**PALM VEIN TECHNOLOGY**

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**ABSTRACT**

* **With the increase in technology threat to personal data and national security had also increased .Themethods that were developed to secure important information from outside intervention were not up to safemark .There was a need to introduce a technology that secures our data more efficiently from unlawfulintervention. The palm vein pattern authentication technology that uses vescular patterns as personalidentification data .Vein recognition technology is secure because the authentication data exists inside thebody and is therefore very difficult to forge. It is highly accurate. This technology can be used in variousfields like banking, hospitals, government offices, in passport issuing etc. Business growth will be achievedwith these solutions by reducing the size of the palm vein sensor and shortening the authentication time. Thispaper is review the palm vein technology, its applications, how this technology is applied in real timeapplications and the advantages of using this technology.**

**Index Terms: Palm vein recognition, Multimodal Biometrics, Feature subset selection, ASFFS, FAR, FRR.**

**I. INTRODUCTION**

In the ubiquitous network society,where individuals can easily access theirinformation any time and anywhere, people arealso faced with the risk that others can easilyaccess the same information anytime andanywhere. Because of this risk, personalidentification technology is used which includesPasswords, personal identification numbers andidentification cards. However, cards can bestolen and passwords and numbers can be guessed or forgotten. To solve these problems,four methods are developed: fingerprints, faces,voice prints and palm veins. Among these,because of its high accuracy, contact less palmvein authentication technology is beingincorporated into various financial solutionproducts for use in public places. Palm veinauthentication is one of the vascular patternauthentication technologies [5] Vascular patternauthentication includesveinpattern authentication using the vein patterns of the

palm, back of the hand or fingers as personalidentification data, and retina recognition usingthe vascular patterns at the back of the eye aspersonal identification.

The vascular pattern used in thisauthentication technology refers to the image ofvessels within the body that can be seen as arandom mesh at the surface of the body. Sinceeveryone has vessels, vascular patternauthentication can be applied to almost allpeople. If vascular patterns were compared tothe features used in other biometricauthentication technologies, such as the face,iris, fingerprint, voice, and so on, the onlydifference would be whether or not the feature isat the surface of the body. Consequently,vascular patterns cannot be stolen byphotographing, tracing, or recording them. Thismeans that forgery would be extremely difficultunder ordinary conditions.

Vein patterns are unique to eachindividual; even identical twins have differentvein patterns. Furthermore, vein patterns do notchange within a human’s lifetime except in thecase of injury or disease. Although these factshave not been medically proven, as with thefingerprint, iris, and so on, experimental resultsbased on extensive data and large-scale practicalresults obtained from financial institutions provethat palm vein authentication has the merits ofconsistency and high accuracy for confirming aperson’s identity.

A prototype low cost automatic thermographic imaging system which has beendeveloped by J.M.Cross and C.L.Smith [6] toobtain vein patterns for positive identificationand describe to use the subcutaneous vascularnetwork of the back of the hand as a uniquepersonal biometric for identification. Vein imageprocessing includes threshold segmentation andthinning of the vein pattern is demonstrated byY.Ding et al [7].

**II. LITERATURE REVIEWS**

An individual first rests his wrist, and onsome devices, the middle of his fingers, on thesensor's supports such that the palm is heldcentimeters above the device's scanner, whichflashes a near-infrared ray on the palm. Unlikethe skin, through which near-infrared lightpasses,



Fig1: veins in palm

Deoxygenated hemoglobin in the blood flowingthrough 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, areinvisible to the sensor. The still image capturedby the camera, which photographs in the near-infrared range, appears as a black network,reflecting the palm's vein pattern against thelighter background of the palm.

An individual's palm vein image isconverted by algorithms into data points, whichis then compressed, encrypted, and stored by thesoftware and registered along with the otherdetails in his profile as a reference for futurecomparison. Then, each time a person logs inattempting to gain access by a palm scan to aparticular bank account or secured entryway,etc., the newly captured image is likewiseprocessed and compared to the registered one orto the bank of stored files for verification, all ina period of seconds. Numbers and positions ofveins and their crossing points are all comparedand, depending on verification, the person iseither granted or denied access.

