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Cardless Cash Withdrawal Using Palm Vein Technology

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***Abstract* - Generally, the easiest way to withdraw money from your bank account is by using an Automated Teller Machine (ATM). The user can withdraw the money by inserting their card into the slot on the machine, and then entering a four-digit Personal Identification Number (PIN) to complete the transaction process. Similarly, some banks adopted the method of using a One Time Password (OTP) to complete the transaction process to make it more secure. With the recent advancements in technology, there are many new methods that can be used for withdrawing money from ATMs, like cardless cash withdrawal or using one's biometrics. But, due to the recent COVID-19 pandemic, we refrain from using things that are not sanitized properly. People started avoiding going to the ATMs since hygiene was a major concern during the pandemic. Also, due to the constant hand washing and the use of sanitizers, the use of conventional biometrics was not efficient. As a result, the idea of using a method that is contact-less and is also more secure emerged, i.e., the palm vein technology. The palm vein technology uses a person's vein pattern, which is unique to everyone and can help us achieve better results with greater accuracy. The paper proposes a concept of using a person's vein pattern as a method of contact-less authentication. It is an extremely safe verification procedure because no two people in the world, not even identical twins, can have the same palm vein structure or pattern. Additionally, it is more secure because it is nearly impossible to replicate the palm vein pattern.**

Keywords – ATM, Authentication, Biometrics, Cardless cash withdrawal, Palm vein technology, Vein recognition.

I. INTRODUCTION

As technology advances, it is necessary to keep upgrading security measures in order to avoid fraudulent activities. An Automated Teller Machine (ATM) is a piece of electronic equipment that enables customers of a financial institution to carry out their transactions without the need for a human clerk, assistant, or bank employee. A plastic ATM card with a magnetic stripe or with a chip that holds a unique card number must be inserted into the majority of current ATMs to identify the user and further carry out the transaction. The user most often sets a Personal Identification Number (PIN) for the purpose of authentication and enters the PIN to complete the transaction as per the traditional method.

In recent times, due to the security concerns with the increasing number of cases that physical cards could be cloned, stolen as well as hijacked came in a new way of using [1] cardless cash withdrawal using OTP. But there were some disadvantages, like if the OTP did not reach the user in time or maybe there is a cellular network issue which was the concern here.

Also, there was another proposed system that instead of using a card reader in the ATM, it would be replaced by a biometric scanner [2]. This biometric-based fingerprint authentication has substantial drawbacks, such as the inability to identify the person in the event of a cut or wound. Furthermore, these fingerprint sensors are also sensitive. They operate accurately when the fingers are clean, but their efficiency reduces when the fingerprints are smudged with dirt.

These drawbacks, in general, can be overcome by using a method that can help us achieve both the goals of safer authentication and having greater security. By using palm vein technology, we can achieve this since it can undoubtedly provide a foolproof, tamper-free security system and provide additional benefits.

Palm vein technology may also be used in a variety of applications, including in governments, airports, restaurants, retail stores, hospitals, personal computers, educational institutions, and so on.

For example, by implementing this technology in any organization, we can monitor the IN and OUT times of the employees. Similarly, on a personal computer, if implemented, the user won't have to remember the username and password, and the login process would be quicker by just scanning their palm and authenticating it.

The use of palm vein technology will eventually become mainstream as it provides more advanced security. This technology will definitely bring about a revolution in the fields of science and technology in the near future.

The proposed system works by storing the palm vein pattern in a secure bank database and then the registered customer authenticates himself / herself by scanning their palm at the ATM and proceeds to complete the transaction process.

The paper is structured as follows: Section 2 illustrates the related work and how various approaches have progressed. Section 3 explains the working of palm vein technology and the various methods used to obtain the palm vein pattern. Section 4 describes in detail the methodology of the proposed system, along with the required registration process, the authentication process, and how the palm vein pattern will be stored. Section 5 covers the conclusion and summarizes the significance of palm vein technology and its advantages.

