

## ENHANCING ATM SECURITY USING FINGERPRINT

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### **Abstract**

*In this modern world, all the people were used ATM machines to withdrawal and transfer cash. This research based on implementing Fingerprint mechanism in the ATM System. We were selected this area to increase save and secure for all customers to make easy to do the transaction. The fingerprint minutiae features are different for each human being. There is no worry of losing ATM card and no need to carry ATM card with you always. By comparing different technologies that are used for ATM security, it observes that fingerprint technology performs better and safer than other technologies. Which is making easy and secure transaction also maintaining user-friendly environment with user and ATM machine. This is most promising technology at electronic money transaction.*

### **Keywords:**

*Enhancing ATM, Security System for ATM, Biometric Base ATM, and Fingerprint Based ATM*

## **1. INTRODUCTION**

Our main focus is to develop the better security system by using fingerprint based ATM. Biometrics is a technology that helps to make your data extremely secure, unique all the users by way of their personal physical characteristics. Biometric information used to identify the people perfectly by using their fingerprint, face, speech, iris, handwriting, or hand geometry and so on. Using biometric identifiers offers several advantages over traditional and current methods. Tokens such as magnetic stripe cards, smart cards and physical keys, can be stolen, lost, replicated, or left behind; passwords can be shared, forgotten, hacked or accidentally observed by a third party. There are two key functions offered by a biometric system. One technique is identification and the other is verification.

Fingerprint technology is highly accepted and matured biometric technology and is the easiest to develop and for an advanced level of security at the fingertips. It is easy to implement and it takes minimum time and effort to obtain one's fingerprint registered with a fingerprint identification device. Thus, fingerprint recognition considered between the minimum intrusive of all biometric verification methods. Ancient time's officials used thumbprints to seal documents thousands of years back, and law agencies have been using fingerprint identification since the late 1800s. We here carry the same technology on digital platform. Although fingerprint images initially captured, the images are not kept anywhere in the system. Instead, the fingerprints converted to templates from the original fingerprints. Not recreate it. Hence, no misusing of the system is possible [1].

Now a day, in the self-service banking system has wide popularization with the characteristic offering excellent 24 hours' service for customer. Using the ATM (Automatic Teller Machine) which provide customers with the convenient banknote trading is very common. However, the financial crime case rises repeatedly in recent years, Lot of criminals' tamper with the ATM terminal

and steals user's credit card and password by illegal means. Once User's bankcard is lost and the password stolen, the criminal withdraws all cash in the shortest time, which will bring enormous financial losses to customer. How to carry on the valid identity to the customer becomes the focus in Current financial circle. Traditional ATM systems authenticate generally by using the credit card and the Password, the method has some defects. Using credit card and password cannot verify the client's identity exactly. In Recent years, the algorithm that the fingerprint recognition continuously updated and sending the four-digit code by the Controller which has offered new verification means for us, the original password authentication method combined with The biometric identification technology verify the clients' identity better and achieve the purpose that use of ATM Machines improve the safety effectively [2].

## **1.1 EXISTING SYSTEM**

In our modern world, all the people used to do truncation in banking like deposit money and withdrawing money. For that, the customers will be standing in queue to withdraw money from bank. All the customers felt like waiting for withdraw cash. Therefore, that bank introduces ATM (Automated teller machine) to help the customer to withdraw money quick. In that ATM system, they introduce CARDS (Credit, Debit, master, Visa) to the customer to withdraw cash by using them. Main advantage is quick cash providing by the ATM system. The customer feels happy and they will not waste time to withdraw cash by standing. but it has the disadvantage like, smart cards and physical keys, can be stolen, lost, replicated, or left behind; passwords can be shared, forgotten, hacked or accidentally observed by a third party. The banks required a better system to maintain security for the customer to do the transaction in their banks. To overcome these problems, the developed this fingerprint based ATM system.

