Palm Vein Technology Security

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Abstract: Forget about signatures and photo IDs, forget about PIN numbers, forget about fingerprint, voiceprint, iris scan, or facial recognition security technologies to counter forged or stolen user IDs. Palm vein ID authentication, which uses an infrared sensor to capture the user's vein pattern unique to every individual's palm for an exquisitely sensitive biometric authentication technique. The palm vein scanner has no deleterious effect on the body, nor does it require that the device be touched, unlike current fingerprint scanners, other limitations of various other technologies are related to measuring external features. On the contrary, palm vein recognition seems not to be affected by aging; neither cuts, scars, tattoos, nor skin color affect the scan's outcome; and, given that veins are internal, they can hardly be tampered with. As we increasingly rely on computers and other machines in our daily lives, ensuring the security of personal information and assets becomes more of a challenge. To help deal with this growing problem, Fujitsu has developed a unique biometric security technology that puts access in the palm of your hand and no one else's.. In all these applications, the key to securing your assets and data will be in the palm of your hand. The new technology has many potential applications such as an ultra secure system for ATMs and banking transactions, server log in system, an authorization system for front doors, schools, hospital wards, storage areas, and high security areas in airports, and even facilitating library lending, doing away with the age-old library card system.

Keywords: Facial recognition, infrared, sensor, biometric, voiceprint

1. Introduction:

Fig 1: PalmVeinTechnology.

How secure are your assets?

Can your personal identification number be easily guessed? As we increasingly rely on computers and other machines in our daily lives, ensuring the security of personal information and assets becomes more of a challenge. If your bank card or personal data falls into the wrong hands, others can profit at your expense. Fujitsu's palm vein authentication technology consists of a small palm vein scanner that's easy and natural to use, fast and highly accurate. Simply hold your palm a few centimeters over the scanner and within a second it reads your unique vein pattern. A vein picture is taken and

your pattern is registered. Now no one else can log in under your profile. ATM transactions are just one of the many applications of this new technology. Fujitsu's technology capitalizes on the special features of the veins in the palm.

Vein patterns are unique even among identical twins. Indeed each hand has a unique pattern. Try logging in with your left hand after registering with your right, and you'll be denied access. 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.

2.   The Basis of Palm Vein Technology:

Palm vein authentication uses the vascular patterns of an individual's palm as personal identification data.

An individual first rests his wrist, and 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 light 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 camera, 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. An individual's 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 to a particular bank account or secured entryway, etc., the newly captured image is likewise processed and compared to the registered one or to the bank of stored files for verification, 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.

Fig 2: Palm graph.

3.   How it works:

Carolina HealthCare System is the first known healthcare provider in the US to use the technology, which pairs a palm scanning device made by Fujitsu with a durable cradle and software system that the hospital designed itself. Incoming patients are asked to place their middle finger between two prongs at the top of the cradle to make sure their palm is properly positioned. The scanner uses near-infrared light to map the vein patterns in a patient's palm. The digital image is converted into a number that correlates with the patient's medical records. Vein patterns in a palm are considered more unique than a fingerprint. Since a number, not an image, is stored with the palm scanner, there is no chance an identity could be stolen and illegally reproduced.

Fig 3: Working of Palm vein

4.   Features of palm vein technology:

Vein patterns are unique to individuals and contain detailed characteristics for formulation of algorithm template. Based on research to date by Fujitsu, Advanced authentication algorithm produces high level of accuracy.

♦   Leading-edge authentication system verifies an individual's identity by recognizing the pattern of blood veins in the palm.

♦   Vein patterns are unique to individuals and contain detailed characteristics for formulation of algorithm template. Contact less authentication is hygienic and non-invasive, thus promoting high-level of user acceptance. Advanced authentication algorithm produces high level of accuracy and application versatility.

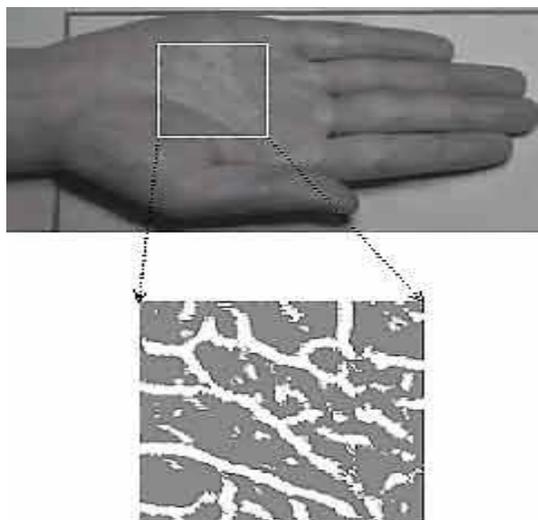♦   Extremely difficult to forge, thereby enabling a high level of security

Fig4: Pattern of blood veins in palm.

5.   How Secure is the Technology?

On the basis of testing the technology on more than 70,000 individuals, Fujitsu declared that the new system had a false rejection rate of 0.01% (i.e., only one out of 10,000 scans were incorrect denials for access), and a false acceptance rate of less than 0.00008% (i.e., incorrect approval for access in one in over a million scans). **Also, if your profile is registered with your right hand, don't log in with your left - the patterns of an individual's two hands 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 utero* (before birth). No two people in the world share a palm vein pattern - even those of identical twins differ.

6.   Advantages:

6.1. Difficult to forge

Because palm veins are beneath the body surface, they are extremely difficult to forge. Compared to the pattern of veins in fingers or the back of the hand, palm vein patterns are more complex - again, increasing they are less affected by temperature and other external impacts.