II. RELATED WORK

The papers surveyed use various methods like, OTP based transaction systems, fingerprint verification system, palm vein biometrics and vein recognition system.

The use of palm vein technology is proposed using a different approach in [3]. This approach involves placing the palm over a palm vein sensor, which then emits IR radiation that falls on the palm, penetrates deep into the skin, and reaches the layer that contains veins. It employs IR radiation because veins have the capacity to absorb radiation that is in the IR band.

The author has proposed a palm vein authentication system using a technology called near-infrared spectroscopy (NIRS) and imaging in [4]. Also, various use cases that make use of palm vein technology are described in this paper. They are ATMs, personal laptops, offices, airports, etc.

In [5], the palm vein authentication system uses the Raspberry Pi single-board computer. The palm vein system consists of vein detection, equalization, and thresholding. Here, a Raspberry B+ is used, which is a modified version of the original Raspberry Pi.

The authors here in [6], have explained the palm vein technology and feel that, as it is highly accurate, it should be used for authentication purposes. It works by using a device that captures images of the vein pattern. The working here is explained in a more generalized way and it does not focus on any particular use cases.

An enhanced ATM system is proposed in [7] that provides security using palm vein technology with a unique identification number for an individual, unlike traditional passwords. The authentication works by linking it to a Unique Identification Number (UIN) to provide more security and authentication. Also, comparisons of the various biometrics are listed with the help of False Acceptance Rate (FAR) and False Rejection Rate (FRR).

The development of palm vein pattern recognition, its theory and broad framework, its methods, its applications, and the benefits of adopting this technology is explained in [8]. The palm vein recognition techniques can be systematically described into three parts, which are preprocessing, feature extraction, and pattern matching.

But these proposed systems were not satisfying all the security measures and had some disadvantages as well. Therefore, our proposed method covers all the factors, including the security as well as that which would be beneficial in the ongoing COVID-19 pandemic. Basically, a scanner would be used to scan the palm vein pattern, similar to a biometric scanner and the scanned palm vein pattern would be used for authentication purposes. And since this palm vein structure is unique for everyone it is helps us in achieving better results in the authentication phase. Also, it is more secure as the there is a very high level of accuracy.

III. PALM VEIN TECHNOLOGY

The palm vein authentication is a vein feature authentication technology that uses palm veins as the biometric feature. The palm vein patterns are captured using near - infrared light via either the reflection or the transmission methods.

The palm is illuminated from the front side and the image is taken on the same side in the reflection method as shown in Figure 1. Figure 2 depicts the transmission method, in which the image is taken from the front side of the hand while the palm is illuminated from the rear. The illumination device and the capture device are placed apart in the transmission technique, facing one another across a palm. While in the reflection approach, the lighting and capture devices can be combined to produce a more compact device because the illumination and capture devices have the same direction of travel.

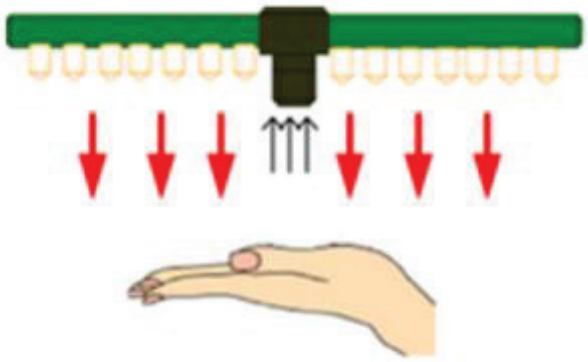

Fig. 1. Reflection method [3]