## **1.2 PROPOSED SYSTEM**

The proposed system to increasing the safe and security by introducing fingerprint system. The advantage of finger-scan technology is accuracy. By using fingerprint system many disadvantages are rapidly, reduce. They are we need not to carry ATM card in your wallet and no chance of loss card, CARD can be stolen, password can be shared or, hacking many customers are satisfied by our system because of quick and better service. Moreover, initially we store the fingerprint of bank manager and that verified with the fingerprint that we are giving when the time of authentication. If the fingerprints are matched then ATM cashbox will open, otherwise buzzer will give alarm.

## **1.3 OBJECTIVES**

The objective of this research are listed below

- Fingerprint based ATM System is more secure than ATM card.

- User can make transaction using his fingerprint any place and at any time, he need not have to carry ATM card.
- User can transfer money to various accounts by mentioning account number in case of emergency.
- The system can be used in various Banks.
- Low educated people can access easily.
- When our ATM card misplaces then no one use or access. It automatically blocks.
- No one can hack the pin code. The hackers can easily guess the 4-digit pin code.

## 2. LITERATURE SURVEY

The word “biometrics” derived from the Greek words “bios” and “metric” which means life and measurement respectively [3]. To implement this concept, we have studied different investigated works and found following data. Most finger-scan technologies based on minutiae. The downside of pattern matching is that it is more sensitive to the placement of the finger during verification and the created template is several times larger. For fingerprint recognition, a system needs to capture fingerprint and then follow certain algorithm for fingerprint matching. This research paper discusses a minutiae detection algorithm to showed key parameters of fingerprint image for identification. The maturity of Biometric techniques and generally the dramatic improvement of the captured devices have led to the proposal of fingerprinting in multiple applications but in the last years, minutiae have been the main type of algorithm used. The minutiae are relatively stable and robust to contrast, image resolution and global distortion as compared to other fingerprint representation [4]. Biometric data separated and distinct from personal information. Biometric templates cannot be reverse-engineered to recreate personal information. They cannot be stolen and used to access personal information to solving the bugs of traditional identification methods the author of designs a new ATM terminal customer recognition system is used for the core of microprocessor and an upgraded enhancement algorithm of fingerprint image intensify the security of bank account as well as ATM machine. For image enhancement, the Gabor filter algorithms and direction filter algorithms are used [5].

Miao et al proposed the Gabor filters (GFs) play an important role in the extraction of Gabor features and the enhancement of various types of images. Fingerprint and voice systems have the smallest comparative sizes with eye systems currently the largest [6]. If images of fingerprint are shoddy images, they result in missing features, leading to the degrading performance of the fingerprint system. Hence, it is very important for a fingerprint recognition system to evaluate the quality and validity of the captured fingerprint images. If Authentication Failure then it send the alert message to the Account holder and Bank [7].

To have good process of operation for fingerprint matching, in depending on the spectral details features two feature reduction algorithms given the Column Principal Component Analysis and the Line Discrete Fourier Transform feature reductions. It can perfectly compress the template size with a reduction rate of 94%. Spectral minutiae fingerprint recognition system shows a matching speed with 125000 comparisons per second on a PC with Intel Pentium D processor 2.80GHz, 1GB of RAM.

Biometric data are separate and distinct from personal information. Biometric templates cannot be reverse-engineered to recreate personal information and they not be stolen and used to access personal information [8].

Fingerprint records usually extend to impressions on the last joint of the fingers and thumb, to the extent that fingerprint cards typically record parts of the lower finger areas of the fingers [9]. Among those new technologies for dealing with payment processing, biometric payment technology has recently attracted more and more attention as a viable solution to decrease identity theft [10]. It may be historical, current or theoretical. The underlying principle of electronic money involves the use of computer networks such as the Internet and digital stored value systems. Examples of electronic money are bank deposits, electronic funds transfer, direct deposit, payment processors, and digital currencies. Electronic money can be understood as a way of storing and transmitting conventional money through electronic systems or as digital currency, which varies in value and is tradable as a currency in its own right [11]. Electronic money transfer at an ATM is a cash equivalent device that is stored on an electronic or remote device in the security of the server and can be described on the one hand as policies, guidelines, processes and procedures necessary to enable electronic transactions to be performed with minimum risk of penetration or intrusion or theft. On the other hand, electronic security is any tool, method or process used to protect system information assets. Information is a valuable strategic asset that is managed and protected accordingly. This insurance is a risk management or risk mitigation tool, and appropriate safety measures mitigate the risk of underlying transaction commensurate with its value [12, 13].

