

Automatic Demand Draft Generation Technique in ATM using IoT

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Abstract: The main aim of this model is to reduce the inconvenience faced by clients and financial institutions for generating a demand draft that will be accepted by any financial institution. Generation of a demand draft is usually a very cumbersome process for both the parties, i.e., the bank and the customer. The customer has to stand and wait in long queues at the bank and the bank can only process the requests placed after closing time on the next day. The proposed model will allow the customer to generate the demand draft at any time and even on bank holidays without any hassle. It is an effective procedure to reduce the time and energy spent in generation of demand draft by the banks. The proposed model gives strength to anywhere banking. The account number of the customer is mandatory for the proposed system. The ATM prints the demand draft in form of a slip from the ATM terminal with a barcode on the slip to identify the transaction by the financial institution and assist during the cancellation.

Keywords: ATM, Anywhere banking, beneficiary, barcode, demand draft, account number, customer, financial institution, RFID, AES

I. INTRODUCTION

Most banks use Demand draft as an effective method to transfer bank account money to any other purposes. It is a Reachable Apparatus. This method is more or less similar to cheque but without bouncing problem DD provides the guaranteed payment. The DD can be created only the money available in the customer account and amount depicted only when the customer deposits the money. By using this method we can ensure the obtainability of cash in the account till the amount mentioned in the demand draft. Demand drafts are of two different types.

Sight demand draft, is approved and paid only after verifying the specific documents. Until the specified document is true, the payee will not be able to receive the money.

Time Demand draft, DD is payable only after the specific time period and it cannot be withdrawn from the bank before that.

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Demand drafts are often used to consuming products over the phone. Demand drafts are regularly used by customers as an alternative of credit cards, and huge companies also normally use them. Demand drafts are also a popular technique for lending organizations to effort to collect on unsettled loans. With the onset of online demand draft generation techniques the conventional method of visiting the bank for its generation is slowly becoming outdated. The demand draft has to be issued by the financial institution and has many interbank procedures involved in it. This system caters to the same need of making the procedure of demand draft generation automated. ATM (automated teller machine) is a system that provides the users with cash anywhere and at any time. ATM terminals can be set up anywhere and are used to make deposits as well as dispense cash instantly. The inspiration behind the ATM was to reduce the workload of the employees at the bank.[1][2]

The ATM helps to reduce the bank overheads as the wage of the employees would be decreased. The entire process for making a demand draft is a very cumbersome process and involves a lot of administrative procedures and manpower. [3][5] The ATM machines were installed in the first place to serve as a mini cash withdrawal counter to make it easier for the bank customers to withdraw money. The main goal of this article is to focus on the demand draft using the already present ATM terminals. In the present situation, the ATM terminals use for the demand draft generation has the following profits,

1. Anyone can use the ATM terminal in any place at any instant of time framework. It is available as 24 * 7 as the main added advantage integrating this service into ATM machine
2. Providing higher efficiencies with greater utilization is one of important goal. This enables the generation of the demand draft with no extra need for human and financial
3. Generating the Demand Draft at whatever time desired affords flexibility and permits the users to access the ATM machine even at remote hours to generate the demand draft.
4. The resources necessary for the financial activities thus could be properly tuned down affording to the requisite. It affords scaled up and down feature of the properties according to the changing requirements of the business.
5. It supports in prompt automatic appraises to the customer mobile about the transactions that occurred in the automated process of generation of demand draft in a timely manner.[6]

6. In the proposed system the RFID card based ATM cards will be used. Each RFID card will be stored with a unique user ID that will be associated with the user's account. Only after the user's RFID card is validated, there will be an option for the user to enter the PIN and subsequently a demand draft will be generated. Maintaining the Integrity of the Specifications.

II. BACKGROUND

The author (Mohd et al., 2011) [4] has proposed that the customer swipe his/her ATM card at the machine. After swiping the card the ATM will show various options as in the existing model and from those options the user will select the option for demand draft generation. The ATM terminal will then show various details that have to be verified, after which a demand draft will be generated from the ATM slot along with a transaction slip.

(Sridharan, S., & Jammalamadaka, S. (2014)) the author proposes that the user swipe his/her ATM card at the ATM machine. After the details of the card have been verified, a message or a time independent key will be sent to the user instead of which will have to be entered into the ATM machine instead of the PIN. This fact is based on a research that concludes that almost everyone who owns a bank account also owns a mobile phone. The key generated would be time independent.

