A Review on Securing ATM System Using Fingerprint

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ABSTRACT

Fraud is a serious issue in today's era. Commonly in ATM, it is increasing day by day. So this issue needs attention to secure ATM transaction safe. The traditional ATM systems uses bank cards, passwords, for verification methods, which are not more decisive means of carrying out user authentication. Some of the challenges in traditional ATM systems are card swallowing, misplacement, damage or expiration. This paper presents a review on challenges of ATM transaction by presenting a literature survey of recent biometric system using fingerprint technique. The Fingerprint based ATM is an application where Fingerprint of the customers is used as an authentication. The Fingerprint minutiae features are different for each human being so the customer can be identified uniquely. The fingerprint and customer detail are stored into the database. The input fingerprint images are used to verify the customer using the database. The main objective of the system is to make ATM transaction more secure and user friendly.

Keywords: ATM, Fingerprint, biometric, Authentication, Challenges.

I. INTRODUCTION

Automated Teller Machine (ATM) is an electronic telecommunications device to perform financial transactions, such as cash withdrawals, deposits, transfer funds, or obtaining account information of the customer, without the need for direct interaction with bank staff or human clerk. The self-service banking systems are widely used as it provides 24 hours service for a customer. Traditional ATM systems authenticate generally by using the credit card and the password, the method has some faults. Using credit card and password cannot verify the customer's identity exactly. There are more threats in ATM system security such as: steal customer's credit card and password by illegal means, ATM Fraud, use of ATM Card duplicators, card Sharing by family and friends, inability to trace the wrongful users, ATM PINs can be share on phone or recorded.

As ATM systems are used for the financial transaction it is important to make the system more secure and reliable. To make system more secure biometric of fingerprint is used. The biometrics is automated methods of recognizing a person based on a physiological or behavioural characteristic. Among the features measured are: face, fingerprint, hand geometry, handwriting, vein, iris, retinal, signature, and voice. The biometric technologies are becoming the highly secure identification and personal verification solutions. Biometric data are separate and distinct from personal information. Each biometric for a customer is unique which help to reduce the faults of traditional ATM. The fingerprint based biometric system can be implemented easily to secure the ATM machine as the biometrics technologies are a secure means of authentication because biometrics data are unique, cannot be shared, cannot be copied and cannot be lost. As fingerprint are unique for a individual person. The customers detail with fingerprint is store in the database. When a customer access the ATM system using the current fingerprint input then that data is checked with the database and verification of the user is done. The

fingerprint trait has the characteristics like accessible, safe and high accuracy.

II. LITERATURE SURVEY

To study and analyse more about ATM system using fingerprint, the following literature survey has be done.

In [1] the authors present various challenges that are faced in the fingerprint ATM systems that included misaligned and distorted of fingerprints due to environmental form such as oil, wrinkles, dry skin, dirt and displacement of the fingerprint template from the database during matching. To provide more security and protection the biometrics of fingerprint is used with facial biometrics to increase the performance of the financial infrastructure. As the fingerprint are in 2-D form of x-y image, to enhance and optimize the technique called Modified Gabor Filter-Hierarchal Structure Check (MGF-HSC) system is used. The benchmarked result of the MGF-HSC approach with the Gabor method is shown in Figure1. To remove completely the light noisy image of a fingerprint from 1%-60% the MGF-HSC method can used but limited to heavy noisy image. This method provides authentication performance with bank application. The advantages of using combination of face and fingerprint system are non-intrusive, robustness, acceptability, low cost and accuracy.
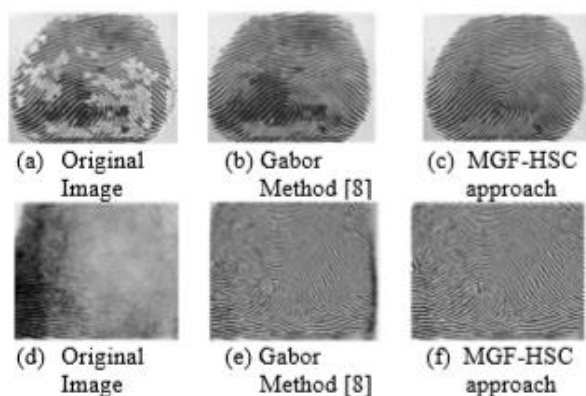
Figure 1. result of the MGF-HSC approach with the Gabor method.

In [2] the authors present the fingerprint recognition algorithm which cans increases the speed of verifying the fingerprint stored in the database. This uses the algorithm called Speeded-Up Robust Feature (SURF) algorithm which is used for detect the local feature point and extracts the robust features. SURF extracts the local robust features using a Hessian matrix-based measure for the detector, and a distribution-based descriptor. SURF approximates Laplacian of Gaussian (LoG) with Box Filter. SURF is a scale and rotation invariant algorithm, which shows better recognition of the fingerprint even if it is rotated, scaled or partially distorted in fingerprint recognition system.

