# A login strategy using fingerprint verification

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***Abstract***—*So far, majority of applications and websites mainly use traditional login method based on username and password. These identity authentication systems acquire two steps that users must execute. Firstly, users must complete registration. Secondly, they must enter correct username and password to login, only these two steps will spend seven or eight minutes. Moreover, the account can be forgotten, lost and stolen. So this paper proposes a technique which based on fingerprint verification. When logged in, people only need to brush fingerprint to verify identity. This kind of login method is simple and quick, safe and reliable.*

***Keywords***—*system login, account security, fingerprint verification*

## I. INTRODUCTION

The global number of Internet users has increased dramatically in recent years. Authentication, thus, becomes pretty important for these applications. Traditional identification method such as identity cards, credit cards, passwords and other holdings or knowledge may be lost or forgotten[1]. Applied to cloud computing and standard X.509 certificate-based PKI authentication framework, SSL Authentication Protocol (SAP) [2] is proved that has low efficient. Recent years, identity-based cryptography (IBC) develops very quickly and is used for all kinds of websites widely [3-5]. Another popular method is digital signature authentication technology based on certificate such as Kerboros protocol. This authentication technology must be on the basis of perfect certificate authority center CA system. However, it requires users to establish a legitimate and judicial third party to participate in the certification. And the current prevalently used method which is based on user ID and password need to fulfill the next operation:

- Registration, this operation will spend five or six minutes.

- Login, the step probably need to expense 40 seconds.

- Filling in the verification code will cost about 30 seconds.

- If the password is forgotten, the password-recovery process will take four or five minutes.

However, this method is complicated and time-consuming. On the one hand, the system database need to store a lot user identity information. Since the users of some popular application up to billion level, thus cause a serious burden to the server. For algorithm itself, verify the identity of users also requires a certain period of time, so users` experience will be poor.

In this paper, we put forward a login method using fingerprint verification which employ the popularly used U disk to store the fingerprint information of the user. When users select to login, they only brush fingerprint can realize authentication. In the method, users do not need to remember the complex username and password, greatly enhance the user experience.

## II. THE SYSTEM LOGIN METHOD BASED ON FINGERPRINT VERIFICATION

### A. Fingerprint U Disk

1) ***Product Introduction:*** The fingerprint U disk is designed for systems involving secret or having a higher level of security requirements. It ensures security of data access through the patent technology of living fingerprint acquisition by scraping and co-processing system architecture. Meanwhile, it supports PKI system and various encryption means, thus to guarantee the safety of communication channel, and it also provides false finger motoring function. Besides, it also can finish the storage and comparison of fingerprint in fingerprint U disk or achieve it through secure network connection.

2) ***Product Characteristics:*** The fingerprint U disk in addition to possess the characteristics of a compact and portable shape, an encryption storage of data and fingerprint acquisition function that other common fingerprint U disk have, but also has the following specials (see in table 1):

Table 1 table of product specifications

| project \ model | | TCR4 | |
|---|---|---|---|
| **Acquisition performance** | Sensor category | scratch type of sensor | |
| | Effective collection width | 12.4MM | |
| | resolution | 508DPI | |
| | Scratch speed | Up to 40CM/S | |
| | Adaptability | Suitable for the weather conditions of high and low temperature, dry and wet. | |
| **Equipment performance** | FRR | < 0.1% | |
| | FAR | < 0.001% | |
| | Extraction time of fingerprint template | 220mS（image size144*384，381DPI） | |
| | Average comparison time | < 14mS | |
| **interface** | Communication interface | USB interface | Supports DB9 serial interface |
| | Transmission speed/baud rate | Supports USB2.0 full speed interface | Supports 9600 ~ 115200 |
| **size** | length×width×height | 86.5mm×36mm×6mmm | |

● It adopts the scratch type of fingerprint sensor.
● It has a high scanning speed, the fingerprint capture speed can be as high as 40CM/S.
● It supports three working status of imaging, standby, sleep, with a low power consumption.
● It supports PKI system and various encryption means, to ensure the security of fingerprint data.
● It has passed the +/-15KV ESD test requirements with a benign antistatic ability.
● It looks tiny, with a good imaging quality.
● It provides two kind of serial connection USB and DB9, in order to satisfy the demands of different applications.
● It supply a secondary development interface for fingerprint software.
● It fits the certification standard of CE,FCC,UL,USB 1.1,WHQL.
● It designed with a fashionable appearance, and anti-skid.

### B. Overview of Fingerprint Identification Technology

As an identification method, biometrics has its unique advantages. It combines biological characteristics of human body and computer technology for authentication. Among the numerous biometric technologies, fingerprint based authentication technology is the most mature technology.

