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Survey of Security of ATM Machine

Prachi More[1], Dr. S.D.Markande[2]

PG Student, E&TC, NBN SSOE Ambegaon, Pune, India[1]

Principal, E&TC, NBN SSOE Ambegaon, Pune, India[2]

Abstract: Nowadays banking sector is one of the most important parts of a human day to day life. Banking facilities are widely used by people for their economies activities. Automatic Teller Machine (ATM) is an electronic machine which is used for accessing a bank account from anywhere without the help of bank staff. The user can perform several banking activities like cash withdrawal, money transfer with the help of ATM. It is observed that the numbers of crime related to ATM increased hence need to provide better security to ATM machine. There are different technologies which are used to provide security to ATM machine which include – Biometric technology, RFID technology etc. Biometric technology includes fingerprint and face recognition system. In this paper survey of different technologies for ATM security is presented. In these technologies, there are some limitations. By comparing various technologies which are used for ATM security it observes that fingerprint technology appears better and more secure than other technologies.

Keywords: ATM system, RFID technology, GSM technology, Biometric technology.

I. INTRODUCTION

Today banking sector is one of the most important parts of a human day to day life. Banking facilities grow faster so people used these facilities for their economies activities. ATM (Automatic Teller Machine) is one of a facility which is provided by the bank to the customer. ATM machine comes in India in1968 which is invented by John Shepherd-Barron. ATMs are located in different places and the customers can make basic transactions without the help of bank staff, due to this use of the ATM machine increase widely as shown in Fig.1. In Fig. 1, shows that in the year 2004 use of ATM machine is less as compared with the year 2010. In the year 2010, the use of ATM increases all most 75% with respect to the year 2004.

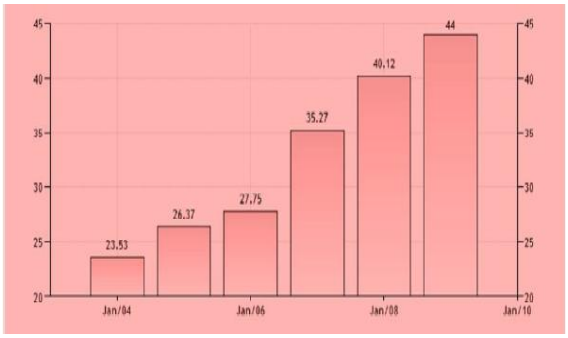

Fig. 1 ATMs' growth in world

The customer can access their bank account from ATM system using a PIN number which provided to the customer from bank. This PIN number is totally confidential.We have to scratch the card into ATM and enter a PIN number to perform a transaction, transfer money etc. Some people write their PIN number on a diary which is not secure at all. As it can be stolen and hacked by someone, resulting the customer have to suffer. Crime related to ATM increases day by day. Fig.2 shows a graph of ATM frauds which increases widely.

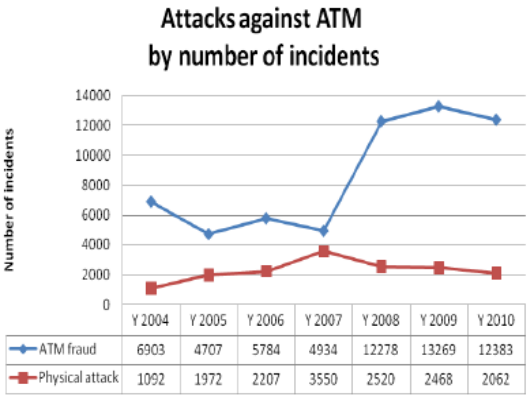

Fig. 2 ATM related frauds [1]

The crime which is happening in ATM becomes a serious issue so ATM security also a serious issue. Once the card of the customer is lost and PIN number is known hacker can withdraw all the money in a short period. So to avoid ATM related frauds there are various methods to provide security to withdraw money.

To provide a security to a transaction or to identify where the person is authorized or not various methods are introduced in ATM system. The previous work focused on biometric technique to provide enhanced security to ATM while GSM based technique is also implemented for the same purpose. While some system uses a combination of the both techniques.

In biometric technique there are various methods like face recognition, fingerprint recognition, etc. have been designed to enhance the security of ATM, but there are various challenges in that techniques. This paper focuses on the previous paper on security of ATM system and its various techniques that is how security is provided to the ATM.

