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Proposed Security System to Embed Fingerprinting and Voice Recognition for ATMs

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Abstract: Automated Teller Machine (ATM) is most commonly used commercial application by people for their money transactions. Over the last thirty years people are largely using and have been depend on ATM. In this paper, a system is proposed to improve the performance in ATM machine security enhancement. Security of customer account is guaranteed by the Personal Identification Number (PIN). But PIN can be shared with others. The fingerprints of every person are unique and cannot be shared. In this paper ATM system security has been improved by integrating the fingerprinting and voice recognition of the user. C# programming language and SQL data base has been used. There is no need to carry cards and memorize passwords. The proposed system can be beneficial for blind persons, senior citizens and uneducated people.

Keywords- Fingerprint-Based Authentication, ATM, Voice-Based Authentication, Verification, Security

I. INTRODUCTION

In the security of the transactions on the ATM has been raising many concerns. The current use of PIN for ATM has been susceptible to unauthorized access, misplacement and forgetfulness. Earlier period there are so many techniques had been designed for an enhanced biometric authenticated ATM system that ensures greater security and increased customer’s confidence in the banking sector. A biometric system is a pattern-recognition system that recognizes a pattern based on a feature vector derived from a specific behavioral or physiological characteristic that the person possesses .Duvey et.al proposed bio-metric based ATM transaction system which is based on bio-metric data. In bio-metric systems physical bio-metrics characteristics in which include fingerprint, hand, palm geometry, retina, iris and face etc. while popular behavioral characteristics are signature and voice. Bio-metrics technologies are a secure means of authentication because bio-metrics data are unique, it cannot be shared and copied. it also cannot be lost.

II. RELATED WORKS

An automated teller machine was first introduced in 1960 by City Bank of New York on trial basis. The concept of this machine was for customer to pay useful bills and get a receipt.[1]. Traditional banking systems are undergoing advancements very firstly for example the self service banking system has got great extent popularization with 24 hours high quality service for customer .The banking operation system provides the cash to customer through Automated Teller Machine at anywhere anytime. Automatic Teller Machine was invented to address the following issues in banking system: Quick access to fund withdrawal, Long queue in banking hall, banking at any time, Improvement in the quality of banking services to customers. Safety of bank customer fund in banking has always been a concern since ATM was introduced.The first ATM that stored PIN on the card was developed in United Kingdom in 1965 while the modem and networked ATM was invented in Dallas, Texas, in 1968.Traditional automated teller machine systems are undergone many changes[2].Biometric based ATM transaction system which is based on biometric data i.e iris recognition, fingerprint recognition, face recognition ,voice recognition etc. In this system biometric data is used along with PIN number and if biometric data of user is matched with stored biometric data then user will allow to do the transactions. Lot of work is done by many researchers to resolve these kinds of problems by biometric approaches. In this section, the work done by earlier researcher.

Table 1 Review related to Fingerprinting techniques in ATM

S.No.	Authors	Year	Technique	Advantages
1.	Arun Ross	2005	A set of 8 Gabor filters and hybrid fingerprint matching Scheme	The hybrid matcher is observed to perform better than the minutiae matcher.
2.	Fengling H,	2005	Two layer of authentication with fingerprint	To enhanced the ATM security system

3.	Gerik Alexander	2007	Replacing the combination of cards and pins with only biometrics	higher security level
4.	Abhishek Nagar	2009	improve the recognition performance as well as the security of a fingerprint based biometric cryptosystem, called finger print fuzzy	Improve the data base problem of fingerprint
5.	Jain,A.K.;Lin Hong;	2011	Improved minutiae extraction Algorithm	ability to compensate adaptively for the nonlinear deformations
6.	Dr.K. Umamaheswari	2011	multi modal biometric system and uses face and fingerprint features for biometric Verification	more evident in the case of a larger database of users
7.	Anil Jain	2011	A Band Pass Filter	to remove the noise and preserve true ridges/structures
8.	Vijay Singh Rathore	2012	discussed importance of dual verification process	higher security level
9.	Subh	2012	key points generation is the iterative process of evaluating the costs of each fingerprint and iris	strength to exclude false feature and minutiae points from its extracted list
10.	Bhosale, Sawant	2012	proposed system hybridize feature-based fingerprint, iris and PIN	proposed systems hybridize feature-based fingerprint, iris and PIN
11.	Himanshi Budhiraja	2013	biometric personal authentication system using a novel combination of iris and fingerprint	To enhanced the ATM security system
12.	Alexander .N Ndife	2013	AFIM model encompasses all the functionalities of the traditional ATMs with integration of biometric fingerprint	Improve the data base problem

