Application Value Management in Enterprise Economic Management Innovation

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Abstract: DSP is the core module of data processing and CPLD is the fingerprint recognition system of central controller. On the basis of reviewing the current development in this field, this paper focuses on the evaluation of fingerprint image recognition algorithm, and puts forward the necessity and method of comprehensively measuring the performance of fingerprint identification. By constructing the hardware environment based on ADIA DSP-BF533DSP, the embedded fingerprint recognition system is designed. However, artificial fingerprint inspection is very tedious, time-consuming and cannot meet the growing needs. Based on the comparison of various preprocessing methods and the characteristics of fingerprint images, the key techniques of fingerprint preprocessing are studied, including fingerprint image enhancement based on histogram equalization and Fourier transform. The effect of fingerprint recognition algorithm on the running speed of the system is studied. The experimental results are given. It is proved that the method can construct the embedded fingerprint identification system better. The effective gradient algorithm and GABOR algorithm are applied to the processing of fingerprint images to make the data processing more effective.

1. Introduction

With the emergence of e-banking, e-commerce and smart cards, as well as people's attention to the confidentiality of information stored in many databases, automatic identification has become an important topic [1]. The fingerprint recognition technology extracts detailed feature points by analyzing the local features of the fingerprints, thereby reliably confirming the personal identity. This method verifies the kind of "thing" that the person holds, rather than verifying himself [2]. Security can be achieved by continuously improving the software identification algorithm, but with the continuous improvement and complexity of the software identification algorithm [3]. The automatic fingerprint identification system generally has four main processes: fingerprint image acquisition, fingerprint image preprocessing, feature extraction, and comparison and matching of feature values. The advantage of fingerprint recognition is that as a unique feature of human body, the complexity of fingerprint recognition can provide sufficient features for identification, and it has high security [4]. The loophole of this method of recognizing people by "thing" is obvious: the loss of "thing" will lead to the legal person can not be authenticated and various relics can easily be forged and decoded. With the in-depth development of e-commerce, network communication and digital society, the issue of identity authentication based on biological information becomes more and more important [5]. Automatic fingerprint identification technology (AFRT) is considered as the first choice for bioinformatics-based identity authentication because of its easy sensor design, user-friendly and full research work [6].

For a long time, when it is necessary to verify personal identity in human social activities, the traditional method is to verify whether the person holds valid tokens, such as photos, passwords, keys, magnetic cards and IC cards. Among all kinds of identification, fingerprint identification has become the most mature and effective method because of its unique and lifelong characteristics [7]. Nowadays, fingerprint recognition mostly adopts fingerprint recognition technology based on minutiae feature points, that is, fingerprint recognition algorithm based on image processing [8]. With the development of computer image processing and pattern recognition technology, automatic fingerprint recognition becomes possible [9]. Fiber beams shoot vertically onto the fingerprint

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surface, illuminating the fingerprint and detecting reflected light. The embedded fingerprint identification system has been widely used in various fields. With the increasing demand of the society, the requirements for the safety and speed of fingerprint products are constantly increasing [10]. For the fingerprint identification algorithm, higher and higher requirements are put forward, especially security and speed. These two aspects are two important criteria for evaluating the practicability of fingerprint products. The uniqueness of a fingerprint can be determined by the overall pattern of the ridges and grooves and the irregularities of the local ridges. Fingerprints are an effective means of personal identification because of their uniqueness (different people, different fingers) and stability (lifetime is basically unchanged) [11]. In automatic feature extraction and matching, we define ridge features as two types, ridge bifurcation and ridge end, which are often referred to as feature points or details.

2. Methodology

Feature extraction is the expression of the fingerprint uniqueness of the fingerprint image, the line breakpoint, the intersection point and other features of the uniqueness of the fingerprint. Dip your finger in the ink, press it on the paper, and prepare it by camera or scanner. This method is not reliable because the ink will bleed so that all or part of the fingerprint image is blurred. Therefore it is not suiTable for AFIS [12]. As a typical image recognition problem, AFRT research has a long history. Most fingerprint recognition systems rely on the extraction of fingerprint feature points to achieve fingerprint recognition. The process of feature extraction includes normalization of fingerprint image, calculation of direction map, calculation of effective area of image, calculation of fingerprint frequency, enhancement of fingerprint image, binarization, thinning of fingerprint image and post-processing of thinning [13]. Many fingerprint images obtained in practice are of low quality, and the ridge structure of fingerprint images with low quality is difficult to be accurately measured [14]. The image quality has been greatly improved by enhancement processing, but further processing is needed to extract features, i.e. pre-processing of feature extraction. Preprocessing includes direction estimation, segmentation and refinement. Fingerprints can be regarded as a structure with a certain direction. Direction estimation is the dominant direction for estimating ridges in each block. It requires not only the removal of invalid regions as far as possible, but also the preservation of effective regions as completely as possible, which requires an effective and accurate segmentation algorithm.