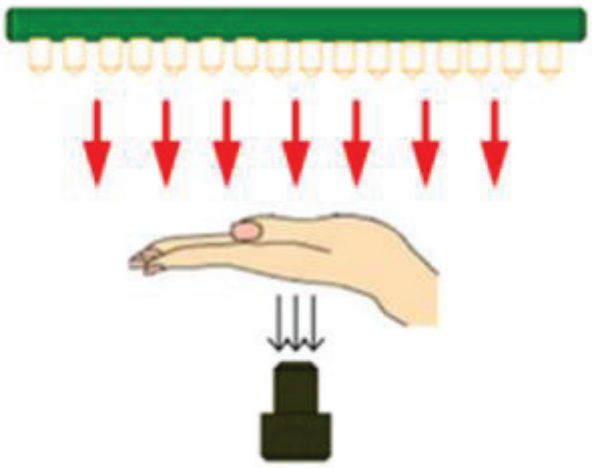

Fig. 2. Transmission method [3]

The palm vein technology is more secure than certain other biometric features since veins reside beneath human skin, making it harder for someone else to replicate or steal them. Furthermore, due to the variety and complexity of palm vein patterns, they can be used to distinguish one person from a big group of people. Palm vein authentication is therefore safe and very precise. It is appropriate for use in public applications because it is a contactless kind of biometric identification.

Figure 3 is an example of how the palm vein pattern is seen for an individual after it is scanned using near – infrared light.

Fig. 3.

IV. PROPOSED METHODOLOGY

The proposed system would work by storing the palm vein pattern of an individual in the database for authentication, which is the primary goal. Initially, registered users would need to go to the nearest branch of the bank to verify themselves and proceed to add their biometrics, which here in this case is the Palm Vein pattern.

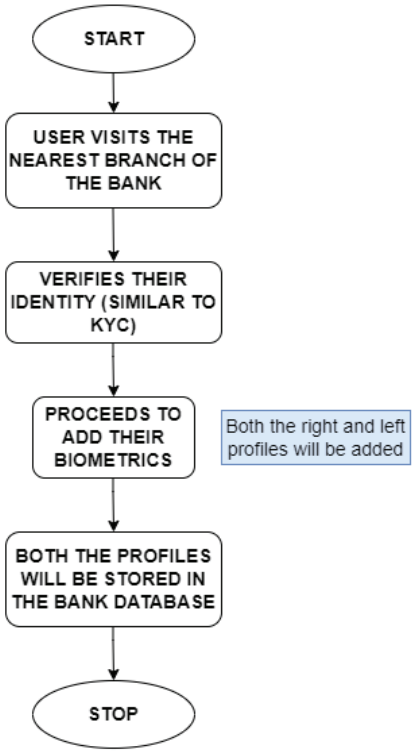

Fig. 4. Proposed registration process

The registration process can be seen in Figure 4. The vein pattern along with the personal details would be stored in the database. While adding the biometrics to the database, if the user adds the profile with the right hand, the left hand cannot be used for authentication then, since both the hands would have different patterns.

Also, as a preventive measure, we can add the palm vein patterns of both the palms in case the pattern on any one palm gets damaged.

When it comes to children who progress from minor to major, even if the palm vein pattern is recorded at the age of 18, the palm vein pattern can still be recognized as we grow as individuals.

Figure 5 shows the complete flowchart of how the proposed system would work.

A registered user goes to the ATM to withdraw cash. The user proceeds to authenticate himself / herself by scanning their palm under the scanner. If a match is found in the database the user proceeds further and completes the authorization process to finish the transaction.

Figure 6 helps us understand how the palm vein biometrics are obtained and then the resultant pattern is stored further into the bank database.

The scanner emits near-infrared rays that are absorbed by the deoxygenated hemoglobin in the veins and then reflected back to the imaging device to take an image of the vein pattern in the palm.

This captured pattern is then checked with the registered bank database and if a match is found, the user proceeds further. If the match is not found, the user may try to scan the palm again.

After the biometric match is found, the user proceeds to select the amount to be withdrawn or enters in a specific amount that is to be withdrawn. To proceed further and complete the transaction process, the user needs to either enter an OTP or a PIN.

Here, in the proposed system, we have given the choice of either an OTP or a PIN because there might be times when the user might face some issues with the OTP, like if there is no proper network coverage or the weather conditions are not good and it is taking a lot of time for the user to receive the OTP, which makes the user anxious as he / she has to wait for the OTP. So, in such cases, we can use the facility to enter the PIN and complete the Authorization process.