M.Wantanbe et al [11] providessoftware for vein pattern authentication. Thisvein pattern authentication software translatesthe black lines into a blood vessel pattern of thepalm, and then matches the translated veinpattern with a pre-registered template pattern,while correction for position and orientation ofthe palm by a pattern matching method.

The techniques presented for personalauthentication [8, 10-11] are based on unimodalbiometric system, which have some limitationssuch as noise in sensed data, intra-classvariations, distinctiveness, and nonuniversalityand spoof attacks. The “Laplacian” and JunctionPoint approach multimodal presented in [9, 12]are based on fusion at imaging level. One of themajor issues in imaging fusion is imagealignment or registration, which refer to pixel-bypixel alignment of the images. The proposedpalm vein recognition system is expected toovercome some of the limitations of the existingwork.

**Palm Vein Technology**

Palm vein authentication works bycomparing the pattern of veins in the palm(which appear as blue lines) of a person beingauthenticated with a pattern stored in a database.Vascular patterns are unique to each individual,according to Fujitsu research even identicaltwins have different patterns and since thevascular patterns exist inside the body, theycannot be stolen by means of photography, voicerecording or fingerprints, thereby making thismethod of biometric authentication more securethan others.

Palm vein authentication uses the vascularpatterns of an individual’s palm as personalidentification data. Compared with a finger orthe back of a hand, a palm has a broader andmore complicated vascular pattern and thu contains a wealth of differentiating features forpersonal identification. The palm is an ideal partof the body for this technology; it normally doesnot have hair which can be an obstacle forphotographing the blood vessel pattern, and it isless susceptible to a change in skin color, unlikea finger or the back of a hand.

The deoxidized hemoglobin in the veinvessels absorbs light having a wavelength ofabout 7.6 x 10-4 mm within the near-infraredarea. When the infrared ray image is captured,only the blood vessel pattern containing thedeoxidized hemoglobin is visible as a series ofdark lines. Based on this feature, the veinauthentication device translates the black linesof the infrared ray image as the blood vesselpattern of the palm, and then matches it with thepreviously registered blood vessel pattern of theindividual.

**Working Principle**

One should place his/her palm near to scanner.



Fig2: Palm on Sensor

The scanner makes use of a special characteristicof the reduced hemoglobin coursing through the

palm veins it absorbs near-infrared light.



Fig3: Infra red on Palm

The integrated optical system in the palmvein sensor uses this phenomenon to generate animage of the palm vein pattern and the generatedimage is digitized, encrypted and finally storedas a registered template in the database.

The parameters a false rejection rate(FRR) and a false acceptance rate (FAR) is to becalculated for performance measurement. Also,if your profile is registered with your right hand,don't log in with your left, the patterns of anindividual's two hands differ. And if youregistered your profile as a child, it’ll still berecognized as you grow, as an individual'spatterns of veins are established in utero (beforebirth). No two people in the world share a palmvein pattern even those of identical twins. Inaddition the devices ability to perform personalauthentication was verified using the following:

1. Data from people ranging from 6 to 85 yearsold including people in various occupations inaccordance with the demographics realized bythe Statistics Center of the Statistics Bureau.

2. Data about foreigners living in Japan inaccordance with the world demographicsreleased by the United Nations.

3. Data taken in various situations in daily lifeincluding after drinking alcohol, taking a bath,going outside and waking up. There may be achance that the palm we had registered may getdamaged then we cannot use this technology, soduring the time of registration we take the veinsof both the hands so that if one gets damaged wecan access through the second hand. When handget damaged up to large extent we can get veinsbecause deeper into the hand veins are obtained.



Fig4: Registering two palms

We maintain complete privacy when we applythis method.

**Contact Less Palm Vein Authentication**

**Device**

The completely contact lessfeature of this Device makes it suitable for usewhere high levels of hygiene are required .Italso eliminates any hesitation people mighthave about coming into contact with somethingthat other people have already touched.



Fig5: Contact less sensor

In addition to being contact less andthereby hygienic and user-friendly in that theuser does not need to physically touch a surfaceand is free of such hygiene concerns, palm veinauthentication is highly secure in that the veinsare internal to the body and carry a wealth ofinformation, thereby being extremely difficult toforge.