Ratha et al. [15] said biometric authentication become more and more popular in the banking and finance sector [15]. It provides easy to withdraw or do any type of transaction. So all the customer prefers for do transaction in ATM. The idea of fingerprint is not only for security but also to overcome the lack of customer understanding on ATM concept. By this biometric system, illiterate people can also do their transaction with the help of fingerprint. The proposed method needs ATM with biometric, fingerprint security system, in order to meet its customer's “who many of them have savings account and need to have access to their money during non-banking”. ATM with fingerprint scanner offer excellent security to customer since there is very low possibility of fraud. By using fingerprint recognition customers are more comfortable with the idea of saving their money with the bank because they understand that no one can replicate their fingerprint and take their money. Fingerprint authentication is the most popular method among biometric authentication, fingerprint based identification is one of the most mature and proven technique [15, 16]. It provides more security than normal security in the banking system. Biometrics holds the promise of fast, easy-to-use, accurate, reliable, and less expensive authentication for a variety of applications [17].

Iwasokun et al. [19] said customer able to do their transaction quick and safe. Because when the entire customers want to deposit cash or withdraw their money, they all want to do their transaction immediately. So all are trying to save their time. Therefore, that bank introduce Automatic Teller Machine (ATM) instead of teller. This machine provides all facility like teller in the bank.

Moreover, it provides better and quick process. Customer does not want to wait in the queue to do their transaction. At the time of transaction customer's enrol their fingerprint to a high resolution fingerprint scanner. The fingerprint image transmitted to the central server via secured channel. At the banking terminal, the minutiae extraction and matching performed to verify the presented fingerprint image belongs to the claimed user in bank database. The function of the feature extraction module is to extract the feature set from the scanned biometric data. This feature set is then stored into the template database. The matcher modules take two inputs, i.e., feature set from the template database and feature set of the user who wants to authenticate him/her and compares the similarity between the two sets. The last module, i.e. the verification module makes the decision about the matching of the two feature [18], [19].

### 3. MATERIAL AND METHODOLOGY

An embedded system is a combination of software and hardware to perform a dedicated task. Some of the main devices used in embedded products are microprocessors and microcontrollers. In this research mainly concentrated in Visual studio and Arduino Uno. In this paper, a fingerprint based ATM cashbox accessing system implemented using Arduino Uno module and it is the heart of the device. Initially we store the fingerprint of bank manager and that will be verified with the fingerprint that we are giving when the time of authentication. In this system, we stored all the data in SQL database. If the fingerprints are matched then ATM cashbox will open, otherwise buzzer will give alarm. The task related instructions are loaded into Arduino, which is programmed using Arduino language. The system consists of Arduino Microcontroller Unit, Fingerprint module, LED indicators and a buzzer alarm system and microcontroller that collect data from the fingerprint module. As it is based on the fingerprint authentication there is no chance of disclosing of password or pin to the third parties. In this system, we are mainly concentrates in customer security and usage. Before introduction our system so many illiterate people cannot use the ATM machine. By introducing Fingerprint based ATM system all the people can use the ATM because of user friendly. In our system, we don't want to carry ATM card and so that loss of ATM card and charring card in wallet have been reduce. Because of that we are mainly concentrating in illiterate people. In this description we have receive the entire fingerprint with the help of Arduino Uno board. In this process an Arduino Uno board plays an important role. An Arduino board is connected with the fingerprint module to receive and checks the fingerprint and all the dates will be save in the MS SQL server. In this system we are mainly concentrated in the illiterate people because all the people are lacking in the communication between the customer and the ATM machine. In banking all the customer wants to do their transaction fast and quick. Because all the customer wants to do their transaction as soon as possible.

