

Palm Vein Technology

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Abstract :- With the increase in technology, threat to personal data and national security had also increased. The methods that were emerged to secure important information from external intercession were chancy. Thereupon was a need to introduce a technology that secures our data more efficiently from unlawful intervention. Palm vein technologies are one of the upcoming technologies which are highly secure as it uses vascular patterns as personal identification data. Vein recognition technology is secure because the authentication data exists inside the body and is therefore very difficult to forge. It is highly accurate. The palm vein image sensor is used for palm vein authentication. The device captures an image of vein pattern in the palm by emitting near-infrared rays that are absorbed by the deoxygenated hemoglobin in the veins and then reflected back to the device for image capturing[1]. This technology can be used in various fields like banking, hospitals, and government offices; in passport issuing etc. Business growth will be achieved with these solutions by reducing the size of the palm vein sensor and shortening the authentication time.

Keywords: *Palm vein, vein recognition, vascular patterns*

I. INTRODUCTION

In the ubiquitous network society, where individuals can easily access their information anytime and anywhere, people are also faced with the risk that others can easily access the same information anytime and anywhere. Because of this risk, personal identification technology, which can distinguish between registered legitimate users and imposters, is now generating interest. Currently, passwords, Personal Identification Numbers (4-digit PIN numbers) or identification cards are used for personal identification. However, cards can be stolen, and passwords and numbers can be guessed or forgotten. To solve these problems, biometric authentication technology, which identifies people by their unique biological information, is attracting attention [2]. In biometric authentication, an account holder's body characteristics or behaviors (habits) are registered in a database and then compared with others who may try to access that account to see if the attempt is legitimate.

Fujitsu, a Japanese multinational information technology equipment and services company, is researching and

developing biometric authentication technology focusing on four methods: fingerprints, faces, voiceprints, and palm veins. Among these, because of its high accuracy,

contactless palm vein authentication technology is being incorporated into various financial solution products for use in public places [3].

II. TECHNOLOGY BEHIND PALM VEIN TECHNOLOGY

The Basis of Palm Vein Technology

An individual first rests his wrist on some devices, the middle of his fingers, on the sensor's supports such that the palm is held centimeters above the device's scanner, which flashes a near-infrared ray on the palm. Unlike the skin, through which near-infrared passes, deoxygenated hemoglobin in the blood flowing through the veins absorbs near-infrared rays, illuminating the hemoglobin, causing it to be visible to the scanner. Arteries and capillaries, whose blood contains oxygenated hemoglobin, which does not absorb near-infrared light, are invisible to the sensor. The still image captured by the cameras, which photographs in the near-infrared range, appears as a black network, reflecting the palm's vein pattern against the lighter background of the palm. The palm vein image is converted by algorithms into data points, which is then compressed, encrypted, and stored by the software and registered along with the other details in his profile as a reference for future comparison. Then, each time a person logs in attempting to gain access by a palm scan; the newly captured image is likewise processed and compared to the registered one, all in a period of seconds. Numbers and positions of veins and their crossing points are all compared and, depending on verification, the person is either granted or denied access.

III. REGISTERING THROUGH PALM VEIN TECHNOLOGY

Step 1: Palm vein authentication technology consists of a small Palm vein scanner that's easy and natural to use, fast and highly accurate. The palm is to be held a few centimeters over the scanner and within a second it reads the unique vein pattern. A vein picture is taken and palm pattern is registered.

Step 2: The registered palm pattern is stored into the database along with the personal details of the client.

IV. WORKING OF PALM VEIN SECURITY SYSTEMS

1. One should place his/her palm near to scanner.
2. The scanner makes use of a special characteristic of the reduced hemoglobin coursing through the palm veins — it

absorbs near-infrared light. This makes it possible to take a snapshot of what's beneath the outer skin, something very hard to read or steal.

3. The integrated optical system in the palm vein sensor uses this phenomenon to generate an image of the palm vein pattern and the generated image is digitized, encrypted and finally stored as a registered template in the database.