The author (Saxena, S., 2013) proposed a system where the user can generate a demand draft sitting at home using their computers. The author mainly talks about extending the currently existing online demand draft making technique to include the fact that the demand draft can be printed by the user sitting at home without going to the bank. This would considerably reduce the workload of the banks and the manpower invested in the same.

(Shraddha V et al., 2016), (Suganya, B et al., 2014), proposed a system which uses the technique to automate the process by adding additional module within the automated teller machine so that instant money deduction in the account in which DD is generated and credit to the account where payment has to be made. They have used the RESTful web services which diminishes the problem on the financial server.[7][8][9]

The ATM, also known as any time money is a convenient replacement for the old banking methods. (Mujtaba, G., & Mahmood, T. 2011), (El-Haddad, A. B., & Almahmeed, M. A. 1992). The main purpose behind the ATM machine is to dispense cash to the legitimate bank customers conveniently whenever and wherever needed. (Zhi Zhong et al., 2010), (Yun Yang & Jia Mi, 2010) Ahmed, S. S. (2005). The major sequential processes involved for dispensing cash from an ATM are as follows:

1. Swiping or inserting the card in the respective ATM terminal
2. Entry of the personal identification number (PIN) to validate the user by the cardholder
3. Selecting the transaction that the user wishes to perform (withdraw, deposit, balance enquiry)
4. Completion of the transaction.

III. SHORTCOMINGS IN THE EXISTING METHOD

The main shortcomings of the existing model are:

The customer has to visit the bank in order to process the request for the demand draft and stand in the long queues at the financial institution.[10][11][12]

Even if the request for the demand draft is placed online the request takes 4-5 days in order to be processed, also the requests placed after the working hours are taken into consideration the next day.

The request for the demand draft has to be placed at the bank within its working hours. The availability of banks on certain days.

The request for the demand draft has to be placed at the bank within its working hours. The availability of banks on certain days such as national holidays is not guaranteed.

Interbank transactions are required in order to process some requests.

The entire process involves a lot of manpower overhead which can be considerably reduced and put to a better use.

In many places automated teller machines are not efficiently utilized. It is encoded to work for other financial facilities in order to expand the utilization rate by which provide an efficient and automated process for the demand draft generation.

The next section describes the high level architecture of the proposed system followed by that the next section describes the various phases associated with the proposed system along with the complete functional flow. Final section deals with the implementation issues of the proposed model and concludes the work with the future scope in the proposed work.

IV. PROPOSED SYSTEM

The ATM card and the pin used by the user are mandatory for the proposed system along with the mobile number that is currently being used by the user. This requirement of the user's mobile number is based on a globally known fact that individuals owning one or more bank accounts have at least one mobile phone in use. The user will scan the RFID based ATM card, this prevents the events such as the card being stuck inside the ATM machine or the card not being read properly by the ATM machine. Each ATM card would already be registered in the bank with the name and id number of the customer.[13][14][15] The keyboard to enter the pin (personal identification number) will only be shown to the user if the RFID based ATM card is recognized by the ATM terminal. After entering the valid pin number, the user will be given an option to enter the name of the payee and the amount for which the demand draft has to be printed. Proceeding the entry of those two details the account is checked for balance limits and the demand draft with a bar code would be printed by the ATM terminal. Once the demand draft has been printed the user will get a message for the amount deducted from their accounts. The mobile once misplaced shall be brought to the notice of the respective financial institution by the cardholder so that the option of change of the mobile number might also be provided.

4.1 Proposed System architecture

The proposed system model send an SMS through GSM modem interfaced through TX, RX pin to the microcontroller. An LCD is also interfaced with the Micro controller to display required information. Thus, the proposed model is designed to demonstrate a working model of bank ATM machine.

The proposed model consists of following components

1. Power supply (12v step down transformer, rectifier, 7805 voltage regulator, capacitor, resistor, LED)
2. 89s52 microcontroller
3. 16x2 lcd
4. GSM module
5. RFID READER
6. 4x3 matrix keypad Switches and Buzzer

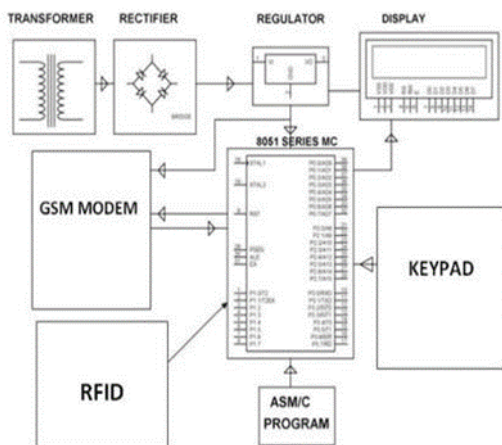


Figure 1: Proposed System Architecture

4.2 16x2 LCD (Liquid Crystal Display)

LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. It has two registers, namely, Command and Data. It was used to display card authentication, Balance Check and Demand draft option.[16][17][18]

4.3 4x3 Matrix Keypad

Keypads are a part of Human Machine Interface and play really important role in a small embedded system where human input or interaction is needed. We make the column as input and we drive the rows making them output, this whole procedure of reading the keyboard is called scanning. To detect which key is pressed from the matrix, we make row lines low one by one and read the columns. For example we first make Row1 low, then read the columns. If any one of the key in row1 is pressed will make the corresponding column is low i.e. if second key is pressed in Row1, then column2 will give low. So, we come to know that key 2 of Row1 is pressed. This is how scanning is done.[19][20]

Keypad was used to Enter amount to be withdrawn and used for demand draft. The following instruction passed to the users, entered amount must be in 4 digits. Suppose, If you want to withdraw 400 you have to enter 0400. '#' key used for enter key option.

4.4 GSM

GSM module is used in many communication devices which are based on GSM (Global System for Mobile Communications) technology. GSM module only understands AT commands, and can respond accordingly. The most basic command is "AT", if GSM respond OK then it is working well otherwise it respond with "ERROR". There are various AT commands like ATA for answer a call, ATD to dial a call, AT+CMGR to read the message, AT+CMGS to send the message etc. AT commands should be followed by Carriage return i.e. \r (0D in hex), like "AT+CMGS\r". We can use GSM module using these commands. We use microcontroller's serial port to communicate with GSM, means using PIN 10 (RXD) and 11 (TXD). It was used to send transaction alert to the user about the amount withdrawn from its account.

It authenticates the identity of the subscriber through the use of a challenge-response mechanism. A 128-bit random number (RAND) is sent to the MS. The MS computes the 32-bit signed response (SRES) based on the encryption of the random number (RAND) with the authentication algorithm (A3) using the individual subscriber authentication key (Ki). Upon receiving the signed response (SRES) from the subscriber, the GSM network repeats the calculation to verify the identity of the subscriber. The individual subscriber authentication key (Ki) is never transmitted over the radio channel. It is present in the subscriber's SIM, as well as the AUC, HLR, and VLR databases as previously described. If the received SRES agrees with the calculated value, the MS has been successfully authenticated and may continue. If the values do not match, the connection is terminated and an authentication failure indicated to the MS. The calculation of the signed response is processed within the SIM. This provides enhanced security, because the confidential subscriber information such as the IMSI or the individual subscriber authentication key (Ki) is never released from the SIM during the authentication process. The overall implementation outputs us a secured and authentic transaction achieving goals of privacy. The only investment is in the RFID & GSM system which is one time and with less maintenance. This proposed system is suitable for several practical applications which are used in financial transactions for application of user identity and prevention from ATM frauds. Hence, our innovation ensures to solve the aspect of ATM security to a large extent. In addition to this the project can be expanded for future scope using more parameters like fingerprint, face recognition.

4.5 RFID

When RFID card is brought into vicinity of ATM, the card reader checks the details of card holder with the database. Then the information customer account number is sent to microcontroller. With this verification the uniqueness is checked & a message is sent to card holder whether to continue the transaction or not. This is done with the aid of RT system

A typical RFID sys consists of 3 components such as Tags, Reader and Host computer system. An RFID tag referred to as a smart tag consist of a transmitter & responder. It comprises of a simple silicon chip mounted on substrate.



The responder memory is used for data storage & response via communication. These tags can be active or passive depending on presence of battery. These tags identify the customer details. The readers called as “scanner” send & receive RF data to & from the tag via antenna. These provides the means of communicating with tag & facilitating data transfer using Command Response Protocol the readers help in verifying the genuineness of the detail.

The contactless card reader can read data from an RFID tag of a customer's ATM card. The contactless card reader, such as an RFID tag reader, can be located so as to provide additional space for another transaction component. It can also be used in conjunction with a magnetic stripe card reader. The ATM includes housing for the RFID tag reader that is adapted to prevent interception of radio signals. The ATM is able to prevent dispensing of currency in situations where unauthorized detection of signals is sensed. Security password is entered through the keypad. When you enter the correct password then further transaction is proceeded otherwise it will be terminated.

