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Survey on Enhanced Cardless Transaction using Biometric ATMs

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Abstract: ***Automated Teller Machines (ATM) are widely used now-a-days by people. These are electronic machines which are operated by customers to deposit or withdraw cash from banks. ATM provides services round the clock and is installed at convenient places including both onsite and offsite. In traditional ATM system card and pin numbers are used for authentication, where security plays a big concern such as losing cards, stolen pin numbers. In order to minimize these issues this paper discusses a system where ATM cards and pins are replaced by biometrics thus the combination of biometrics will be difficult to break the security. This process provides authentication for withdrawal of cash from ATM when the user's fingerprint and face recognition matches the collected datasets. In this system Raspberry pi microcontroller is used in the controlling part. It performs the search operation in the Database and sends necessary information to a display device. Open CV libraries are used for the method of recognition verification and identification of face images. Moreover to improve the efficiency of the system Haar Cascade is used.***
Keywords: Haarcascade, Raspberry pi, embedded system, sensor.

I. INTRODUCTION

With the introduction of technology in the banking sector by introducing the ATMs and online banking, usage of credit and debit cards have increased throughout the world. Banks reduce their infrastructure costs by introducing Automatic Teller Machine(ATM) and Internet websites by which the customers' transactions will be carried out effortlessly. The customers will definitely prefer ATMs for all physical transaction purposes, like cash withdrawal and cash deposit without going to the bank. By the introduction of ATMs and online banking, the user experience has become a very important thing to be provided by the banks. But this may also lead to an increase in theft and attacks in ATM and online banking by various fraudulent methods. However the technological development in the Banking sector provides enhanced security to avoid fraudulent activities. In the present ATM system, debit cards and pin numbers are being used which has a higher possibility of being threatened. Thus the sole purpose of our paper is to lower these crimes by applying a user-friendly and safe method for accessing ATMs for all transaction purposes.

Haar Cascade is an object detection algorithm that is an efficient way for distinguishing objects in an image or in video .Raspberry pi 3 is a mini version of a computer which is user friendly and very compact in size. The Raspberry pi 3 holds the operating system, programs for compilation and running of a project also holds a document. This project discusses the secure transaction in ATMs with above kit - Raspberry pi which is used to operate the system.

II. LITERATURE SURVEY

The works of various researchers and scholars are studied for survey and analyzing the advantages and drawbacks in order to improvise the system to function better.

Maninder et.al.,[1] proposes a system that uses either two fingers(thumb, middle) or three fingers(thumb, middle, ring) as input data, producing a unique identity by combining all the inputs. Matching result is produced from the minutiae formed from the combination. Fast Fourier Transform (FFT) is the technique used for the enhancement of image quality. Though this combination produces a unique identity which will not be easy to hack, the system may be difficult to implement since it leads to storage of all large amounts of data and leads to confusion between different finger details.

Abhijeet S. Kale et.al.,[2] proposes a system which uses an ARM Controller for both fingerprint and Aadhaar card verification. Initially both fingerprint and Aadhaar details of the customer are stored in a database. During a money transaction, both details are verified and when successful the customer gets authenticated.When fingerprint and Aadhaar card recognition doesn't match, a message is sent to higher authorities through GSM modem. This system is proposed as a measure to reduce fraudulent activities. But, since every personal detail of an individual are linked to an account, problems related to privacy issues needs to be figured out.

G. ReneeJebaline et.al.,[3] proposes a system which combines fingerprint recognition along with pin number. The first process includes the technique of Blowfish algorithm used for the encryption of the captured client's fingerprint. Minutiae is extracted from the

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fingerprint image, which involves techniques of Binarized fingerprint images and gray scale fingerprint images. The encrypted image is then decrypted through a secure network to the server. During the process, both images are compared and when successful, pin number authentication is carried out to fetch account details. The time of transaction is only 10 seconds and since encryption is performed it reduces power consumption but the issues in this system is that ATM pins can be easily guessed, stolen or misused and fingerprints can also be forged.

Yogesh.H.Dandawate et.al.,[4] proposes a system which captures two biometric traits-Fingerprint and Palm Vein. The first process involves feature extraction which includes fingerprint extraction using smoothing algorithm and palm vein extraction using curvelet transform. These features are then fused using normalization and augmentation technique. This proposed work is used for the authentication followed by a cash transaction. The palm biometrics is opted as a good identifying factor and the multimodal system is opted for greater security. However, this system leads to more processing and execution time.

Rasib Khan, et.al.,[5] proposes the system in which Secure PIN Authentication as a service(SEPIA) is used for authentication of PIN for ATMs which uses cloud connected personal mobile and wearable devices. The process gets initiated when the user touches the screen. This in turn is transmitted to the ATM server as a request message. A QR code gets generated and is transmitted to the ATM machine as a response. This QR code is scanned by user's wearable device like Google glass where the user location and details can be retrieved and the template of the PIN is generated in the ATM screen for the PIN to be extracted which is already sent to the users mobile phone for user to be authenticated for money transaction. SEPIA is more resistant to security attacks. However the wearable cannot be afforded by all and this also leads to problems for users wearing glasses or users with vision problems.