Fig 5: Preparing patient's id from scanner

6.2. High applicability

Unlike fingerprint-based authentication methods, for which registration and verification of biometric data cannot be successfully completed if the surface of the skin is impacted by abrasion or dryness, contact less palm vein authentication has negligible susceptibility to such external factors.

6.3. High user acceptance

In addition to requiring no direct contact with the sensor surface, the non-invasive scanning process is carried out in a simple and natural manner that is not awkward to the user. This alleviates potential psychological resistance due to concerns regarding hygiene or difficulty of use.

6.4. High Security

As the vein pattern registration and the authentication process are both done within the IC card, the client's financial transaction can be highly secured without leak of the personal data. The addition of IC card and authentication function to the existing branch office system developed by Fujitsu, the incumbent SI vendor for the system, enables cost-effectiveness and short lead-time of the deployment.
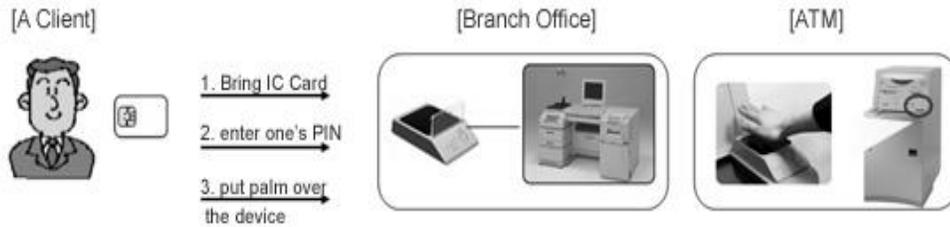
Fig 6:   Financial Transaction Process

7.   Applications:

The Palm Secure sensor is a biometric authentication device offering very high accuracy through the use of internal physiological characteristics to support the demands of high level security applications. The Palm Secure sensor can be applied to use in access control systems, system log in solutions and for personal authentication solutions. There are many market segments which are already requiring biometric solutions or which are very close to adopting biometric security solutions

7.1.Accesscontrol

The Palm Secure sensor can be integrated into an access control system as either a standalone or a networked solution. This ensures a high level of authentication performance providing secure access to authorized individuals only for buildings, villas, apartments, and restricted areas and individual rooms.

Fig 7: Access control.

7.2.Banking-ATM

Breaches of credit card server security and the incidence of card forgery and theft have highlighted the need for an increase in the security measures employed. The application of biometric solutions in ATMs or bank teller machines provides this high security environment. By using a smartcard, on which the client's unique palm vein pattern is stored, the client can authorize himself at an ATM by scanning his palm vein pattern to let the ATM compare it with palm vein pattern stored on the smartcard.

Fig8: Banking-ATM

7.3. E-Commerce & Web Applications

An increasing number of customers are using the Internet for online banking and card holder not present transactions. To achieve a higher security level for such online financial transactions Fujitsu's Palm Secure sensor can be used to authorize users' access to dedicated trading web pages.

Fig9: Web applications

7.4. Biometric ID card, E-Passport

To improve passports and ID-cards against forgery government and authorities need to apply biometric and embed biometric data in documents. The palm vein pattern is almost impossible to
Forge and is therefore ideal for such applications.

Fig 10: Passport and ID card

7.5.SystemLogin

The Palm Secure sensor can be also used for protecting sensitive computer networks or even data on an individual PC/notebook from unauthorized access. The palm vein pattern can be requested when a system is booting up (i.e. BIOS) or when the operating system is started replacing the password or to restrict user access to certain applications or data areas.

Fig 11: System login

7.6.Automotive

Even with newest electronic anti-theft devices, the rate of stolen cars is still increasing. By using biometrics, like the Palm Secure sensor, the car ignition systems can be enabled by registered persons only. Palm Secure can also be employed to control access to cruise ships for passenger registration during boarding and disembarking.

Fig 12: Automative

7.7. Medical Environment

In the medical environment there is a strong demand for especially hygienic biometric devices. Fujitsu Palm Secure meets this need by being a non-contact device. Applications can ensure access patient data is restricted or to maintain access to specific laboratories to the authorized. Computer systems can have an equal high security application allowing system log-in to approved medical staff. The Palm Secure sensor can also be used to register medical patients and to secure prescription distribution.

Fig 13: Medical environment

8.   Conclusion:

Fujitsu's technology capitalizes on the special features of the veins in the palm. Vein patterns are unique even among identical twins. Indeed each hand has a unique pattern.   Bank card security isn't just the responsibility of the end user. Financial institutions around the world are being urged to take a greater role in preventing bank card fraud by improving card security. Japan's Financial Services Agency, for instance, has called on banks to implement added security measures such as introducing biometric identification systems. Fujitsu's palm vein authentication technology will help stop this new wave of crime, and can also be adapted for use in access to secure as well as online transactions, customer identification and claiming baggage.

The opportunities to implement palm vein technology span a wide range of vertical markets, including security, financial/banking,healthcare, commercial enterprises and educational facilities. Applications for the device include physical admission into secured areas; log-in to PCs or server systems; ATMs or kiosks; positive ID control; and other industry-specific applications. With the new palm vein authentication device and with considerable experience in image recognition, Fujitsu expects to be a leader in providing solutions for the biometric security industry.

References:
[1]   **www.fujitsu.com**
[2]   **www.biometrics.org**
[3]   **www.networkworld.co**m
[4]   **www.cxotoday.com**