In the proposed model,, when consumers use their card for the transaction, a corresponding message about the transaction will be sent to the mobile number which is registered by the consumer. The major is the ability to uniquely identify things & entities. This purpose is served by the RFID technology along with maintaining user’s confidentiality under any situation. The GSM module functions as a network that consists of several functional entities whose functions & interfaces are defined. This network comprises of various subsystems, stations, and register necessary for communication. This module helps us in providing the customer the corresponding dynamic password which is generated. This provides an additional level of security.

RFID works at different frequencies each determining the range of its operation. The card can be of active type, passive type or Battery Assisted Passive (BAP) type. This classification is according to the type of energizing the card employs. Reader on the other hand is classified based on its source of energy either AC or DC. For the implementation transmitter and receiver circuit is used to resemble the operation of the card and reader pair. Distance of separation between the transmitting and receiving module depends upon the type of antenna used. 3. Microcontroller to get the count of the RFID tags used.4. It has a RS232 interface to communicate with external device (Martin, J., & Hinkle, D. 2004)

4.6 AT command

AT commands are also known as HayesAT commands. There are different views to understand the meanings of "AT". Some call it "attention telephone", whereas others interpret it as "attention terminal" commands. AT commands allows giving instructions to both mobile devices

and ordinary landline telephones. The commands are sent to the phone's modem, which can be a GSM modem or PC modem. AT commands can be used for operations that are usually done from the keypad, for instance calling a number, sending, reading, or deleting an SMS, setting the SMSC number, looking for a GPRS access point, reading and deleting phonebook data, reading the battery status, reading the signal strength, and so on. AT commands allow

giving instructions to both mobile devices and ordinary landline telephones. The commands are sent to the phone's modem, which can be a GSM modem or PC modem. When you want to make a pc-based application to interface a mobile phone using USB, IR or Bluetooth, these commands are needed to communicate with mobile phones. Basically AT commands work on devices that have a built-in GSM modem.

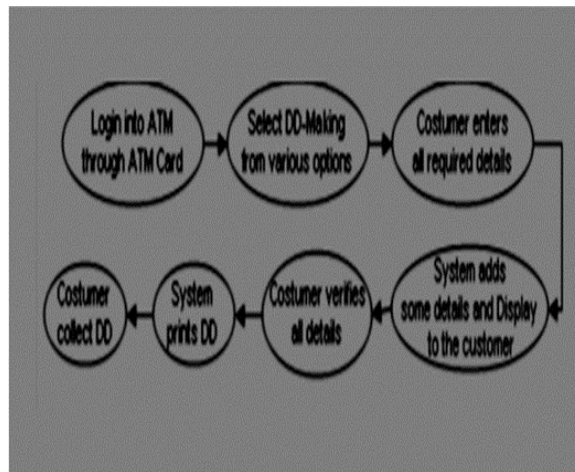


Figure 2:Flow chart for the working of the system

4.7 Proposed system algorithm procedure:

1. The user takes the RFID based ATM card near the RFID scanner to be recognized by the RFID scanner. User details such as the unique identification number allotted to the user and the user name are stored in the magnetic chip inside the RFID scanner.
 - a. RFIDscanner <- RFID (u_id, username)
2. After the RFID card is recognized by the ATM machine the option for making the demand draft is chosen and the PIN is entered into the ATM.
 - b. Choose -> Opt (DD) && Enter (PIN)
3. After PIN verification the ATM terminal shows the option for entering the payee name and the amount for which the demand draft has to be prepared.
 - . Verify (PIN) && Enter (PayeeName, amount)
 - a. Print (Demand_Draft)
4. The demand draft for the specified amount is generated from the ATM using a thermal printer.
5. On generation of the demand draft a message is sent to the registered mobile number specifying the amount deducted.
 - a. Mobile <- SMS("Success DD generated,amount)

V. ARCHITECTURAL COMPONENTS

The functional units of the proposed system contain the different stand-alone modules which are needed to be interfaced in proper fashion to obtain the desired functioning of the automated demand draft generation process. (Starrs, E. 2008) , (D. Chaum, 1982), (Morgan, R.,2015), (Pollin, R. 2006).[20][21]



The windows form takes different inputs from the user such as the serial ports to which the GSM module and the RFID module are connected and the mobile number of the user on which the message will be sent after the printing of demand draft. On verification of the phone number, the user is requested to enter the PIN and then the amount for which the demand draft has to be generated.