Sweta Singh et.al.,[6] proposes a system which uses pin number followed by fingerprint verification limited only for cash withdrawal which exceeds the daily cash limit by using the technique electronic data capture and constraint based biometric system. For balance enquiry and withdrawal of amounts which is less than the cash limit, only pin number verification is taken into account. While, when the user wants to withdraw an amount that exceeds the daily cash limit, fingerprint verification is carried out to reduce the working capability and accuracy of the system.

It includes the advantage of reduction in the matching time during fingerprint verification. However, this system does not provide security for low cash withdrawal.

Joyce Soares et.al.,[7] proposes a system of using physiological biometrics such as fingerprint and iris recognition for ATM banking systems which replaces the use of cards and pins. This recognition system uses an algorithm of minutiae matching and a GUI based circular Hough transform.

Thus this process is carried out in the form of verifying the fingerprint and the iris authentication of the genuine user and is verified with the collected datasets. When it gets matched, the user receives an One Time Password (OTP) in his phone. Withdrawal of cash is processed followed by above authentication. This system uses an embedded system which is user friendly and non invasive. But absence of the registered mobile phone at the point of transaction would become a disadvantage. Also, use of iris scanning technique is quite expensive.

G¨uneyKayım et.al.,[8] proposes a system in which when the card is inserted into the ATM, a session is initiated and the system starts appearance detection of the face and body with a camera in the ATM and a short lived identity database is built for the user. When the card or cash is forgotten by the user and is left in the bank, instead of retracting the forgotten item ,the ATM waits for the user to retrieve it. If a different customer approaches the ATM, the item gets retracted instantly. For the behavioural recognition, Local Binary Pattern (LBP) operator and Support Vector Machines are used as classifiers. Though the system reduces the theft of cards, it doesn't provide a solution for forgetting pin numbers or cards.

Prakash Chandra Mondal et.al.,[9] proposes a system which uses behavioral biometrics for authentication with more security. In this system, authentication is performed using three factors which includes online handwriting signature verification, chip based card and PIN verification. This method does not involve the need for further enhancement like using physical biometrics (finger print, face images, etc.). However forging of signatures would become a threat to the user.

Sweedle Machado et.al.,[10] proposes a system that uses a fuzzy vault system for the security of ATM pins and passwords using a user's fingerprint data. It involves encryption and decryption. In the encryption process, the minutiae points gets extracted from the fingerprint which is encoded using pin password. While accessing the user's account the data encoded is decrypted using the same fingerprint impression to retrieve the pins and the passwords. The main advantage of this system is securing ATM pins and passwords with fingerprint data. However generating chaff points takes more time and forging of fingerprints may lead to revealing of all user pin details and data.

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Table 1: Comparison Of Various Methods Used In Biometric Based Atms

S.No	Paper	Algorithm	Result	Issues
1.	Enhancing Security by Averaging Multiple Fingerprint images.	Fast Fourier Transform.	Involves the authentication of three finger images-thumb, middle and ring finger.	This system is difficult to implement for the storage of large data and it leads to confusion.
2.	Design of Highly Secured Automated teller machine system by using Aadhaar card and Fingerprint.	ARM controller	Biometric Recognition and Aadhaar card verification can be used for authentication.	This system leads to privacy related issues.
3.	A Novel method to enhance the Security of ATM using Biometrics	Blowfish Algorithm	Performs Fingerprint Recognition along with PIN number	The issue in this system is that PIN numbers can be easily guessed, stolen or misused and fingerprints can be forged.
4.	Fusion Based Multimodal Biometric System	Smoothing Algorithm and Curvelet Transform	Performs Fingerprint Recognition along with Palm vein extraction.	This system leads to more execution time.
5.	SEPIA-Secure PIN Authentication as a service for ATM using Mobile and wearable devices.	SEPIA	Performs QR code scanning and PIN number Authentication for transaction of money	This system cannot be affordable to all kind of people and it is not suitable especially for visually impaired people.
6.	A Constraint based Biometric Scheme on ATM and Swiping Machine	Electronic Data Capture and Constraint Based Biometric System	Fingerprint recognition is done for withdrawing of large amount and for small amount withdrawal, pin authentication is performed	This system does not provide security for low cash withdrawal.
7.	Fingerprint and Iris Biometric Controlled Smart Banking Machine embedded with GSM Technology for OTP	Minutiae Matching Algorithm and GUI Based circular Hough Transform	Fingerprint and Iris Recognition followed by authentication using OTP are used for transaction of money.	Iris scanning is quite expensive and absence of a registered mobile phone during transaction leads to failure in transaction.
8.	Short term reidentification of ATM users via Face and Body Appearance features	Local Binary Pattern Operator and Support Vector Machine.	Involves face and body appearance detection for particular sessions after which card is retracted.	Though this system reduces card theft, it does not provide the solution to forgetting PIN numbers or cards.
9.	On Reinforcing ATM Transaction Authentication and Security Process by Imposing Behavioral Biometrics	Comparison Algorithm.	Performs Authentication of user by three factors-chip based card ,PIN and online handwriting signature verification	Forging of signatures would become a threat to the user. .
10.	Securing ATM PIN and Password using Fingerprint based Fuzzy Vault System	Fuzzy Vault system.	Provides pin and password details after authenticating using fingerprint.	Generating chaff points takes more time and forging of fingerprint may lead to revealing of all user pin details and data.