Figure 2. SURF uses larger and larger filters

In [3] the authors present the encryption and decryption method. There are different types of fingerprint such as arch, tented arch, right loop, left loop, whorl, twin loop. The fingerprint image is identified using the specific core points called minutiae. The core points can be termination, bifurcation, lake, independent ridge, dot or island, spur, crossover. The encryption is carried out using the blowfish algorithm. There are two encryption techniques to get the minutiae extraction that are Binaized fingerprint images and gray scale fingerprint images. The encrypted image is transmitted to the server though secure network and at server the decryption is done.

In [4] the authors present a mechanism that combining the concepts of Cryptography and Steganography and the PIN and OTP are encrypted using AES 256. Here the encrypted fingerprint is called as the BASE image. There are 3 basic ridge patterns of fingerprint such as arch, loop and whorl

pattern. The AES 256 encryption provides more security to the system.

In [5] the authors present the new approach for the ATM Banking System called IBIO (Iris recognition based BIOmetric verification). The approach uses two techniques called 2DGabor filter, hamming distance. The feature extraction of the Iris rectangular block is implemented using 2DGabor filter. To measure how many bits are same between two bit patterns it done by using hamming distance.

In [6] the authors present the design and implementation of an embedded fingerprint authentication system worked in two stages: minutia extraction and minutia matching. The minutia extraction includes Estimation of Orientation Field, Ridge Detection and Minutiae Detection and the minutia matching uses the Euclidean distance matching criterion is used to match two fingerprints. The hardware-software co-design is responsible for matching two fingerprint minutiae sets and use of reconfigurable architectures for automatic fingerprint authentication system which is used to increase the response time of the system. The implementation of fingerprint algorithm using a Spartan-6 FPGA, which is the appropriate portable and low cost device .

In [7] the authors consider the fusion methods for the biometric recognition. To solve the biometrics comparison problem biometric crypto system (BCS) and cancellable biometric systems can be used. Two methods are used to classify the dimensionality called linear and nonlinear methods. To enhance the performance of the recognition with fuzzy logic the soft computing, neural network is used.

In [8] the authors present authentication for multi biometric system with GUI interface. By using the fingerprint and palm print algorithm it reduces the computation time and memory space. For fingerprint feature extraction it uses the Euclidian distance algorithm. Principal line based algorithm is used for authentication of the palm print.

III. RESULTS AND DISCUSSION

There are 2 phases in ATM Fingerprint System [9]:
1. Enrolment Phase.
2. Authentication Phase.

1. Enrolment Phase: In the enrolment phase, registration of the fingerprint of each individual customer is store in database. This help in verifying the customer is valid or not as each customer has their unique fingerprint.

2. Authentication Phase: In this phase, the input fingerprint in the system is matched with the database fingerprint if the fingerprint matches then the next unit is done. This phase create the authentication of the customer.

The working of the ATM fingerprint system is as follows:
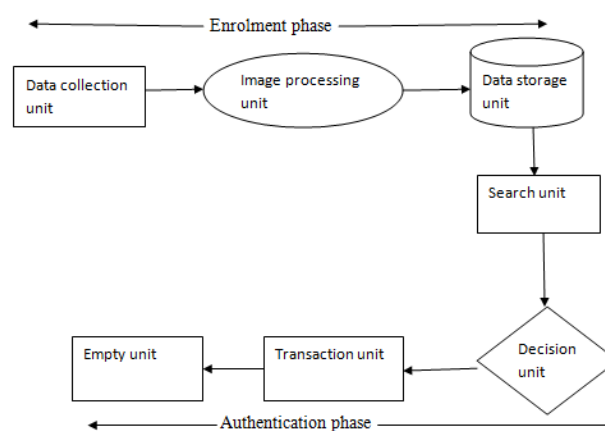
Figure 3. Flow Chart of Fingerprint based ATM System.

First, data of each customer such as fingerprint is collected and stored in the database. Then the pre-processing of the fingerprint image is done using the image pre-processing unit where fingerprint image is converted from analogy to digital form and later if the pre-processing image is correct then it is converted into template. Each templates of the fingerprint image is stored in the data stored unit for the further use. The search unit is called when the fingerprint of the customer is placed in the

fingerprint scanner. Then it is cross check with database fingerprint and returns the match id if it is found. In the decision unit the system checks for the authentication of the customer by comparing the input fingerprint with the database fingerprint. If the customer is authorised then the transaction is carried out successfully in the transaction unit and the database containing fingerprint is emptied using the empty function. The authentication of the customer is to providing more secure and safe transaction as the biometric fingerprint cannot be stolen or forged.

IV. CONCLUSION

The main goal and importance of the ATM system using fingerprint is to provide security. ATM system using fingerprint is secure, but it still has some demerits. To overcome the challenges of the technology it can be combined with more secure features. These can include adding some more security mechanisms, methods and algorithms such as MGF-HSC technique, SURF algorithm, encryption and decryption method, Cryptography-Steganography-AES 256 method, Spartan-6 FPGA algorithm or fusion method. This further development mechanism can increases the usage of fingerprint to wider range of application.

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