The PIN can be set simply by logging into the mobile app or through the bank's website. Also, as a security measure, the user would need to change this PIN every 90 days and a notification would be sent for the same to remind the user to change the PIN. To change the PIN again, the user can follow the exact above steps again.

Once the correct credentials are entered and the authorization is successful, the user will be able to complete the transaction and collect the cash from the ATM.

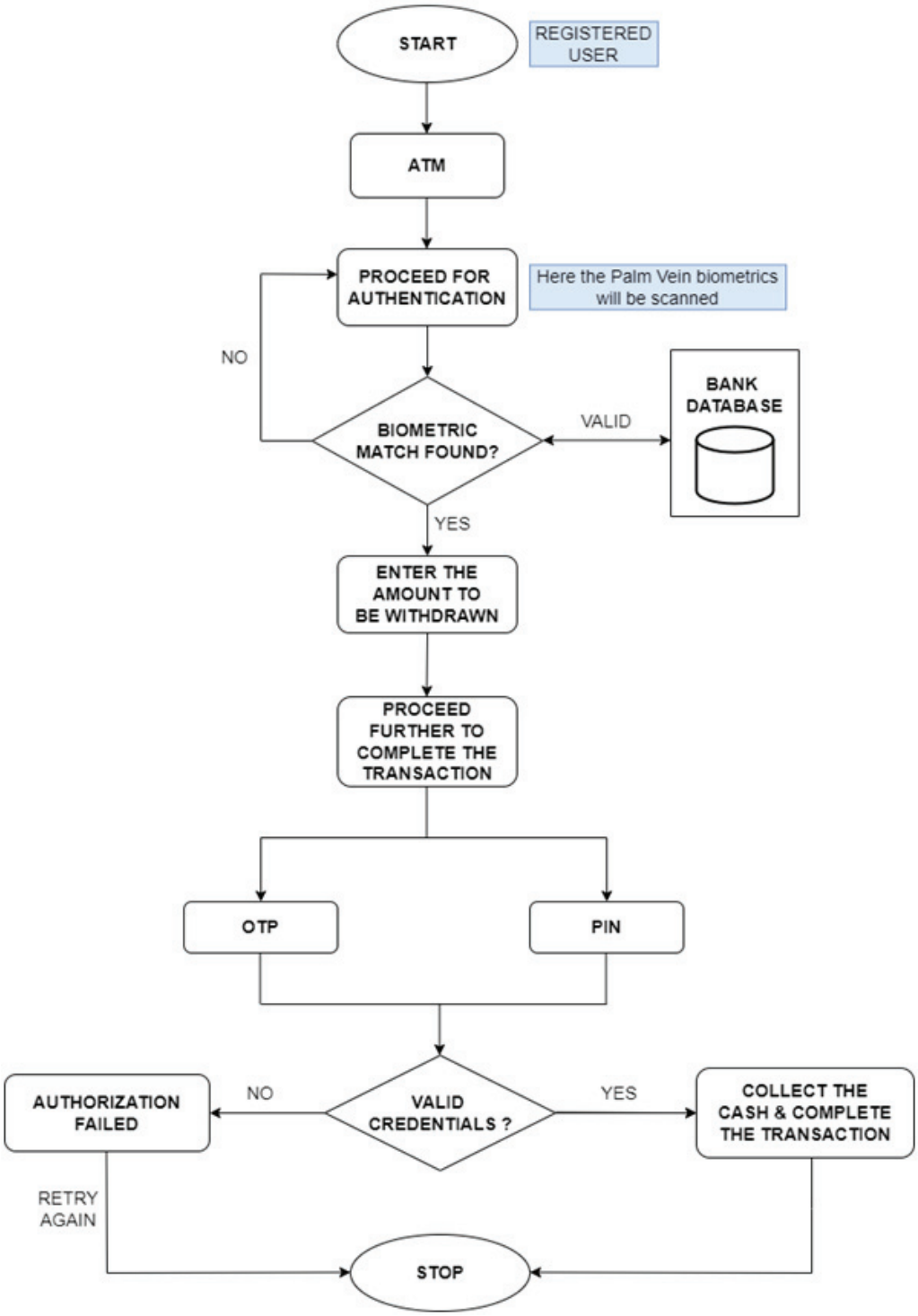

Fig. 5. Flowchart of the proposed system

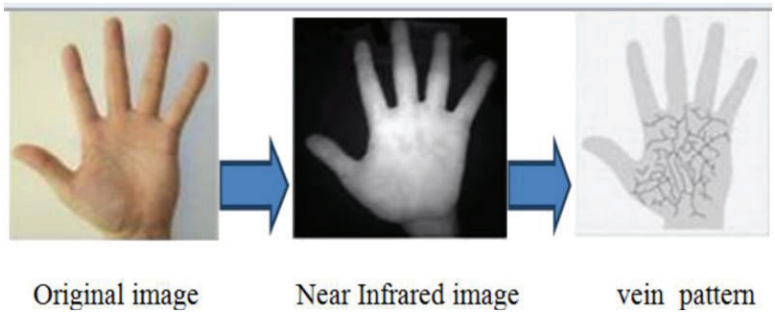

Fig. 6. Process of storing the pattern of palm vein [5]

V. CONCLUSION

The palm vein technology uses a person's vein pattern, which is unique to everyone, and if used for authentication, can help us avoid touching the biometric scanner as per the traditional process, removing any concerns or issues with sanitization and providing better results.

A traditional cash withdrawal would require our ATM card and our pin, but with the help of palm vein technology, we can use it for cardless cash withdrawals, so there is no need to carry our cards to the ATM machine. We can just scan the palm print and proceed to complete the transaction process by entering either an OTP or a PIN.

Also, using palm vein biometrics does help us increase the security of the ATM withdrawal process for sure, since no two people in the world can have the same palm vein structure or pattern, not even identical twins. Also, replicating the palm vein pattern is nearly impossible, and theft is not even an option.