Through the test of fingerprint identification system, Table 1 lists the time taken by each part of fingerprint identification.

Table 1 Time required for each part of fingerprint identification to run (in seconds)

Project	Normalization	Directional graph	Effective area	Fingerprint frequency	Fingerprint enhancement	Two valued	Refinement post-processing
Time	0.08	0.147	0.158	0.068	0.982	0.06	0.314

The purpose of fingerprint image segmentation is to distinguish the poor quality region of the image from the effective region, so that subsequent processing can be concentrated in the effective region [15]. Due to factors such as image noise, many of the feature points extracted from the above algorithm are to be deleted. The server of the city fire center writes the IP address of each building server to be detected when the system is set up. This Table is called the system registry. In this way, the system can get the last system setting when restarting or repeating the test. In the fingerprint entry, even if the fingerprint image recorded twice by the same finger is not exactly the same, various deformations such as panning, rotation, and the like are generated. Computational pattern is used to enhance fingerprint image, so calculating the pattern is an important step, which directly affects the effect of image enhancement. The wrong pattern will eventually lead to the wrong image enhancement. System control software mainly performs initialization configuration and common system functions. After initialization configuration is completed, it waits for user's request. At this time, in order to save power, the system can be placed in a low-power operation state, such as

putting the DSP in a deep sleep state, closing the CMOS image sensor and so on. With the development of IC chip and DSP technology in recent years, the application and development boom of AFRT has begun to emerge. On the basis of reviewing the three main achievements of AFRT research and application, this paper presents the author's views on the comprehensive performance evaluation of AFRT system.

Fingerprint recognition algorithm has a high processing speed, which can meet the speed and time required for the operation of fingerprint recognition algorithm. The whole algorithm operation process is shown in Figure 1.

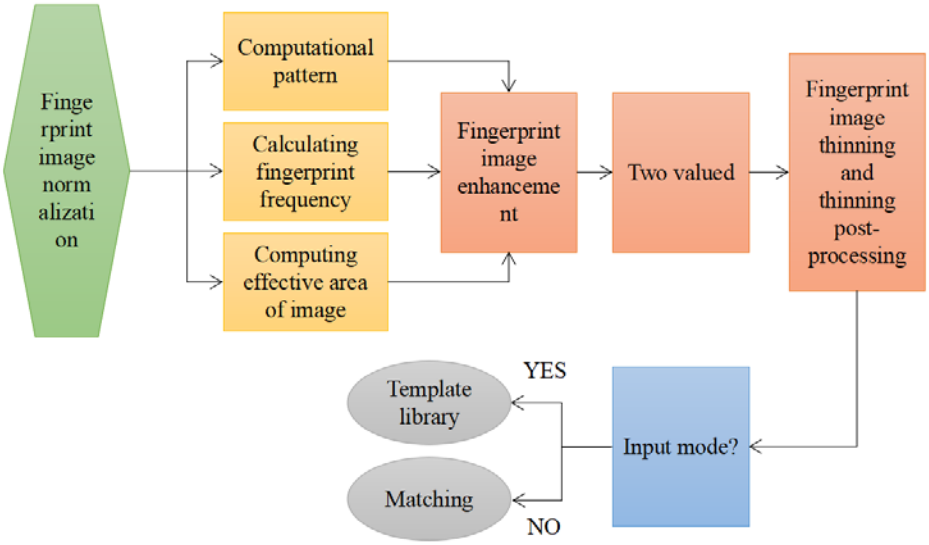

Fig.1. Fingerprint Recognition Algorithmic Flow

3. Result Analysis and Discussion

The key technologies of AFRT applications are roughly divided into: sensor technology, namely fingerprint acquisition technology; image processing and analysis, identification problems; application system design and development issues. The fingerprint sensor is a device for collecting fingerprints and is an essential device for all AFRT systems, which has a very important impact on the performance of the AFRT system. All software parts are stored in the Flash program memory, and the DSP's boot mode selection is initiated from off-chip Flash. In this case, once the system is powered up, the DSP executes the off-chip boot mode. First, the system control software is downloaded to the chip and execution begins. To effectively match, the various deformations must be minimized. Considering that the various nonlinear deformations of the fingerprint are usually radioactive, we decided to perform fingerprint matching in the polar coordinate system. Effective area refers to a clear fingerprint area composed of ridges and valleys, which we call foreground, but not a fingerprint area or a noisy area, which constitutes the background. In addition, because of the existence of non-linear deformation, it is difficult to find the feature points which are exactly consistent with the position of the feature points in the fingerprint template, so the matching algorithm should be flexible. That is to say, the allowable frame is introduced into the system to realize elasticity because of the errors caused by non-linear deformation in a certain range. At present, a lot of research work has been done on fingerprint image segmentation. In this paper, a fingerprint image segmentation algorithm based on directional pattern characteristics and mathematical morphology is used to obtain a better segmentation effect.