Table 2. Review related to Voice Recognition techniques in ATM

Sr.No.	Authors	Year	Technique	Advantages
1.	Bhupinder Singh	2012	Speech Recognition Process using Hidden Markov Model.	disable persons can operate computer with their own voice commands.
2.	Mahalakshmi.M	2012	implementation of Hidden Markov model algorithm (HMM) to calculate speech rate .	allows to provide a much more secured voice recognition system in ATM machine .
3.	AMIT KUMAR SINHA	2013	SPEECH RECOGNITION with the help of MATLAB Programming which requires wave format speech signals.	Improve the wave format of voice signals.
4.	AKSHATA PATIL	2014	using the MAT LAB software to the iris and voice recognition	one is able to access the other systems

III. PROPOSED SYSTEM

Our system integrate biometric identification into normal, traditional authentication technique use by electronic ATM machines now a days to ensure a strong unbreakable security and non-repudiate transactions. In order to increase the security we are using the combination of three authentication methods of card, fingerprint, and PIN with voice. Our proposed System makes use of the Finger Print Scanning Technology and voice Recognition Technology to authenticate the user. Our proposed System require user to generate the finger print sample and voice sample at the time of creating account in bank. Then these data's are stored in authentication database. The user now uses the ATM machines without pin number

The User can now enter the ATM Room and have to place his fingers in the finger print scanning device. Then the system will authenticate with samples stored in authentication database. If the accuracy is 98% with the sample stored in database then it will enter mode. One is voice recognition and another is password. if select the voice recognition mode then check for the voice samples to be stored in database.

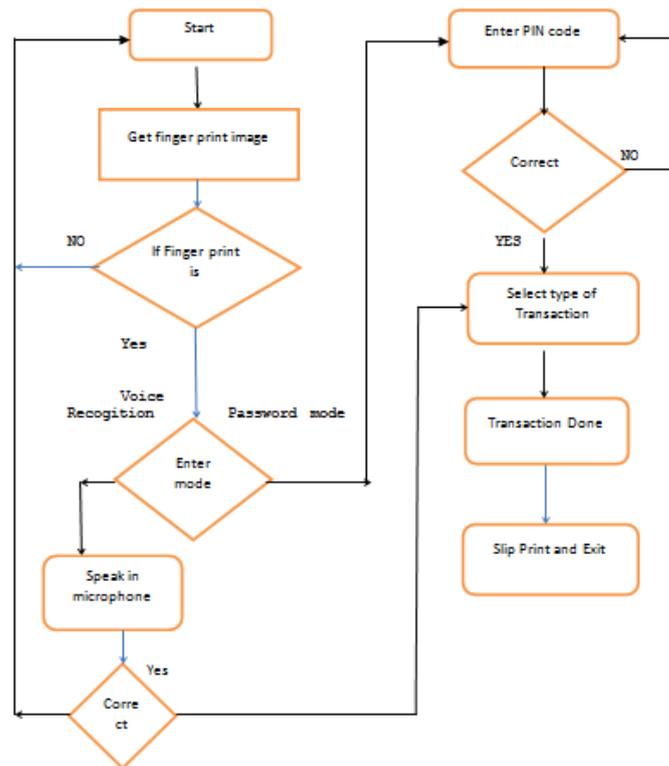


Fig 1. Flow Chart of Proposed System

If match voice sample then select type of transaction and transaction completed. If select the password mode then enter the PIN. if PIN verification and identification correctly done. then select type of transaction and transaction completed.

IV. FINGER SCAN TECHNOLOGY

Finger Print technology is the initial bio metric sciences and uses unique features of the fingerprint to verify or identify of individuals. It is most deployed technology among other bio metric characteristics, used in application ranging from physical access and logical access. Each and every human have unique characteristics and patterns. A Finger Print pattern or sample consists of lines and spaces. These lines are referred as ridges while the spaces between these ridges are called valleys. These ridges and valleys are matched for verification and authorization. These unique finger print traits are referred as “minutiae” and comparisons are made on these traits. The typical live scan produces 40 “minutiae”. [5].

There are five stages in finger scan verification and identification they are finger print image acquisition, processing, location of distinctive characteristics, template creation and template matching. Image acquisition stage involves preprocessing, such as scaling. Image processing is the process of improving the appearance of an image. These results in a series of thick black ridges contrasted to white valleys [6]. In this process image features are detected and enhanced for verification against the stored minutia file. Image enhancement is used to reduce the distortion of fingerprint caused by scars, cuts and dirt [7].

The next stage in the finger process is to locate particular distinctive characteristics. Finger print ridges and valleys form particular patterns such as

- i) Arch: The ridges enter from side of the finger then rise in the center which forms an arc then exit the other side of the finger.
- ii) Loop: The ridges enter from side of a finger, forming curve then exit on that same side.
- iii) Whorl: Ridges form circularly around a central point on the finger.

