Person Verification with the Help of Finger Vein-A Review

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Abstract: Finger Vein Identification is a biometric authentication system that matches the vascular pattern in an individual's finger to previously obtained data. The technology is currently in use or development for a wide variety of applications, including credit card authentication, automobile security, employee time and attendance tracking, computer and network authentication, end point security and automated teller machines. This paper proposed new approach for person verification with the help of finger vein. In this thesis I will develop and investigate two new score-level combinations, i.e., Gabor filter and Reapted Line Tracking, and comparatively evaluate them with more popular score-level fusion approaches to ascertain their effectiveness in the proposed system.

Keywords: finger-vein recognition, Gabor filter and Reapted Line Tracking.

I. INTRODUCTION

Biometric is the technology of verifying people using human physiological or behavioral features such as fingerprint, iris, face and voice. Due to the fact that a hand contains lots of information and the information is easy to be retrieved, hand based biometrics such as fingerprint and palm print are the most popular biometric technologies. Fingerprint is the most mature hand based biometric method where it has been used in many applications for years. However, fingerprint based biometric system is vulnerable to forgery because the fingerprints are easily exposed to the others. In addition, the condition of the finger's surface such as sweat and dryness can prevent a clear fingerprint pattern from being obtained. This can degrade the system's performance. To overcome the limitations of current hand based biometric systems, finger vein recognition had been researched. They proved that each finger has unique vein patterns so that it can be used in personal verification. Finger vein based biometric system has several benefits when compared with other hands based biometric methods. The finger vein pattern is hard to replicate since it is an internal feature. In addition, the quality of the captured vein pattern is not easily influenced by skin conditions as compared with palm vein based verification system, the size of the device can be made much smaller.

A. Finger Image Features

The most common representation used in Finger image identification is the Galton features. A ridge can be defined as a single curve segment. The combination of several ridges forms a finger image pattern. The small features formed by crossing and ending of ridges are called minutiae. Ridge Ending & Bifurcation are taken as the distinctive features of finger image. In this method the location & angle of the feature are taken to represent the finger image & used in the matching process. Together with there, finger image contains two special types of feature called core & delta points. The core point is generally used as a reference point for coding minutiae & defines as the topmost point on the innermost recurring ridge. The core & delta are also called the singularity points.

B. Finger Image Recognition

The uniqueness and permanence of the finger image are very well-know. Archaeological artifacts prove those finger images were already used by the ancient Assyrians and Chinese as a form of identification of a person. The first scientific studies on finger image date from the late sixteen century, but the fundamentals of modern finger image identification methods were provided at the end of nineteenth century. The studies of Sir F. Galton and E. Henry led to formally accept finger image as valid signs of identity by law Enforcement agencies. The first Automated Finger image Identification Systems (AFIS) were developed in the 1950s by the F.B.I. (Federal Bureau of Investigation) in cooperation with the National Bureau of Standards, the Cornell Aeronautical Laboratory and Rockwell International Corp.

C. Finger-Vein Image Preprocessing

The acquired finger images are noisy with rotational and translational variations resulting from unconstrained imaging. Therefore, the acquired images are first subjected to preprocessing steps that include:
 1) Segmentation of ROI,

2) Translation and orientation alignment, and

3) Image enhancement to extract stable/reliable vascular patterns.

Each of the acquired finger-vein images is first subjected to binarization, using a fixed threshold value as 230, to coarsely localize the finger shape in the images. Some portions of background still appear as connected to the bright finger regions, predominantly due to uneven illumination. The isolated and loosely connected regions in the binarized images are eliminated in two steps: First, the Sobel edge detector is applied to the entire image, and the resulting edge map is subtracted from the binarized image. Subsequently, the isolated blobs (if any) in the resulting images are eliminated from the area thresholding, i.e., the eliminating number of connected white pixels being less than a threshold. The resulting binary mask is used to segment the ROI from the original finger-vein image.
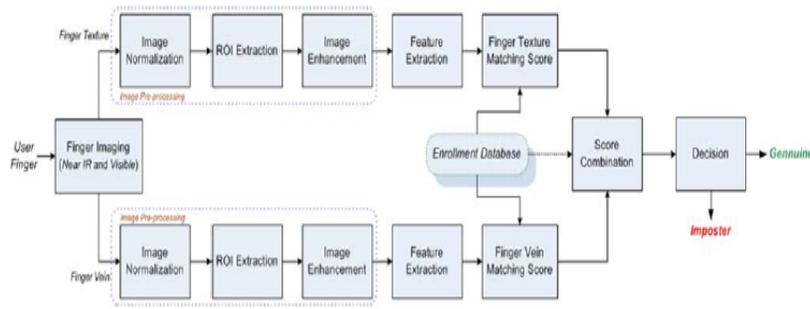
Block diagram for personal identification using simultaneous finger-vein and finger texture imaging.

D.   Repeated Line Tracking

The repeated line tracking method gives a promising result in finger-vein identification: The idea is to trace the veins in the image by chosen directions according to predefined probability in the horizontal and vertical orientations, and the starting seed is randomly selected; the whole process is repeatedly done for a certain number of times.

E.   Gabour Filter

It is a linear filter used for edge detection. Frequency and orientation representations of Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate for texture representation and discrimination. In the spatial domain, a 2D Gabor filter is a Gaussian kernel function modulated by a sinusoidal plane wave. The Gabor filters are self-similar: all filters can be generated from one mother wavelet by dilation and rotation.

II.   Conclusion.

The proposed system simultaneously acquires the finger-vein and low-resolution finger images and combines these two evidences using a novel score-level combination strategy. We develop and investigate two new score-level combinations, i.e., Gabor filter and Reapted Line Tracking, and comparatively evaluate them with more popular score-level fusion approaches to ascertain their effectiveness in the proposed system.

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