As we all known, the fingerprint of everybody is unique, it is made up from patterns of ridges and furrows on the surface of finger [6]. Therefore, we can put the fingerprint of someone and himself correspond through employing fingerprint recognition technology, and by comparing the fingerprint of someone with the fingerprint pre-stored, we can verify users identity. Multifarious technique including minutiae-based method [7] and texture-based approaches [8] have been applied to fingerprint recognition. Among these techniques, the approach involving the transformation of a fingerprint into a finger code [8] has got a lot attention in recent years.

1) **Steps of Fingerprint Recognition:** In general, fingerprint recognition mainly includes the following steps: acquisition of fingerprint image, pre-treatment, abstraction of feature, matching. The basic process is shown in fig1.

1. To extract fingerprint image by fingerprint U disk, in order to reduce storage space, we can make a compression processing to the acquired fingerprint image.
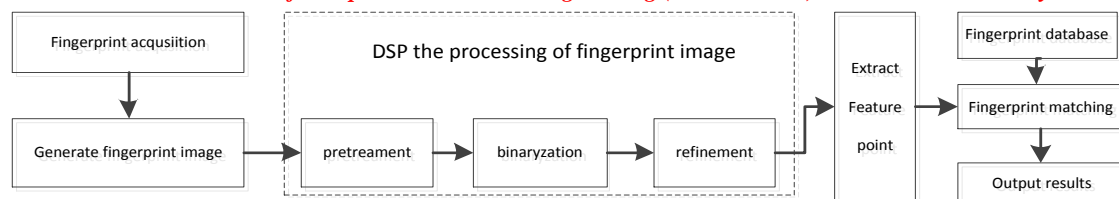
Fig 1   fingerprint identification schematic diagram

2. To make a pre-processing to the collected fingerprint image.

3. We can acquire the ridge line data from the image after pre-processing.

4. From the ridge line data, we can abstract feature points.

5. Make a one by one match for the information of fingerprint feature points with that of fingerprints stored in fingerprint U disk, then output the matching result.

### 2) *Advantages of Fingerprint Recognition*
1. Fingerprints are unique features of our body, and their complexity is sufficient to provide the feature information for the identification.
2. To enhance reliability, we only need to register more fingerprint, to identify more finger, up to as many as 10, and each one is unique.
3. The speed of scanning fingerprint is pretty fast.
4. When read fingerprint, users fingers must contact with fingerprint acquisition head. Contacting with fingerprint acquisition head directly is the most reliable method of acquiring human biological features.
5. The fingerprint acquisition head can be more miniaturized and the price can be cheaper.

### C. *Combination of Biometrics and Fingerprint U Disk*

Because fingerprint has the biometric feature of uniqueness and invariance, which is safe and convenient. Leading the fingerprint authentication technology solution into computer login and business system login can provide the following value for customer:
1. It is easy to use, users just press a finger gently, can he realize a simple and secure authentication.
2. It can ensure the authenticity of users identity in information system, eliminate the economic loss of password theft, missing and forgetting.
3. The fingerprint integration technology takes the feature value collection method, reduces the burden of storage, and improves the security of the process.
4. It can promote the image of company, but also meet the confidential requirements of the information system security presented by State Security Committee.

Therefore, we take advantage of combination of fingerprint recognition technology and fingerprint U disk, at the same time, apply the fingerprint U disk to system login, thus propose a novel login method.

### D. *Statement of The Login Method and Application Implementation*

#### 1) *Detailed Description to The Login Method*

1. After users purchase fingerprint U disk, they can gather their fingerprint by themselves and the fingerprint will be preserved in fingerprint U disk. When capture fingerprint, once the fingerprint information is stored, modification is not allowed. In order to enhance the reliability of system, users can collect a plurality of fingerprint information once.

2. When the first time to login certain system, at begin, the users insert the fingerprint U disk into the USB interface of computer, then brushes fingerprint to match the fingerprint that stored in the U disk, if success, next, the system will identify whether the hardware ID of fingerprint U disk that the user holds has already registered at this website, if not, the system will prompt the user to register. In this case, if the user agree, the system can register for the user automatically and the registered information will be saved in the fingerprint U disk, the hardware ID of the U disk will be saved in system database, so that we can use it to verify the user identity while login next time.