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II. SECURITY TO AVOID ATM FRAUDS

ATM frauds increase day by day. So we need to give security to the ATM machine to prevent these frauds. Various researchers studied about the security of ATM and give a different solution to avoid these frauds. The following are solution for ATM fraud:

A. GSM based Technology
B. RFID Technology
C. Biometric Technology

The brief discussions about these technologies are as follow

A. GSM based Technology

Global System for Mobile Communication (GSM) which is wireless network also it has low power, low cost and easy to use. It behaves like a dial-up modem also it support extended AT commands which are defined in GSM standard. GSM is used by billion people across the world. GSM modem accepts a SIM card and operates a subscription to a mobile operator. The computer uses GSM modem to communicate over the mobile network when a GSM modem is connected to the computer. GSM modem is like a mobile phone it is used to provide internet connectivity. It is also used for sending and receiving SMS. GSM modem is a device which has a serial, USB and Bluetooth connection. GSM network operate in different bands depend on the country, but most of the GSM operate in 900 MHz or 1800 MHz bands. America uses 850 MHz and 1900 MHz bands.

The researchers Arjun Kumar Mistry, Suraj Kumar and Vicky Prasa proposed a system, Secured Atm Transaction Using GSM [2], in which they provide security to ATM transaction. In this system whenever a user wants to make transaction user have to enter the pin number, if the password matches then a message will be send to corresponding account holder throughGSM. The machine also gets acceptance message from an account holder. If acceptance message is delivered to the machine then machine allow doing further transaction else machine denies the transaction.

The researchers Siva kumar T., Gajjala Askok, k. Sai Venu prathap introduces ATM theft monitoring system [3]. In this system vibration sensor, DC motor, GSM stepper motor, Stepper motor is used to secure ATM machine. Whenever robbery occurs in ATM center, vibration generates from vibration sensor and due to this beep sound is comes from buzzer andDC motor is used for closing the gates and stepper motor used to leak the gas inside the ATM center.

The camera is also there to take the video from ATM center and send to the computer for saving a video. Here GSM is used to send a message to the nearby police station and bank whenever robbery happens in ATM.

B. RFID Technology

RFID Technology mostly used for a security purpose. It is also used in a library, for antitheft security, E-passport etc. Radio Frequency Identification (RFID) Technology is used for security purpose. RFID technology is used to identify a particular person is authorized or not. In this technology, RFID tag and RFID reader is important. RFID tag which is a small device for data transmission. There are three types of RFID tags

a) Passive RFID tags
b) Active RFID tags

The Passive RFID tags are a small and less expensive; they have no onboard power supply. They derive their power from RFID reader. In other hand, Active tags have an onboard battery so it is expensive. The range to read active tag is larger than the passive tag. The passive tag can operate only when there is RFID reader else it will be inactive. Normally Passive RFID tags are used for security purpose.

Passive RFID tag consists of a small microchip, which stores a unique Electronic Product Code (EPC) number which is transmitted to the reader within RF range [4][5]. This EPC number is unique. RFID reader reads this EPC number through an antenna.

Researcher introduces a technique which is a combination of RFID and GSM technology [6]. In this system whenever the customer wants to make transaction users have to show RFID card to RFID reader, a reader reads RFID tag compares the information from RFID tag with data in controller memory for identification of authorized and unauthorized user. Also, GSM is used to send a message to registered mobile number, Yes/No/Action that means user want to make transaction user have to send message Yes to GSM then transaction take places. If a user sends no then transaction gets cancelled. If a user sends ACTION message that means in ATM center unauthorized person is entered and transaction immediately stops also ATM doors get locked as well as alarm start ringing.

Researchers also introduced new system using same technology [7]. In this system RFID tag is used for authentication. After detecting authorized user, the user has to enter correct PIN then 4 digit code is send to the registered mobile number through GSM. This 4 digit code has to enter further transaction after entering this code further transaction will be complete.GSM based system has required more time to make a transaction as compared to RFID-based technology.

The security provided by the RFID technology is not secure [8] [9]. The drawbacks are as follow:

- RFID card can be track easily.
- The communication between tag & reader can eavesdrop; it occurs when unauthorized reader intercepts the tag.
- RFID can be cloned in which unauthorized copy can be prepared and this copy can be used for any purpose.
- Whenever RFID card is stolen, that card can be misuse.
- RFID card can be disabled using jamming so that RFID card stop working.
- Due these drawbacks next techniques are introduced by the researchers.