III. CONCLUSION AND FUTURE WORK

This method of biometrics ATM systems in the future will guarantee us by providing the advancement in technology and secure money transaction machines as well. In recent times the existing ATM systems racked up so many hackers and fraud towards the fraudulent activities such as pin pad overlays card skimming etc. these loopholes came into existence because of the insecure ATM systems. In this method two level authentication phases are used. One of the authentication includes fingerprint scan followed by the face recognition system which grants access to the new ATM model when the data of the user stored in the database obtained during the enrollment stage gets verified with the user who wants to access the ATM. This procedure generates a secure and trustworthy money transaction machine for the user. Since nowadays every government system gathers individual biometrics to verify the person. Thus from above procedure we conclude that a biometric ATM can provide high level securities and efficient processing. This would be more efficient if we can include more upcoming technology and algorithms along with the above used algorithms

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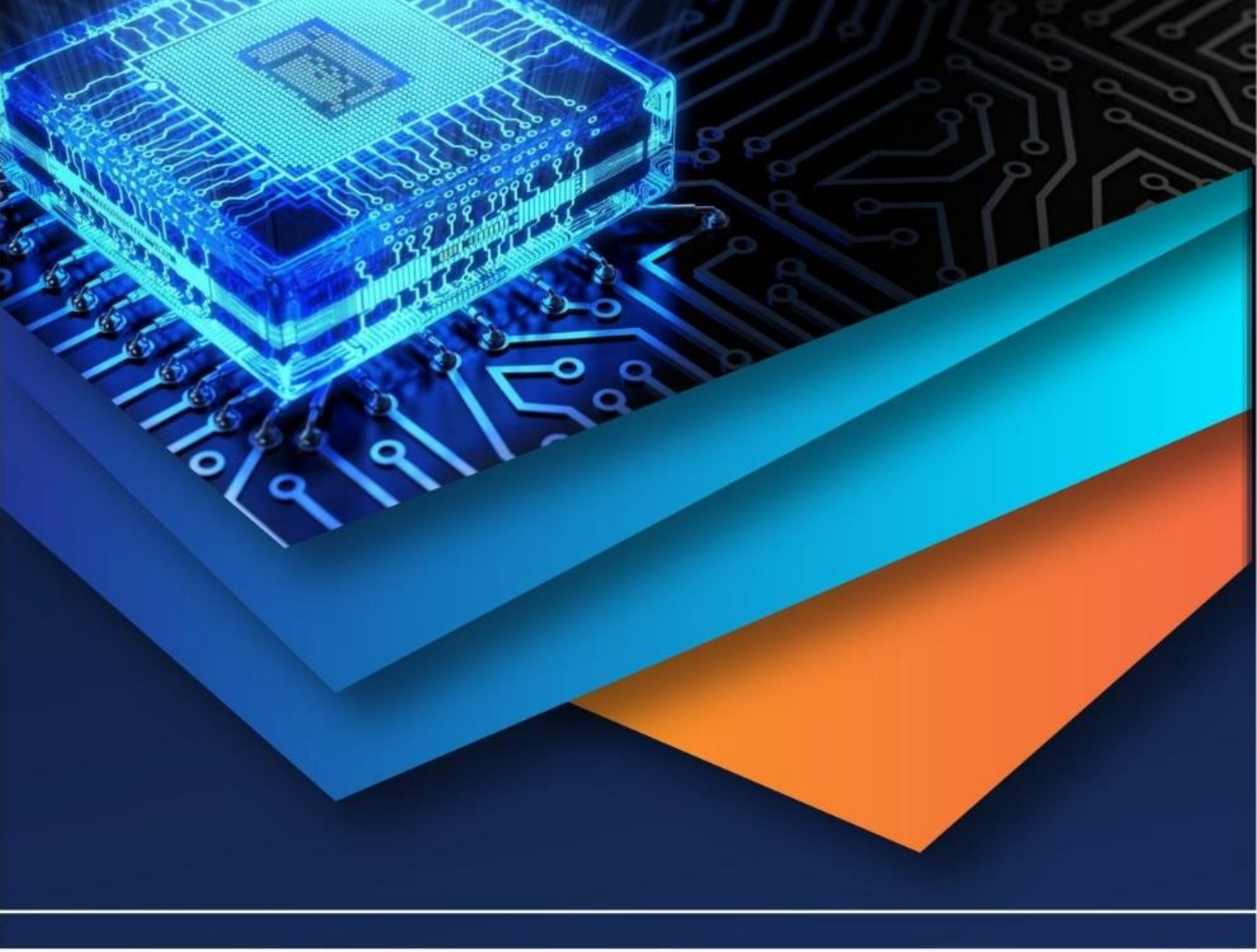

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