The DSP matches the processing result with the feature fingerprint extracted in FLASH, and then outputs the matching result to the peripheral through the communication module to display the recognition result. The system structure block diagram is shown in Figure 2.

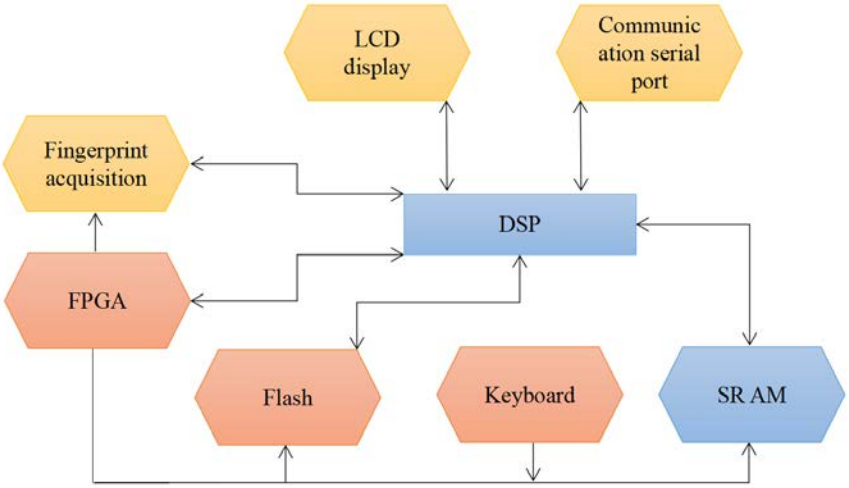

Fig. 2. System Structure Block Diagram

The general method of image segmentation is variance segmentation based on image gray characteristics, but this method is not suiTable for low contrast or enhanced images. So we need to enhance the fingerprint image, fingerprint image enhancement mainly includes standardization and filtering. Segmentation can not only improve the accuracy of feature extraction, but also greatly reduce the time of fingerprint preprocessing, so it is an important part of fingerprint image processing. At present, the calculation of fingerprint pattern is mainly divided into two categories: the method of predefining several discrete directions and the method of using continuous directions. Fingerprint lines have strong directionality, so the direction segmentation algorithm for fingerprint image segmentation using directional pattern is a more commonly used method. The segmentation effect of this method depends on the reliability of the obtained point pattern, but is insensitive to the contrast of the image. In order to facilitate feature extraction, image segmentation must be carried out, first of all, foreground/background segmentation. Fingerprint image acquisition must contain many invalid regions. To calculate the effective regions of the image is to remove these invalid regions, so as to avoid affecting the final recognition effect. And the elastic deformations caused by different degrees of force are different when the finger is pressed on the paper, and the impressions obtained will change. Another major drawback is time-consuming. The application of mathematical morphology can simplify and decompose complex shapes in images, and extract meaningful shape components from blurred information.

4. Conclusions

Preprocessing is the first step in the automated fingerprinting process. A key factor in the design of the embedded fingerprint identification system is the running time. The hardware platform based on the ADI ADSP BF533 DSP can greatly reduce the running time of the system and its cost is also low. In addition, in order to speed up the speed of fingerprint recognition, it should also consider simplifying the preprocessing of the image to achieve direct extraction of fingerprint detail features on the grayscale image. The author believes that objectively and accurately evaluating the performance of the system, it is far from enough to focus on FRR and FAR. Using the ICMP protocol, multi-threading technology and Winsock programming are adopted. This system can test the accessibility of building servers in key fire prevention units in time and in real time, which reduces the burden of network administrators, reduces the running time of system detection and improves the efficiency of system detection. Its quality directly affects the effect of AFRS system. CMOS image sensor OV7141 with small size, low price and excellent performance is used to collect fingerprints, high-speed DSP processor is used to calculate fingerprint images, and CPLD is used to control most of the peripheral period of the system, which saves the resources of DSP. In addition to the uniform, fair and close to the actual fingerprint database performance testing, we should comprehensively evaluate the performance, and pay attention to other parameters such as

FER. It is of great significance for the actual construction of fingerprint identification system.

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