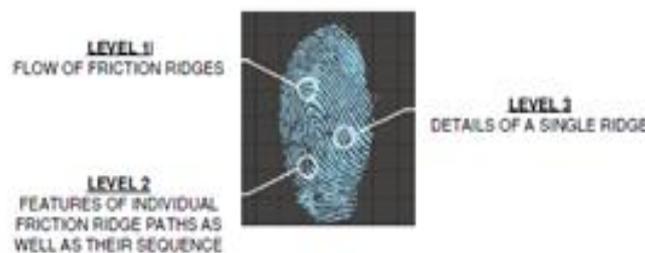


Fig 2 Three Level Fingerprint Verification Process.

Source:- SavitaChoudhary et.al(2014)

The common types of minutiae are ridge endings and bifurcation. This is the point at which one ridges divides into two. Then template is created using that.

V. VOICE RECOGNITION TECHNOLOGY

Voice recognition is the ability of a machine or program to receive or to understand and carry out spoken commands. It is generally regarded as one of the convenient and safe recognition technique [13]. Voice verification combines behavioral and physiological factors to produce speech patterns that can be captured by voice processing technology (Rubab and Jhat 2011). Voice recognition techniques can be divided into different categories depends on the type of authentication domain (Ruud et al., 2003):

- i. Fixed Text Method: in which the customer speak a predetermined word that is recorded during registration on the system.
- ii. Text Dependent Method: Here, the system prompts the user to say a specific word, to use these to computed on the basis of the user's fundamental voice pattern and match with recorded data.
- iii. Text Independent Method: This is an advanced technique where the customer need not articulate any specific word.

The matching is done by the system on the basis of the fundamental voice patterns irrespective of the language and the text used.

iv. Conversational Technique: verifies identity of the speaker by inquiring about the knowledge that is secret or unlikely to be known or guessed by someone else.

In voice recognition systems, inherent properties of the speaker like fundamental frequency, cadence, nasal tone, inflection etc. are used for voice authentication. It work by analyzing the waveforms and air pressure patterns produced while a person talks. user speaks into the microphone. microphone capture sound waves and generates electrical impulses and sound card converts voice signal into digital signal These systems may use the characteristics of an individual voice or some pre -arranges words. Voice is one of the most convenient biometric but is not reliable due to bad accuracy. A person with a cold or throat problems may face problems using the voice recognition system as it may be rejected.

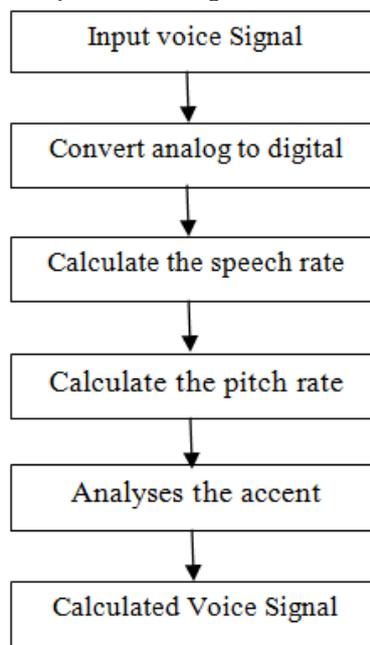


Fig 3. Voice Recognition System.

The system has the following phases:

- Training phase
- Testing (operational) Phase

5.1 Training phase

Training phase in this phase a persons are registered and their voices are recorded. Features extracted from the recorded voices are used Then template is created using that.

5.2 Testing (operational) Phase

Testing or operational phase in this phase a person who wants to access the ATM is required to enter voice in speaker. The entered voice is processed and compared. At this point system decides the feature extracted from the given voice matches with the template of claimed person. Threshold is set in order to give a definite answer of access acceptance or rejection. When degree of similarity between a given voice and model is greater than threshold the system will accept the access otherwise the system will reject the person to access the ATM