When we introduce this system all the customers able to do their transaction quick and safe. Because when the entire customers want to deposit cash or withdraw their money, they all want to do their transaction immediately. So all are trying to save their time. Therefore, that bank introduce Automatic Teller Machine (ATM) instead of teller. This machine provides all facility like teller in the bank. Moreover, it provides better and

quick process. Customer doesn't want to wait in the queue to do their transaction. We provide it as the same technique like ATM, but when all the customer wants to do their transaction banks provide some security using debit card, credit card, master card, visa card. When the customers start to do their transaction, they want to have their cards and the pin number. When the customers have poor knowledge about ATM and their function they are so much confused. Using this system, the customer can use their fingerprint to do their transaction instead of cards. We have done many researches due to this biometric system. By our research we have notice that fingerprint is unique. It's very difficult to make any duplicate fingerprint. Its shows that it is more secure than the old system. At the end of our research Fingerprint biometric system prove more percentage of security and safe system to develop our system.

Arduino UNO is the most used board in the family of Arduino boards (Fig.1). In this research Arduino board function as main software. It is used for many researches in the field of electronic. This board is mainly connected to fingerprint module.

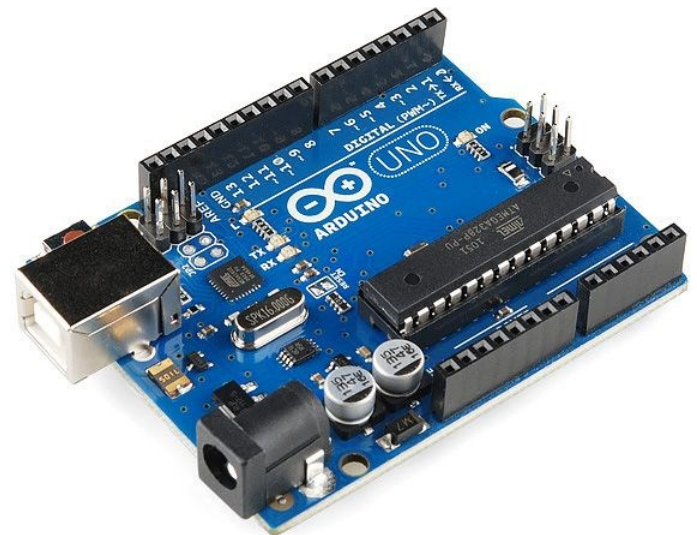


Fig.1. Arduino Uno R3

Fingerprint module is an input device used for Fingerprint processing and captures a digital image of the fingerprint pattern. We are using to recognized fingerprint because it is unique. Fingerprint module (Fig.2) is an input device used for fingerprint processing and capture image of the fingerprint Patten. We are using to recognized fingerprint because it is unique. In this type of biometric system, we have more advantages. In the modern world people are so advance to take over the security system. After so many researches we are introducing fingerprint system. It is more secure than all other biometric system



Fig.2. Fingerprint module

The circuit diagram it shows (Fig.3 and Fig.4) the modules we used in the system. We were connected fingerprint module to Arduino Uno for receiving the data. The Table.1 shows the connection on pin to the Arduino Uno to fingerprint module.

Table.1. Connecting jumper cables from fingerprint module and Arduino

Fingerprint module	Arduino board
Green Pin	2
Yellow Pin	3
Red pin	5
Black Pin	GND

