

Palm Vein Pattern Authentication Technology

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Abstract- A contactless palm vein pattern authentication technology that uses vein patterns for biometric identification. This recognition technology is secure because the pattern that lies inside the body and as a result it is very difficult to copy. It is very much accurate — in a test using 140,000 palm patterns of 70,000 people, it had a false rejection rate of about 0.01%* and false acceptance rate which is not more than 0.00008%.

Keywords- Contactless palm vein authentication, NearInfrared, PalmSecure, Reflection photography, Vascular pattern authentication.

I. INTRODUCTION

In the present society, where information can be accessed easily anywhere and anytime, individuals also face the risk where other people can simply access their information. Because of this risk, palm vein identification technology, which is able to distinguish between previously registered users and pretenders, is gaining interest.

Currently, PIN numbers, passwords or ID cards are used for identification of a person. However, cards can be broken, and passwords and numbers can be predicted or forgotten. To resolve these problems, palm vein verification technology, which recognizes people by their exclusive vein information, is attracting people's attention. In this technology, an card holder's characteristics or behavioral habits are saved in a database and then verified next time with users who may attempt to access that account to check if the tried login is authentic.

Palm vein authentication system is introduced in this paper. It focuses on PalmSecure, an scanner that has been developed by fujitsu for market, in an effort to generalize and use PalmSecure for biometric verification.

II. IMPLEMENTATION

Palm vein authentication is a comparison technique that compares the vein patterns in the palm (that seem as blue lines) of a person who authenticates with a outline which is stored in a database.

Vein patterns are exclusive to each single, research says — even twins have unique patterns. And since the vein patterns are existing inside the body, they cannot be whipped by any means such as photography, voice recording or fingerprints, thus making this method of verification more secure than any of the extra methods.

A. Principles of vein pattern authentication

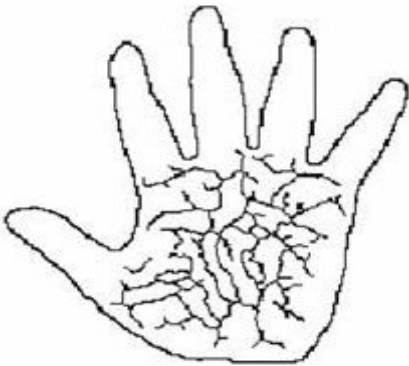
Hemoglobin contained in our blood is oxygenated in the lungs and this oxygen is carried to the tissues through the arteries. After the oxygen is released to the tissues, the deoxidized hemoglobin is pass return to the heart via the veins. Hence both these types of hemoglobin have variable rates when it comes to absorbency 1. In the near-infrared area deoxidized hemoglobin absorbs rays at a wavelength of nearby 760 nm. When the palm is irradiated with nearinfrared ray, in contrast to the image visible to the normal human eye [Figure 1], this hemoglobin absorbs this ray, and thereby decreasing the reflection which causes the vein to look like a black pattern [Figure 2]. In authentication working on this standard, the region used for verification is snapped or scanned with near-infrared rays, and the vascular pattern is checked by image processing [Figure 3] and registered. The vascular pattern of the individual who logs in is then checked against the stored pattern in database.



1. Visible Ray Image



2. Infrared Ray Image



3. Extracted Vein Pattern

B. Benefits of using the palm

Along with palm vein, verification can also be done using the pattern on the other side of the hand or a finger. But, the palm vein pattern is the most complex and wide area. Since the palm does not have hair, it is easy to capture its pattern. Also the palm has no variations in skin color of the hand or fingers, where the color can vary in certain areas.

C. Benefits of reflection method

There are different methods of capturing vascular patterns: reflection and transmission. Fujitsu uses the former method.

The replication method irradiates the hand and captures the rays that is reflected back from the hand, in the transmission method captures rays that passes through the palm. Both types photographs the nearinfrared rays passing off by the area used for verification after dispersion.

Reflection and transmittance varies in how they react to differences in the ray transmission from palm. Sometimes if because of decrease in nearby temperature if the body temperature lowers, the blood veins contract, which ultimately lower the blood through the body. This upsurges light transmission from hands, so that rays can pass through it. If the transmittance from hands is high, it can get saturated with light and light can easily penetrate through the hand. In the Thus, this results in a low contrasted image and light in transmittance method in which it is difficult to view the vessels. With another method, the vessels can be viewed even when the hand is cool, because a light transmission does not really affect the contrast of the reflected light.

The system alignments of both the methods also vary expressively. The reflection method scans the palm and captures light which is reflected back from the palm, so the brightness and apprehended components can be placed in the same place. Moreover, because the transmission method captures light passing through the body, the sanpped and bright components must be placed in different positions. This makes it hard for this system to be embedded into other smaller like notebook, computers or mobiles. An in-depth study of the require components to reduce the size of the sensor, making it suitable for embedded presentations has been carried out.

D. Non-contact design minimizes hygiene worries and psychological resistance

The focus is also to design a completely contact free authentication device. In this device, authentication consists of holding body part over the sensor.

This contactless feature of the device makes it accurate for use where very high level of hygiene is necessary, Example in public areas or hospital. It also cuts down any hesitancy an individual can have in coming into contact with anything that others have touched.



E. High accuracy

Used the data of more than 140,000 palm from more than 70,000 people, and it has been proved that it has a false reject ratio of about 0.01% and false acceptance rate which is less than 0.00008%, with the only condition that the palm vein is placed over the device exactly three times at the time of recordkeeping, allowing one retry for judgement if any at the time of verification.

Moreover, the ability of device to perform verification was checked using the following data:

- data from people of all ages, including people in various professions with respect to the demographics out by the Data Center of the Statistics Bureau
- data about foreign living in Japan with respect to the world demographics out by the United Nations
- data occupied in various circumstances in day to day life, including situation after waking up after drinking liquor, bathing, coming back from outside.

III. CONCLUSION

Palm vein authentication is described in this paper. This system is highly secured because it makes use of patterns within the body and is also very highly precise because the vascular pattern in the hand-palm is unique to each individual. Also, its non-contact feature gives it a hygienic benefit over other biometric authentication technologies.

References

- [1] Intelligent Computation Technology and Automation (ICICTA), 2010 International Conference on (Volume:1)
- [2] Computer Sciences and Applications (CSA), 2013 International Conference
- [3] Information Science and Applications (ICISA), 2013 International Conference
- [4] R. Brunelli, D. Falavigna, "Person identification using multiple cues," IEEE Transactions on Pattern Analysis and Machine Intelligence 1995
- [5] L. Wang, G. Leedham and Siu-Yeung Cho, "Minutiae Feature Analysis for Infrared Hand Vein Pattern Biometrics," Pattern Recognition, 41(3),2008