Finger Vein Recognition Based Authentication Using Deep Forest Algorithm

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ABSTRACT:

As people's daily behavioral activities become more data-based, how to protect personal information security is a crucial consideration for the whole society. Fingervein recognition is becoming an essential means of identification because of its uniqueness, live detection, security, and many other advantages. Although deep learning can make fingervein recognition have an excellent effect. However, the number of samples needed to build a deep network model is too large, and the current authoritative fingervein database cannot reach the minimum number of samples required. The emergence of Multi-Grained Cascade Forest provides a solution to the problem of insufficient sample data and long training time, which can give a new research avenue in feature extraction. In order to obtain higher accuracy, the deep forest algorithm is introduced in this paper to process the finger vein images. Firstly, the image data in the fingervein image database is pre- processed to prepare for the subsequent feature extraction and matching. Then, the deep forest algorithm is used to find the feature points used to match the features to obtain the angular information of each matched pair, and the final identity is determined according to the sparse distribution of angles.

Keywords: Deep Learning , Data

INTRODUCTION

With the development of artificial intelligence and computer science technology, emerging biometric technologies are gradually replacing traditional identification technologies such as keys and passes. People's requirements for identification are getting higher and higher, and biometric technologies are transforming from the first generation (fingerprint, palm print, voice print) to the second generation (finger vein, face). Compared to other biometric technologies, finger vein recognition has the following advantages: (1)Vein features are hidden under the skin and are not easily stolen. Finger vein images must be captured in a live body, which is difficult to forge, and are not affected by external environments such as skin condition and temperature. (2)Does not change over ime, has good stability and uniqueness. (3)The small size and contactless nature of the finger vein capture device allow for a broader range of applications. As a research hotspot, finger vein recognition technology has experienced decades of development, and many advanced finger vein recognition methods have been proposed in recent years.

II. METHODOLOGY

Biometric system utilizes pattern recognition which analyzes the physiological characteristics and biological characteristics. The uniqueness and persistence of finger images are well known for biometric system. The finger image consists of both finger print and finger vein image. Finger print has been used in many applications, but it is exposed to others and hence vulnerable to forgery. To overcome this, finger vein has been considered. Finger vein recognition comes below physiological characteristics which uses vein pattern from fingers for human identification. The Challenges such as Poor lighting, Recognition rate and Misalignment Additionally, finger vein recognition efficiency is affected by environment changes. The cost of implementation as scanner is very expensive to install and maintenance.

In this proposed for the As the captured image contains noise, vein pattern are extracted after noise reduction and normalization. To get better accuracy more vein pattern is extracted and preserved using a deep forest algorithm. Therefore, extracting vein pattern is important for authentication process. Basically vein pattern fall into four forms of board categories such as, tracking based method, transform based method, and filter based method and threshold method. The false acceptance rate is very low. Achieving high accuracy and more security. Despite unique finger vein patterns to each and individual persons even among identical twins. So, it is extremely difficult to read and steal.

III. ARCHITECTURE

The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system. The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.

DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.

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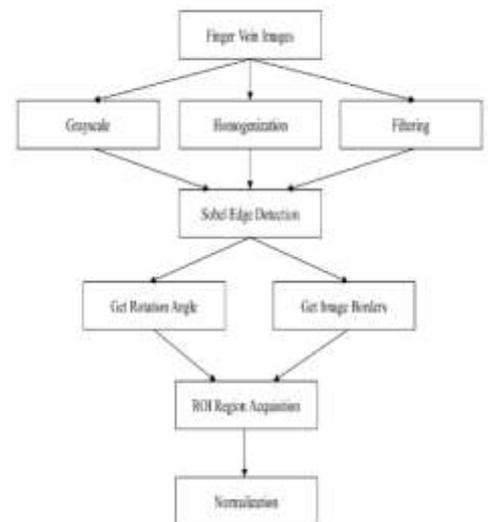

IV. WORKING PROCESS

Preprocessing step is very important to enhance the quality of the images. Thus, our first contribution aims to improve the image quality during the preprocessing step. After the ROI segmentation, we apply a block-local normalization and sharpening filtering, in contrast to other authors that use global normalization and histogram equalization. It should be noted that the efficiency of DAISY is improved because convolutions operations

are separable and can be implemented by using separate Gaussian filters. The matching process of the proposed methodology is based on a sparse technique to obtain the displacement matrices between finger vein samples. Use the CPM algorithm to compute sparse correspondences between patches of finger vein images to be compared.

Proposed methodology is deciding whether the sample is genuine or impostor. Based on the key ideas proposed in the work by the authors of, this decision is determined by analyzing the uniformity of
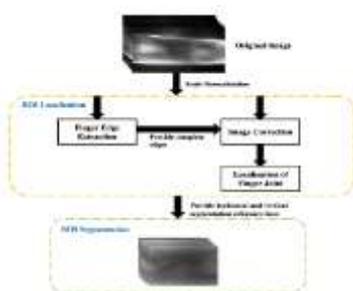
displacement matrices.

Proposed methodology introduces some improvements concerning the baseline method, achieving a significant speed-up for the matching process, which is demonstrated in Moreover, our proposal aims to accelerate the matching process of

finger vein images in order to lead a real-time recognition. On this regard, propose the implementation of a multithread parallel algorithm by using Open MP to compute the matching process under a multi-core platform.

V. RESULTS

A deep forest-based finger vein recognition method is proposed. Compared with traditional machine learning models, the method proposed in this paper fully exploits the feature representation capability of deep forest and is applicable to small sample scenarios. The algorithm mainly uses the model to obtain the coordinates of the feature points, and then uses the ORB algorithm to extract the main direction of the feature points by the FAST operator, and uses the BRIEF algorithm to binarize the encoding of the feature points, to match the features and obtain the angle information according to the Hamming distance data between the reference template image and the image to be recognized, and finally to determine the recognition results according to the matching probability obtained from the angle distribution.

VI. CONCLUSION AND FUTURE SCOPE

A deep forest-based finger vein recognition method is proposed. Compared with traditional machine learning models, the method proposed in this paper fully exploits the feature representation capability of deep forest and is applicable to small sample scenarios. BRIEF algorithm to binarize the encoding of the feature points, to match the features and obtain the angle information according to the Hamming distance data between the reference template image and the image to be recognized, and finally to determine the recognition results according to the matching probability obtained from the angle distribution. In future work, it is hoped that finger vein databases can be collected on a large scale: because there is no public large database to compare the performance of finger vein recognition methods, the image differences in each database will not be conducive to the fair evaluation of recognition performance.

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