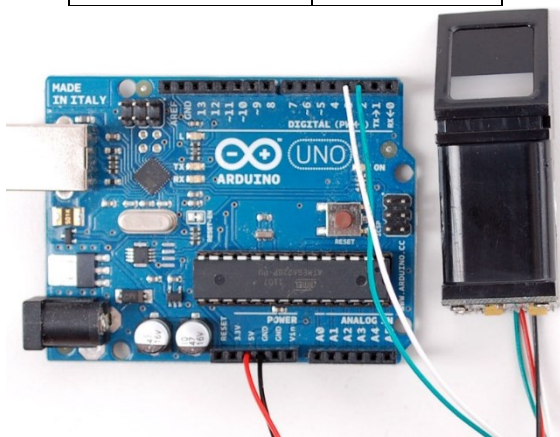


Fig.3. Circuit diagram of the proposed system

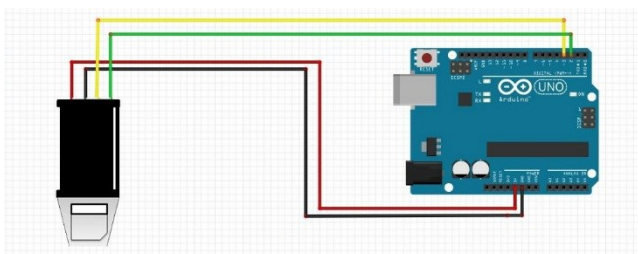


Fig.4. Circuit module of the proposed system

In Fig.4, we use arduino board and fingerprint module. This diagram shows how to connect the Arduino and fingerprint with some jumper cables. In this diagram green pin connected to two, yellow pin connected to 3, red pin connects to 5, and black pin

connect to GND. After we connect to the circuit, we can collect the fingerprint from the fingerprint module and with the help of MS SQL and visual studio we can use the fingerprint and we can return the data from our database.

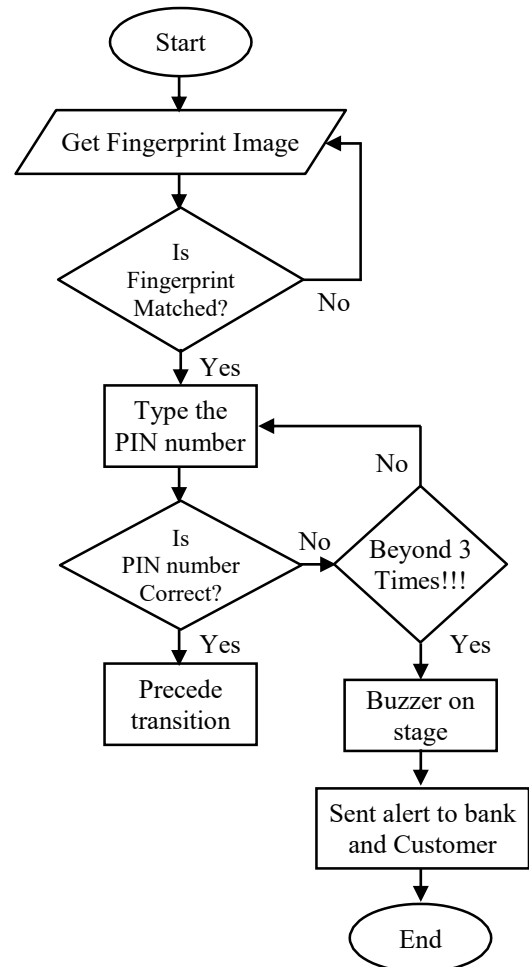


Fig.5. Flowchart for Fingerprint Based ATM

## 4. RESULTS AND DISCUSSIONS

In this research, we are mainly concentrated about the end-user and a poor literacy people. In this way we were created simple login page. Using this login page, we have two option, they are going to use the option card and fingerprint (Fig.6).

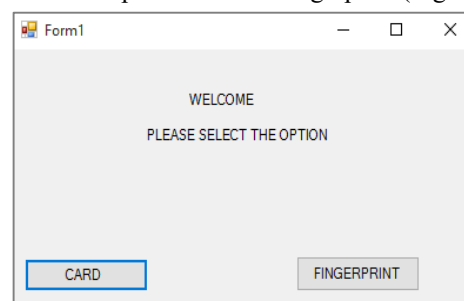


Fig.6. Fingerprint system welcome module

The customer wants to use the card option he or she should select the particular option. Otherwise, he/she want to select other option of the fingerprint.



Fig.7. Finger placing module

After selecting fingerprint, user have to place his or her finger in the scanner to verify identity (Fig.7). In this step the user's fingerprint will be identified with the help of fingerprint scanner.