GSM(Global System for Mobile Communications) is a communication method developed by European Telecommunications Standards Institute (ETSI) to describe the protocol which are used by the mobile and cellphone devices to communicate with each other. GSM module sends a message to the registered mobile number.[22][23] RFID (Radio frequency identification) uses electromagnetic fields to detect and track the devices. Information is stored inside the magnetic chip which on scanning is recognized by the RFID scanner. RFID tags are also used for security purposes to track and locate valuable possessions.

UART(Universal Asynchronous Receiver/Transmitter) is a microchip that is used to interface the serial devices with the computer. It is used for asynchronous serial transfer. It takes care of whatever data has to be transmitted to the serial devices from the PC and vice versa.

Thermal printing is a digital printing technique that uses heat to print the desired image on the paper. As the paper passes through the head of the thermal printer it applies heat at certain places which are to be printed and those places on the paper turn black. Two different types or different intensities of heat are applied to print two different colors.

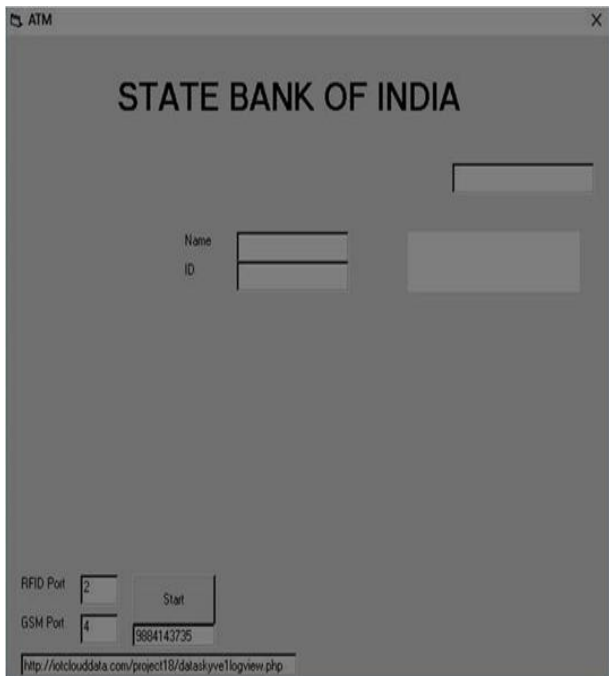


Figure 3: ATM GUI Interface

The customer name, user id and their mobile number are entered into the GUI interface and all the details are logged for the security purpose. The RFID port and GSM port is added and the login process starts. After this the demand draft is generated with the time and date for the specific bank. Parallely, the short message service is send to the

customer mobile number with the details of the demand draft. (Otto, J. A. 2003) (Starrs, E. 2008)

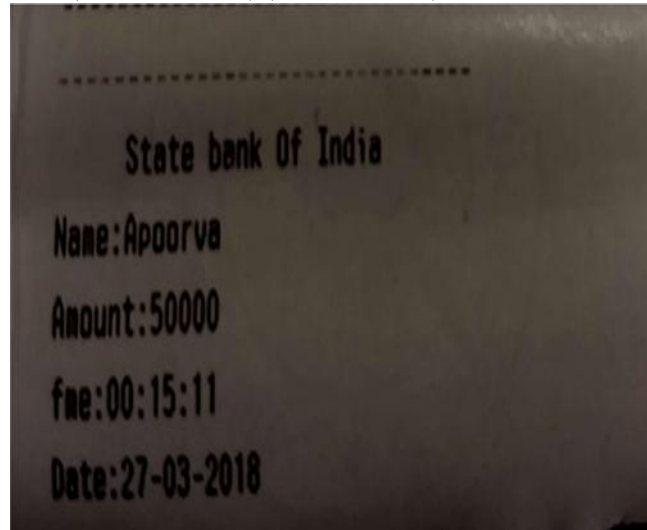


Figure4: Demand draft generated



Figure 5: Text message sent after demand draft withdrawal

The AES algorithm is used for security to store all the information in the server in the secure way. In cryptography, the term AES is officially known as Advanced Encryption Standard(AES). AES is fast and secure form of encryption that keeps prying eyes from our data. Encryption, the first thing that happens is that your plaintext is separate into blocks. The block size of AES is available with 128 bits, 192, 256 bits. We have used 192 bits block size of AES algorithm for ensuring the privacy and security of the customers. The following are the details of the AES algorithm. Depending upon the key size the number of rounds can be used as 10 or 12 or 14.