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C. Biometric Technology

The biometric system is a pattern recognition system which is operated by acquiring the biometric data from users and then extracting this feature of biometric data, after extracting this feature compare with the stored set of the database. Biometric technology is used for security purpose; it is more secure than RFID & GSM technology. There are various techniques that are used in ATM security:

i. Fingerprint Recognition
ii. Face Recognition

i. Fingerprint Recognition System:

In Novel Method to Enhance the Security of ATM using Biometrics [10] in which replaces the PIN number with biometric system. In this system; the bank will collect the fingerprint from the customers which are stored in a database. Each fingerprint has a unique identification number. Whenever customers have to make a transaction in ATM, customers have to place a finger in fingerprint module, then module compares this fingerprint with database fingerprint. If this fingerprint matches then the further transaction will proceed else transaction will be denied.

In this system, they proposed a system which extracts minutiae of the fingerprint. After extracting the minutiae it will be encrypted using blowfish algorithm. To extract minutiae there are two techniques Binarized fingerprint images and Gray-Scale Fingerprint Images. When encryption is done then this image is transfer to the server side and decrypted at the server side. Core points can easily find out after extracting minutiae. During transaction hit and miss algorithm is used.

The researcher also combines fingerprint and GSM techniques for better security of ATM. Researchers introduce this technique in a paper [11]. In this system, bankers collect fingerprint of each customer as well as mobile number. Whenever a customer wants to make the transaction, the customer has to place a finger on fingerprint model. When fingerprint matches 4 digit code will be send in customer mobile number.

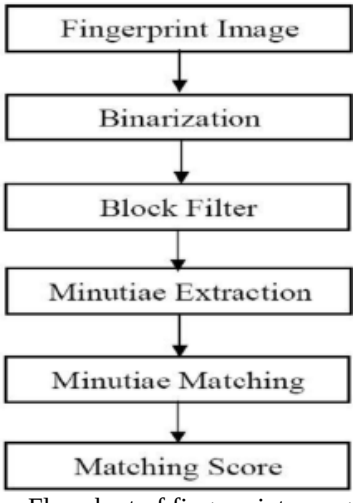

Fig. 3 Flowchart of fingerprint recognition

Fig 4 The customer has to enter this 4 digit code on the screen. If this code is valid then the customer can process further access. There are three basic fingerprint patterns- Loop, Whorl and Arch. This paper gives a flowchart of fingerprint recognition as follow:

As shown in finger there are 6 steps.

- Binarization means convert gray scale image into a binary image that is in 1 & 0 form. The threshold value is set to fix value. If the pixel value is above threshold value set '1' else it will be '0'. After binarization fingerprint image is clearer.
- Block filter is used to reduce the thickness of ridge line into the single pixel to extract minutiae points.
- Minutiae Extraction is used to find out the location of minutiae.
- Minutia matching is used to compare current fingerprint image with a stored fingerprint image. To get efficient matching extracted image is stored in matrix form.
- Matching Score is used to calculate between current fingerprint image and stored fingerprint image [12].

Matching score = Matching Minutiae / Max(NT,NI)

Where, NT and NI represent the total number of minutiae in the template and input matrices respectively [13].

ii. Face Recognition System:

In biometric techniques, there is another method called face recognition system. In ATM if a customer wants to withdraw money face recognition system is proposed for security. Researcher Deepa Malviya proposed [14] authentication for ATM using face recognition from 3 angles. Facial characteristics are analysis such as face cut, mouth etc. of the user in the face scan technology. In this system whenever the user wants to access their account users have to enter PIN after entering correct PIN face will be scan from 3 angles. 3 angles are front, left & right angles. If all these face angles are matched then the user can access the account else card will be rejected. Face recognition means matching the extracted feature of a face with sample feature stored in memory.

In face recognition, there are some drawbacks if face and camera are not at the proper distance, face size will be reduced due to this there will be a problem of matching a current facial image with stored facial image. To get appropriate matching it should necessary that face at proper angle and distance between camera and face at a proper distance.Face recognition technology is a very costly secure application. Fingerprint recognition technology performance is high as compared with face recognition technology.