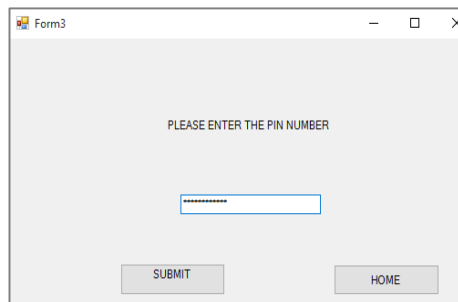


Fig.8. Pin number feed module

After the second steps, next step is the most important step. In this step the customer has to enter the pin number correctly (Fig.8). In this step all the customer has a security pin number given by the bank. If the customer enter the security pin number correctly and click on submit, the customer can do the further activities. If the customer enters the wrong pin number, it will allow entering it three times. If the pin number exceed more than three times, the ATM card

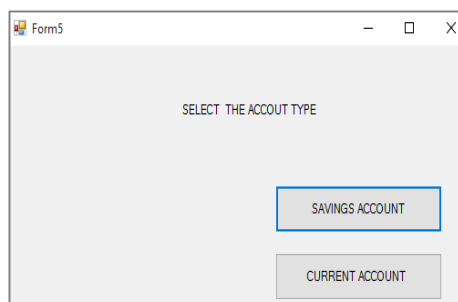


Fig.9. Account selection module

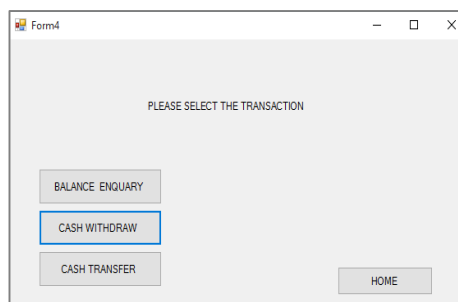


Fig.10. Transaction selection module

The following module is as usual banking system account selection (Fig.9) and transaction selection module. In this step, his or her transaction will be on their decision. We have three option. First one is to check their balance, next is to withdraw cash from their account, and the last is to transfer cash from one account to another account (Fig.10).

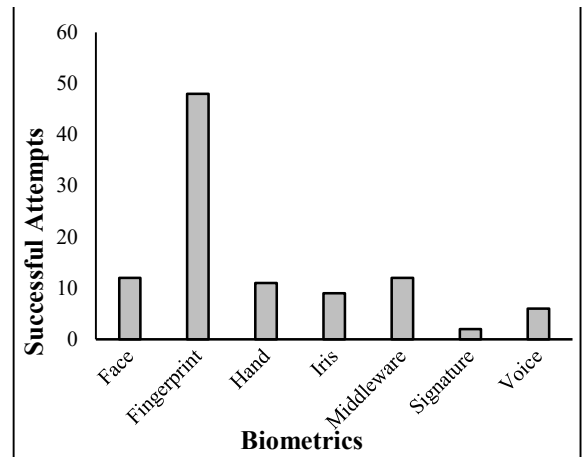


Fig.11. Survey of fingerprint with other Biometrics

The advantages of enhancing ATM security using fingerprint are Low educated people can access easily. When our ATM card is misplaced then no one use or access, it automatically blocks, no one can hack the pin code. The hackers can easily guess the 4-digit pin code. Crimes which are happening in ATM become a serious issue that affects not only customers but also bank operators. Number of the population is still skeptical about using ATM because of the issues associated with it, Fingerprint technology is the most widely accepted and mature biometric method and is the easiest to deploy and for a higher level of security at your fingertips. The Fig.11 shows the survey of fingerprint with other biometrics. In this survey among all the biometrics fingerprint system, gain a great response and success.

## 5. CONCLUSIONS

The implementation of ATM security by using fingerprint also contains the Original verifying methods, which were inputting customer fingerprint, which is send by the controller and verified properly. The security Features were enhanced largely for the stability and reliability of owner recognition. The whole system was built on the fingerprint technology, which makes the system safer, reliable and easy to use. This will be most promising technology at electronic money transaction.

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