3. For users who have already registered successfully, while login, through brushing fingerprint performs the matching with the fingerprint stored in U disk. After successfully matched, the system will read the hardware ID of the U disk to verify with the hardware ID saved in system database. If the verification is correct, then the system will read the username corresponding to the user to display and the user can login. Finally, reach a result of directly login and do not need to manually input username and password. The flow chart of login the system is shown in Fig2:

#### 2) *Application Implementation*

The fingerprint identification system is composed of fingerprint identification equipment and platform which supports fingerprint authentication. The fingerprint U disk is connected with the user computer, realizes the function of fingerprint collection and fingerprint ratio.
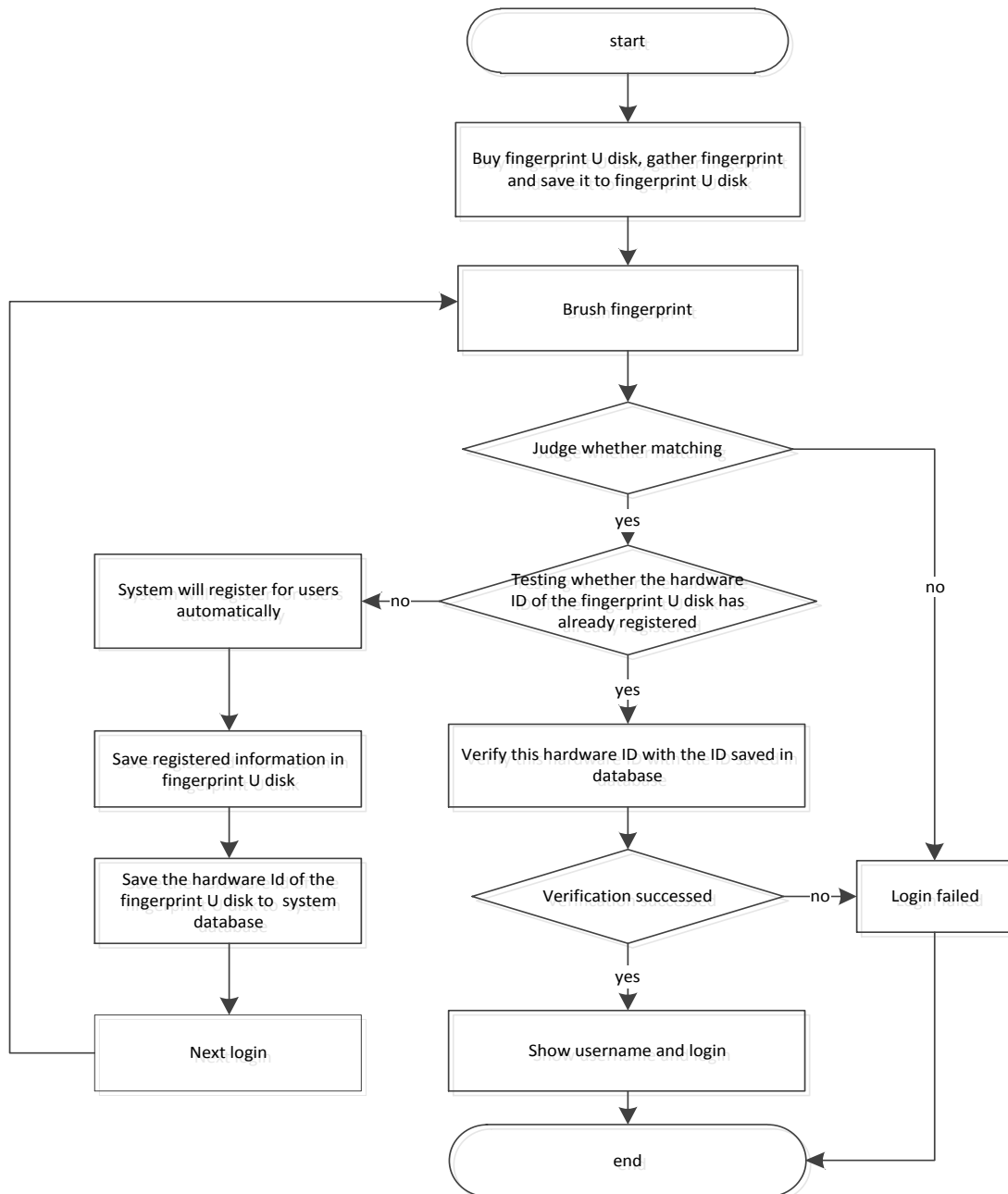
Fig 2. system flow chart

Fingerprint authentication platform achieves fingerprint verification identity through embedding authentication module in system client process.