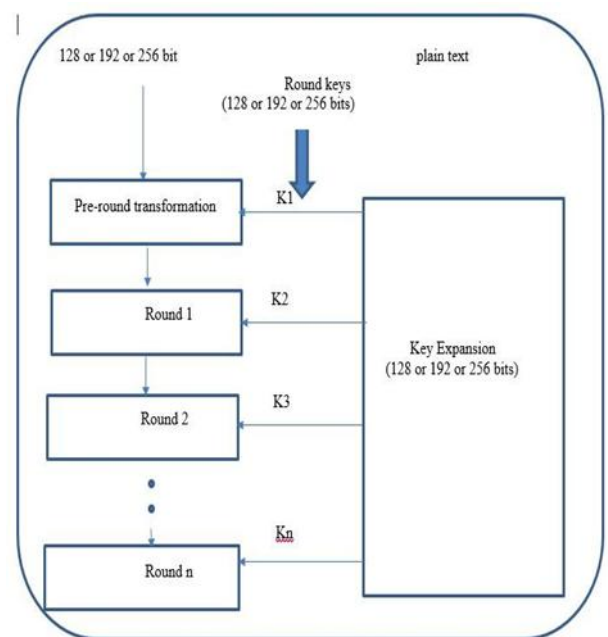


Figure 6: AES Encryption architecture

KeyExpansion—round keys are consequent from the encryption key using Rijndael's key_schedule. AES requires a either a 128-bit or 192 or 256 bit round key for each and every round plus one more.

2. Initial round key addition:

a. AddRoundKey step, the subkey is combined with the state with a round key block. The subkey is derived from the main key using Rijndael's key schedule. The subkey is same as state of the block size. Each byte of the state is combined with the subkey is using the bitwise XOR operation.

3.3. In 9, 11, 13 rounds

- i. In the SubBytes stage, using an 8-bit substitution box, each byte in the state array is substituted with a SubByte. The substitution-box is resultant from the multiplicative inverse above GF(28). In order to avoid attacks, S-box is made by combining the inverse function.
- ii. The ShiftRows step drives on the rows state, each row are shifted the bytes by a certain offset. First row is left side is unchanged, each byte of the second row is shifted one to the left. For AES, the first row is left unchanged. Each byte of thesecond row is shifted one to the left. Likewise, the 3rd and 4th rows are shifted by offsets of 2 and 3 correspondingly. In this method, the output state of each column of the ShiftRows step is collected.
- iii. The MixColumns step, the 4 bytes of each column state are joined using an invertible linearTransformation. The Mixcolumns function proceeds 4 bytes as input and outputs 4 bytes Together with ShiftRows, MixColumns provides diffusion in the cipher.
- iv. Agin AddRoundKey step is performed.

4. Final round (making 10 for 128 bits, 12 for 192 bits or 14 rounds for 256 bits):

a. Again the SubBytes, ShiftRows, AddRoundKey are performed.

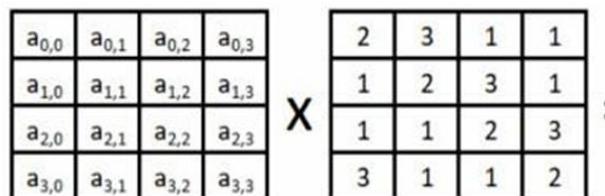


Figure 7 : mix columns step

VI. SOLUTIONS TO THE SHORTCOMINGS OF CURRENT SYSTEM

The proposed system provides the remedies for the failures in the existing system in the following ways:

The number of interbank transactions would be reduced and the manpower overhead will also be considerably reduced. The main purpose of 24x7 availability of ATM terminals as mini banks will be properly served.

The problem of non-availability of financial institutions at a certain place will also be overcome. The amount will be debited once the demand draft has been deposited in the desired financial institution.

VII. CONCLUSION AND FUTURE SCOPE

The ATM machines globally are much underutilized and do not exactly serve the purpose of “mini banks” that they were meant for. Generation of demand draft from an ATM terminal requires considerably less changes in the overall architecture of an ATM and will be more convenient for the customers to use. It would reduce the bank overheads considerably by reducing the manpower and time that goes into the existing process of demand draft generation.

For cancellation of demand draft it is suggested that a new demand draft should be printed because once the demand draft has been generated there is no scope for editing. The procedure to sign the Demand draft digitally and to verify the demand draft using a proxy server can be done in the future.

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