A number of studies showing theadvantages of multimodal biometrics fusionhave appeared in the literature. Brunelli andFalavigna [1] used hyperbolic tangent (tanh) fornormalization and weighted geometric averagefor fusion of voice and face biometrics. They

also proposed a hierarchical combinationscheme for a multimodal identification system.Kittler et al. [2] have experimented with severalfusion techniques for face and voice biometrics,including sum, product, minimum, median, andmaximum rules and they have found that thesum rule outperformed others. Kittler et al. [2]note that the sum rule is not significantlyaffected by the probability estimation errors andthis explains its superiority.

Hong and Jain [3] proposed anidentification system based on face andfingerprint, where fingerprint matching isapplied after pruning the database via facematching. Ben-Yacoub et al. considered severalfusion strategies, such as support vectormachines, tree classifiers and multi-layerperceptron, for face and voice biometrics. TheBayes classifier is found to be the best method.Ross and Jain combined face, fingerprint andhand geometry biometrics with sum, decisiontree and linear discriminant-based methods. Theauthors report that sum rule outperforms others.

**III.IMPLEMENTATION**

In addition to the palm, veinauthentication can be done using the vascularpattern on the back of a hand or a finger.However, the palm vein pattern is the mostcomplex and covers the widest area, because thepalm has no hair, it is easier to photograph itsvascular pattern. The palm also has no significant variations in skin color comparedwith fingers or back of the hand, where the colorcan darken in certain areas. As veins are internalin the body and have a wealth of differentiatingfeatures, attempts to forge an identity areextremely difficult, thereby enabling a high levelof security [4].

**ATM**

This service features high securityfor customers using vein authentication , doesnot require a bank card or pass book andprevents withdrawals from branches otherthan the registered branch and ATMs therebyminimizing the risk of fraudulentwithdrawals. To open a Bio-Security Depositaccount, customers go to a bank and have theirpalm veins photographed at the counter in orderto guarantee secure data management, the palmvein data is stored only on the vein data baseserver at the branch office where the account isopened. This Super IC Card contains thecustomer’s palm.

Vein data and vein authenticationalgorithms and performs vein authentication byitself. This system is advantageous because thecustomer’s information is not stored at the bank.When a customer applies for a Super IC Card,the bank sends the card to the customer’s home.To activate the palm vein authenticationfunction, the customer brings the card and hispassbook and seal to the bank Counter where the

customer’s vein information is registered onthe card. After registration the customer canmake transactions at that branch



Fig6: ATM Sensor

Counter and ATM using palm veinauthentication and a matching PIN number.

**PCS & Hospitals**

In personal computers palm veintechnology can apply by inserting the veinsensor inside mouse. When power is supplied tosystem the mouse also gets power and the sensorin the mouse will be ready to sense palm veins.When one place his/her palm the sensor sensethe veins and if they are matched with theregistered ones the system allows the person touse it. One can use this technology even to lockfolders that should be maintained as privateinformation. The hospital has done delivery ofa contact less palm vein authentication systemto secure physical access to its Departmentof Planning, Information and Management.

**Authentication**

In front of our homes we can apply thisPalm vein technology so that by registering theveins of our family members and relatives wecan maintain high range security which is notpossible through other technologies. Japaneserecently used this technology before front doorsand getting high range security.

**IV. RESULT**

As a result of the using data from

140,000 palms (70,000 individuals), it isconfirmed that the FAR is 0.00008% and theFRR is 0.009%, with the following condition: aperson must hold the palm over the sensor forthree scans during registration, and then onlyone final scan is permitted to confirmauthentication. The data has been used toconfirm the accuracy of this technology from 5year to 85 year old people of variousbackgrounds and of various human activitiessuch as drinking, bathing, going outside, andwaking up.

The palm vein recognition system usingmultilevel fusion of multimodal features andneural network classifier has been developed.The shape and texture features have beenextracted and multimodal features have beenobtained at feature extraction level as well asmatching score level. The Neural networkclassifier has been used to classify the veinpatterns for making necessary decision. It isconcluded from the analysis that the multimodal

**VI. CONCLUSION**

Palm vein pattern authenticationtechnology was being used in a wide range. Ifthis technology is introduced in India we cansolve many problems such as passwordprotection in ATM, security in various fields andif we implement this technology in governmentoffices we can make the employees to workaccording the government timings, surely thistechnology will bring a revolution in the field ofscience and technology in the near future.

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