This system does have some future scope, like we can increase the accuracy of the detection as well as reduce the time that would be taken for scanning our palm. Also, the biometrics stored in the database could be kept more secure by encrypting them as well as using an algorithm called the Elliptic Curve Cryptography algorithm (ECC), which would help us make the database more secure.

REFERENCES

[1] M. A. Imran, M. F. Mridha, and M. K. Nur, "OTP based cardless Transction using ATM," 2019 International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST), 2019.

[2] T. Sangeetha, M. Kumaraguru, S. Akshay, and M. Kanishka, "Biometric based fingerprint verification system for ATM machines," Journal of Physics: Conference Series, vol. 1916, no. 1, p. 012033, 2021.

[3] Vankamamidi, A. B, 2021, "Palm Vein Technology," SSRN Electronic Journal

[4] T. Shinzaki, "Use case of palm vein authentication," Handbook of Vascular Biometrics, pp. 145–158, 2019.

[5] M. Ghute, M. Korde, K. Kamble, and S. Khade, "Design of palm vein authentication system," Bioscience Biotechnology Research Communications, vol. 13, no. 14, pp. 273–276, 2020.

[6] Anjitha Ajith K, Resija P. R, 2015, "Palm Vein Technology," INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) NSRCL – 2015 (Volume 3 – Issue 28)

[7] B. V. Prasanthi, S. M. Hussain,P. Kanakam, and A. S. N. Chakravarthy, "Palm Vein Biometric Technology: An Approach to Upgrade Security in ATM Transactions," 2015 International Journal of Computer Applications (0975 – 8887) Volume 112 – No. 9

[8] R. S. Parihar and D. S. Jain, "Palm Vein Recognition System for Human Authentication: A Review," International Journal for Research in Applied Science and Engineering Technology, vol. 7, no. 2, pp. 472–477, 2019.