light-emitting diode (LED) is used as illumination source for IR light. LED has high permeability and power.

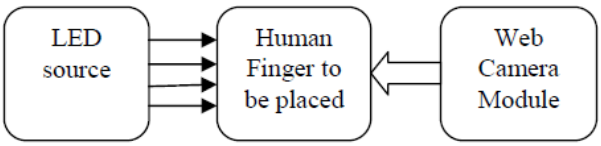


Fig. 2: Image acquisition device

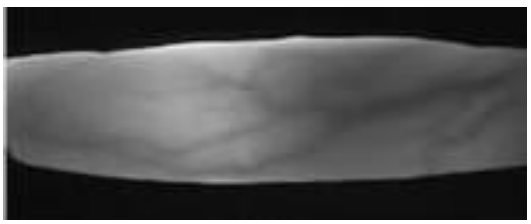


Fig.3 : Finger-vein image captured by our device.

IV. WORKING

In the working of real time recognition system using finger-vein we have proposed a real time recognition algorithm. This proposed finger-vein recognition algorithm contains two stages:

1. The Enrollment stage and
2. The Verification stage.

A. ENROLLMENT STAGE:

The enrollment stage is to enroll users to the system. First it takes the finger-vein image from the web-camera. Image segmentation and enhancement process are done by using Image processing technique and the software used here is MATLAB. The finger-vein patterns are extracted by calculating various parameters like vein Width, Length, Position, Pixels and Intersection points of vein. Then they are stored as featured templates. The flowchart is shown below:

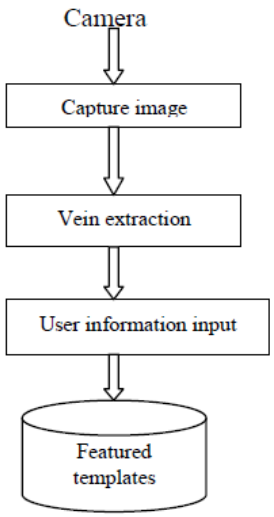
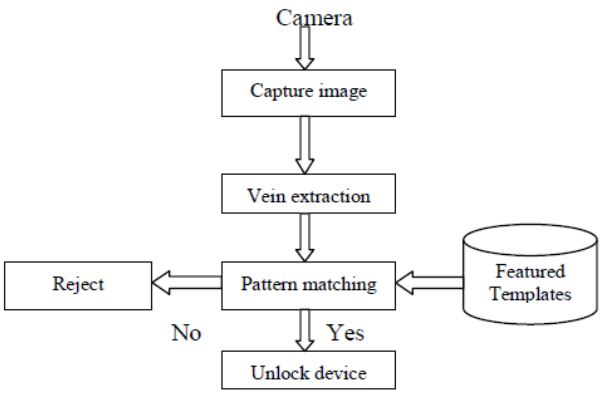


Fig. 4 : Enrollment stage.

B. VERIFICATION STAGE:

The verification stage enables the current user to lock or unlock his system. Like enrolment stage, the verification stage also has to deal with Web camera, MATLAB, database, and PC to store and display the results. This stage will check if the finger vein of the current user is matched with the featured templates or not. The flowchart for this stage is shown below:



C. IMAGE SEGMENTATION AND ENHANCEMENT:

The position of fingers usually varies according to different finger-vein images. So it is necessary to normalize the finger-vein images before feature extraction and matching. When a finger is irradiated by IR rays uniformly, the vein images will look brighter than other parts. The segmented finger-vein image is then enhanced to improve its contrast level. Then the image is resized to $1/4^{th}$ of the original size. Finally, histogram equalization is used for enhancing the gray level contrast of the image.

V. CONCLUSION

In the present study, proposed a finger-vein recognition system and vein image extraction is implemented on a MATLAB platform. The proposed system includes a device for capturing finger-vein images and a proposed algorithm to extract finger-vein images by considering various parameters like vein width, position, length, pixels and intersection of veins. Our system is suitable for mobile device because of its low computational complexity and low power consumption. The advantage of this proposed system is more secured and confidential.

VI. REFERENCE:

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