V. HOW SECURE IS THE TECHNOLOGY?

As the patterns of an individual's two hands differ, the hand used on registration must be used for logging in. No two people in the world share a palm vein pattern - even those of identical twins differ. And if you registered your profile as a child, it'll still be recognized as you grow, as an individual's patterns of veins are established in uterus (before birth). Over and above the device's ability to perform personal authentication was verified taking into account the age factor, the state of the person whether drunk or not, just after a bath etc.

VI. WHAT HAPPENS IF THE REGISTERED PALM GETS MUTILATED?

It may happen that the palm we had registered may get mutilated [4]. In such a case we cannot use this technology, so during the time of registration we take the veins of both the hands so that if one gets damaged we can access through the second hand. When hand gets mutilated up to large extent we can get veins because deeper into the hand veins are obtained. When we apply this method we can maintain complete privacy.

VII. CONTACT LESS PALM VEIN AUTHENTICATION DEVICE (HYGIENE CONCERN)

The complete contactless feature of this device makes it suitable for us where high levels of hygiene are required [5]. It minimizes hygiene concerns and psychological resistance. Fujitsu is a pioneer in designing a completely contactless palm vein authentication device. With this device, authentication simply involves holding a hand over the vein sensor. The completely contactless feature of this device makes it suitable for use where high levels of hygiene are required, such as in public places or medical facilities. It also eliminates any hesitation people might have about coming into contact with something that other people have already touched.

In addition to being contactless and thereby germ-free and fool-proof, palm vein authentication is highly secure in that the veins are internal to the body and carry a wealth of information, thereby being extremely difficult to forge.

VIII. WHY PALM SECURE FOR SECURITY?

- Vein patterns are unique to individuals and contain detailed characteristics for formulation of algorithm template. The sensor of the palm vein device can only recognize the pattern if the deoxygenated hemoglobin is actively flowing within the individual's veins.

- Contactless authentication is hygienic and non-invasive, thus promoting high-level of user acceptance.
- Advanced authentication algorithm produces high level of accuracy and application versatility.
- Technology based on more than two decades of Fujitsu image recognition experience [6].

IX. ADVANTAGES

In addition to the palm, vein authentication can be done using the vascular pattern on the back of a hand or a finger. However, the palm vein pattern is the most complex and covers the widest area, because the palm has no hair, it is easier to photograph its vascular pattern. The palm also has no significant variations in skin color compared with fingers or back of the hand, where the color can darken in certain areas.

X. APPLICATIONS

This palm vein authentication technology is used in various areas for more security. The following are some of the important areas where it is used.

A. ATM

This amenity which features high security for customers using vein certification does not require a bank card or pass book [3]. Further it prevents withdrawals from branches other than the registered branch and ATMs thereby minimizing the risk of illicit withdrawals. To open a Bio-Security Deposit account, customers go to a bank and have their palm veins photographed at the counter in order to view secure data management, the palm vein data is stored only on the vein data base server at the branch office where the account is opened. Later on, a card facility was introduced. This card combines the functions of a bankcard, credit card, electronic money and palm vein authentication. The card encloses the customer's palm vein data and palm authentication algorithms and performs vein authentication by itself. This system is advantageous because the customer's information is not saved in the bank.

B. Personal Computers

In personal computers palm vein technology can be applied, by inserting the vein sensor inside mouse. When power is supplied to system the mouse also gets power and the sensor in the mouse will be ready to sense palm veins. When one places his/her palm the sensor senses the veins and if they are matched with the registered one the system allows the person to use it. One can use this mechanization even to lock folders, so that privacy can be maintained.

C. In Hospitals And Libraries

A public library in Japan is set to become the first in the world to use palm-vein biometrics as a substitute for conventional library cards. The University of Tokyo hospital has taken delivery of a contactless palm vein authentication system to secure physical access to its Department of Planning, Information and Management.

D. Authentication

In front of our homes we can apply this Palm vein technology so that by registering the veins of our family members and relatives we can maintain high range security which is not possible through other technologies. Japanese recently used this technology before front doors and getting high range security.

XI. CONCLUSION

Palm vein pattern authentication technology developed by Fujitsu was being used in a wide range in Japan. Sooner or later this higher end security system use will be inevitable in the world. This is surely going to ensure fool proof tamper free security systems and different other advantages also. Surely this technology will bring a revolution in the field of science and technology in the near future.

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