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IDENTITY VERIFICATION has become increasingly important in many of the modern life such as, electronic government, medical administration systems, access control systems for secure areas, passenger ticketing, home office and home studying environments. However, current methods for identity verification, such as code numbers, passwords, and smart cards carry the risk of loss, theft, forgery or unauthorized use. BIO-METRIC authentication technology which authenticates, physiological data, is a non-transferable way to supplement or serve as an alternative to other systems.

Although bio-metric authentication is being used by companies and government authorities, it must become less intrusive and more hygienic for it to gain wider acceptance. Here we look into the contact less palm vein authentication device that uses blood vessel patterns as a personal identifying factor. The vein information is hard to duplicate since veins are internal to the human body.

The palm vein authentication technology offers a high level of accuracy, and delivers the following results: a false rejection rate (FRR) of 0.01%, and a false acceptance rate (FAR) of 0.00008% or lower, based on a research using the data of 140,000 palms. Several banks in Japan have used the palm vein authentication technology for customer identification since July 2004. Recently, an integrated technology introduced this into the access control of electronic door lock systems. Further expansion of applications for this technology is going on by downsizing the sensor and improving the verification speed.

INTRODUCTION

- The world’s first-ever ‘contact less palm vein authentication technology’.
- In terms of authentication precision, the system has a false rejection rate of 0.01% and a false acceptance rate of less than 0.00008% out of the 1,50,000 Palms profiles tested.

This new technology uses a device that distinguishes blood vein patterns in the palm with no need for physical contact. As the hand is held over the sensor device, infrared light is used to capture an image of the palm. The software then extracts the vein pattern and compares it against patterns already stored in database in order to verify the identity.

Since the palm floats in mid-air, when using a contact less system, there is no height or palm positioning restrictions in relation to sensor device. So, technology is developed that can detect palm positions and reliably verify palm vein patterns at high speeds even if the sensor
device is installed in different locations. Environmental lightening, which is used in order to capture a variety of palm positions also controlled optimally.

The sensor device used in this system can be embedded in a variety of equipment. Embedded in the wall it can be used for access control to secure areas. Integrated into electrical Equipment, such as personal digital device, it could be used to authorize user access. In public spaces or medical facilities, where hygiene is a particular concern, the contact less feature of this system makes it useful.

- **Palm vein authentication**

  Palm vein authentication uses the vascular patterns of an individual’s palm as personal identification data. Compared with a finger or the back of a hand, a palm has a broader and more complicated vascular pattern and thus contains a wealth of differentiating features for personal identification.

  The palm is an ideal part of the body for this technology; it normally does not have hair which can be an obstacle for photographing the blood vessel pattern, and it is less susceptible to a change in skin color, unlike a finger or the back of a hand. The deoxidized hemoglobin in the vein vessels absorb light having a wavelength of about $7.6 \times 10^{-4}$ mm within the near-infrared area. When the infrared ray image is captured, unlike the image seen in Fig.1, only the blood vessel pattern containing the deoxidized hemoglobin is visible as a series of dark lines as shown in figure: 2.
Based on this feature, the vein authentication device translates the black lines of the infrared ray image as the blood vessel pattern of the palm as in figure :3, and then matches it with the previously registered blood vessel pattern of the individual.

**Fig. 3. Extracted vein pattern**

- **Implementation of contact less palm vein authentication**

  The contact less palm vein authentication technology consists of image sensing and software technology. The palm vein sensor as shown in figure:4

**Fig. 4. Palm vein sensor**

Captures an infrared ray image of the user’s palm. The lighting of the infrared ray is controlled depending on the illumination around the sensor, and the sensor is able to capture the palm image regardless of the position and movement of the palm. The software then matches the translated vein pattern with the registered pattern, while measuring the position and orientation of the palm by a pattern matching method.

  Implementation of a contact less identification system enables applications in public places or in environments where hygiene standards are required, such as in medical applications. In addition, sufficient consideration was given to individuals who are reluctant to come into direct contact with publicly used devices.
Product development geared toward financial solutions

A rapidly increasing problem among financial sectors in Japan is the illegal withdrawal of bank funds neither using stole nor skimmed fake bankcards. To address this, palm vein authentication has been utilized for customer confirmation of transactions at bank windows or ATMs. The smart card from the customer’s bank account contains the customer’s palm vein pattern and the matching software of the palm vein patterns. A palm vein authentication device at the ATM as in fig:5 scans the customer’s palm vein pattern and transfers it into the smart card. The customer’s palm vein pattern is then matched with the registered vein pattern in the smart card. Since the registered customer’s palm vein pattern is not released from the smart card, the security of the customer’s vein pattern is preserved. In 2004, the Suruga Bank and the Bank of Tokyo-Mitsubishi in Japan deployed a secured account service utilizing the contact less palm vein authentication system. Several other banks in Japan have followed suit in 2005. Fujitsu plans to develop another type of ATM (Fig.6)

Fig.5. ATM with palm vein pattern authentication sensor unit
Access control device using palm vein authentication

The palm vein pattern sensor is also used for access control units. The “palm vein authentication access control device” (Fig.7)

Fig.6. ATM for convenience stores with downsized palm vein pattern sensor unit for use at convenience stores in Japan, embedding the palm vein authentication sensor in the ATM.

As a result of the Fujitsu research using data from 140,000 palms (70,000 individuals), Fujitsu has confirmed that the FAR is 0.00008% and the FRR is 0.01%, with the following condition: a person must hold the palm over the sensor for three scans during registration, and then only one final scan is permitted to confirm authentication. In addition, the following data has been used to confirm the accuracy of this technology: data from 5-year to 85-year old people of various backgrounds based on statistics from the Ministry of Internal Affairs and Communications of Japan’s population distribution; data from foreigners in Japan based on the world population distribution announced by the U.N.; data of the daily changes of Fujitsu employees tracked over several years; and data of various human activities such as drinking, bathing, going outside, and waking up.

Results of practical experiments

Plus the control unit that executes the authentication processing and sends the unlock instruction. A simple configurations system can be achieved by connecting this device to the electric lock control board or electric locks provided by the manufacturer.

Fig.7. Palm vein access control unit

Is comprised of the palm vein pattern sensor, a keypad and a small display. This device controls access to rooms or buildings that are for restricted personnel. The device consists of two parts: the palm vein sensor,
• **Conclusion**

Palm vein authentication technology offers contact less authentication and provides a hygienic and noninvasive solution, thus promoting a high-level of user acceptance. it believes that a vein Fig.7. Palm vein access control unit Print is extremely difficult to forge and therefore contributes to a high level of security, because the technology measures hemoglobin Flow through veins internal to the body. The opportunities to implement palm vein technology span a wide range of applications.

• **References**