The researcher implemented Improving ATM Security via Face Recognition in this system [15] for a transaction; user's face is compared with stored image in the database if that match then the user can make a transaction. In this system for extracting face feature PCA(Principal Component Analysis) algorithm is used. This algorithm converts face image into Eigen face. Also, locate anchor

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points at eyes, nose, and mouth. After locating this point connect these points and form a net. Unique face image can be created after measuring distance and angles of the net. In this system pose variation gives a problem.

The combination of OTP (One Time Password) with face recognition system is one of the method to improve a security of ATM [16]. In this system, customers have to scratch the card into the ATM center. The live image is capture by the camera then this image is compared with stored image. If these images match OTP will be send on customer's registered number. OTP is 6 digit code which is generated randomly. Users have to enter this 6 digit code for the further transaction. Here Eigen face based method that is PCA algorithm is used for face recognition, however, this method has a drawback as it can be spoofed. To overcome this OTP is used. Also, in this system if more than one faces are detected by machine then account gets temporarily locked to overcome a problem like physical attacks.

Therefore, this system makes transaction only when a user is alone.

III. PROPOSED SYSTEM

There are some limitations in the previous technology used for ATM security, so there is a need to add some extra features in ATM security. The following diagram gives the proposed system which is used to enhance a security of ATM.

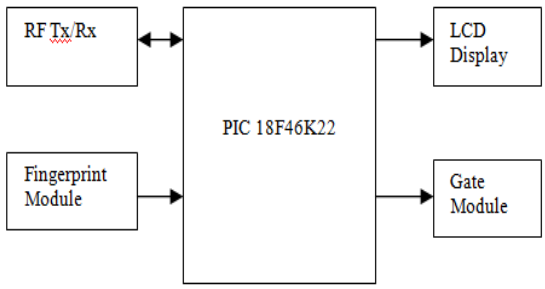

Fig. 4 Door Control Module

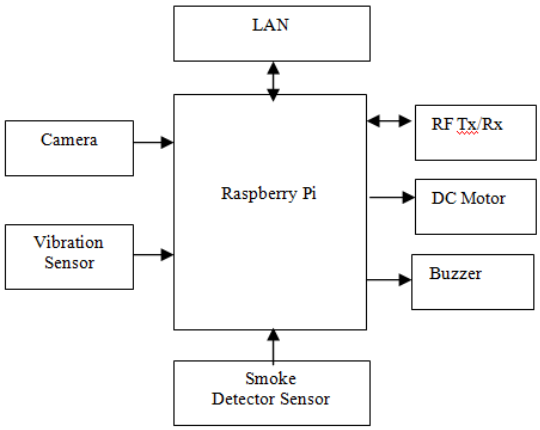

Fig. 5 ATM center Unit

The proposed system system block diagram is shown in Fig.3 and Fig.5.

There are two module first module is place in the door and the second module is place inside the ATM center. The first module shows in Fig.3. door control system which is used for authentication purpose. When customer open account in bank, bank will collect the fingerprint of each customer and stored in the fingerprint module. Whenever a customer wants to enter in ATM center for transaction fingerprint module is there for authentication. If fingerprint matches then the door will be open for particular customer else it will remain close.

The second module is ATM center unit in which Raspberry Pi is used. Camera, vibration sensor RF Tx/Rx, smoke detector, sensor buzzer, and DC motor are interface with Raspberry Pi. Whenever theft tries to steal whole ATM machine the vibration sensor sends a notification to raspberry pi and buzzer get start ringing also DC motor is used to close the shutter of ATM center.

Smoke detector sensor is also there for detecting the fire inside the ATM center. For real-time monitoring system camera is used whenever authorized person is entering in ATM center, also whenever buzzer gets starts alarming then the camera will get on and start monitoring the ATM center from a control room on a computer. The computer and Raspberry Pi connected through LAN. RF Tx/Rx is used for informing Raspberry Pi that authorized person is entering in the room start the camera.

In this system as camera is on for the particular time, power will be saved also it is a real-time monitoring system. It is an efficient system as compared to previous technology.

IV. CONCLUSION

Securities provided by previous technologies are less significant and allowing frauds at ATM. There is a need to add some extra features in previous technology to enhance ATM security. Biometric technology is more secure than RFID and GSM technology. In the biometric method, fingerprint recognition gives high performance as compared with face recognition technique.

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