All fingerprint identification devices are connected with the user`s computer via USB and fitted with the corresponding drive. When users need to determine the true identity, they just brush their fingerprint can reach a safe and convenient authentication. The identity verification of users can be completed by fingerprint U disk with system database. The whole system communication is encrypted through SSL, which assured data security in communication process. The application deployment of the entire system is showed as Fig 3.

## III. ADVANTAGES AND APPLICATION PROSPECT

### A. *Advantages*

In this paper, we propose a login method based on fingerprint verification and users do not need to manually input username and password. It has special merits:

1. Fingerprint instead of password to verify identity, which can avoid the management problems of missing, stealing, peeping, failure, forgetting, without replacement, issue and other maintenance, one time acquisition is effective for lifetime.
2. The identity information of users is stored in fingerprint U disk, thus reduces the burden of the database.
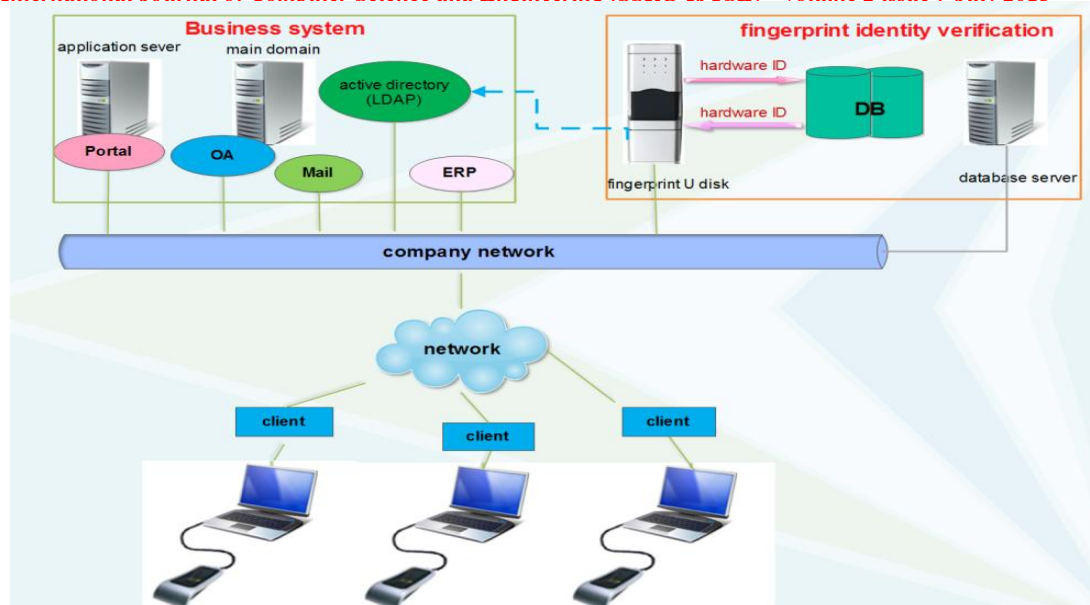
**Fig 3.** system deployment diagram

3. Because of adopting hardware verify users

4. identity, the system just testify the hardware ID, therefore it can greatly shorten verification time, improve users experience.

5. It can decrease the fill in of registration information, even free registration and the system can registered for users automatically. In contrast, it is more simple and quick.

6. The fingerprint U disk can also be used as ordinary U disk, safe and practical.

7. The U disk based on fingerprint identification technology can greatly improve the using security of U disk, it can also reduce the leakage of storage information of U disk.

8. The authentication system based on fingerprint recognition technology without modifying the original application system framework.

9. Due to the identity of person is only marked, each of us must take responsibility for our own speech.

B. *Application Prospects*

Since Fingerprint identification technology has been widely applied in various fields, so the login method proposed in this paper will have broad application prospects. It can provide convenient, safe login scheme for individual, enterprise, government and other agencies, facilitate the safety management for the department in need of confidential. Therefore, the login method will be acquired more favors among majority of users, some application websites and system can select this login strategy as the authentication method for their customer.

## IV. SUMMARY AND OUTLOOK

In this paper we put forward a novel system login method by combining fingerprint recognition technology and commonly used fingerprint U disk and at present. Compared with currently used login method, it is more secure, simple and reliable. Moreover, the same fingerprint U disk can also save several fingerprint information, so the U disk can be shared by multiple users. However, if someone has too many accounts, the U disk should possess enough space. In that case, they can consider only own an account for all applications with the same U disk.

Furthermore, if the fingerprint U disk is issued by security apartment, it can avoid minors to enter some unhealthy registered website. Thus protect the physical and mental health of teenagers. Researchers can begin to design and optimize according to these aspect.

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