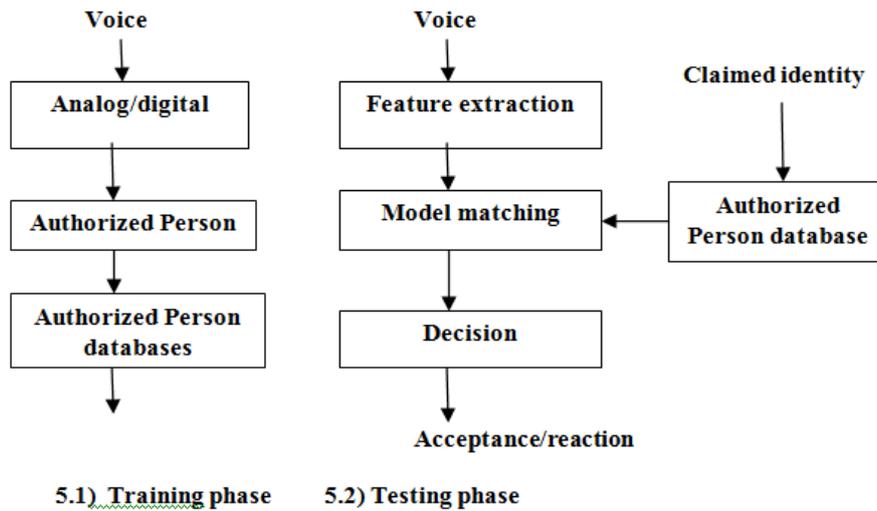


Fig 4. System Architecture of Voice Transaction

VI. DESIGN IMPLEMENTATION

The implementation of this work was carried out on a Visual basic Network (V.B.Net) framework using C# language. The application was made in six interfaces: login interface, enroll fingerprint interface, Transaction mode interface, Voice interface, PIN no. and transaction type selection interface.

i) login interface: user enter card. A dialogue box appears prompting an invalid or valid card number , If the Card number is valid, the customer is directed to the next phase.

ii) Enroll fingerprint interface: in this phase the authentication box for inputting of the fingerprint. A Scanning device takes a mathematical snapshot of user unique biological traits. This snap shot is saved in a finger print database as a minutia file.

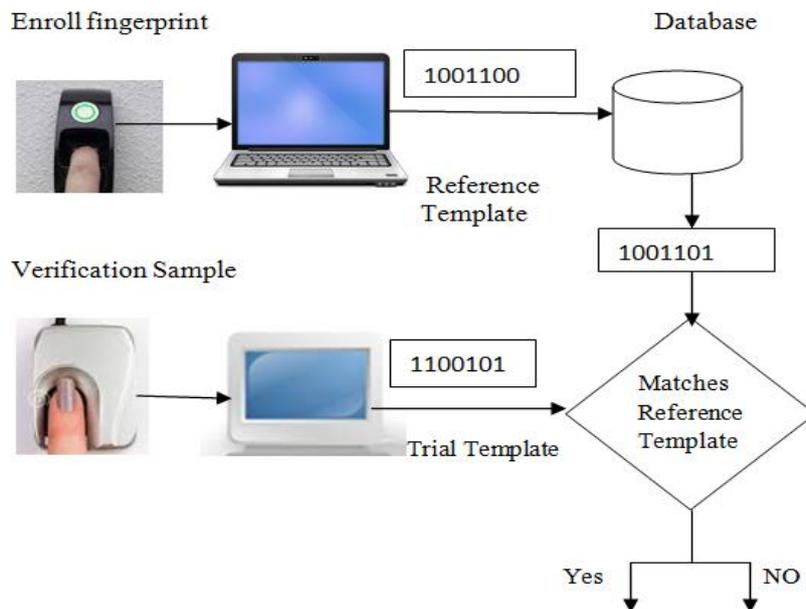


Fig 5 Fingerprint Verification System.

The fingerprint reader accepts the fingerprint and seeks to match with the already enrolled templates in the bank database. If it matches, the customer will be authenticated, otherwise access will be denied.

iii) transaction mode interface: The customer is taken to transaction mode phase where he/she chooses among PIN or voice mode of transactions.

iv) PIN mode interface: if user select PIN number mode then user enter the PIN. If the PIN number is valid, the customer is enter the transaction selection process.

v) Voice mode interface: if user select voice mode then here use Conversational Technique of voice recognition. in which verifies identity of the customer by inquiring about the knowledge that is secret or unlikely to be known or guessed by someone else. That information is store bank database that time account is open.

vi) Transaction type Selection: In this interface user select the transaction type. If choose withdrawal type. At completion of the withdrawal, then print the slip and shows the customer current balance.

VII. ADVANTAGES OF PROPOSED SYSTEM

1. Provide 3 Step Strong Authentication
2. Our System replaces card system with physiological characteristics.
3. Hidden cost of ATM Card Management can be avoided.
4. It's ideal for rural masses
5. Useful for senior system because no need to carry cards and memorize passwords
6. Card Stolen problems and related call centers are not required which will reduce the cost of operation of bank.
7. Due to bio metric system no one is able to access the other systems.
8. User can change the authentication any time in home branch with few simple procedures.
9. It is easy to use.
10. It is used instead of PIN number

Limitation

1. The requirement of bio metric devices in ATM Machines will improve the cost of ATM Machine but it will balance in operation cost of the ATM Machine.
2. Every time, account holders should come to ATM to collect money
3. Due to three step authentication process timing is very high but it ensures absolute security to users.

VIII. CONCLUSION

ATMs have become more important to the society. There are millions of money transactions that happen in a single day through ATM. There are many frauds that occur in ATM, mainly due to PIN. So, this proposed system enhances security on money transactions and has also made ATMs an easier access for the less educated. This method when fully deployed will not only increase the authentication, but will also help in the implementation of complex ATMs (performs deposits and money transfer), as this system provides increased security.

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