

# Image Processing Approach for INR Currency Note Number Recognition System for Automated Teller Machines

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**Abstract:** In this paper an algorithm is proposed for real time application to an existing automated teller machine (ATM) using image processing in currency note number recognition. Sometimes getting fake currency notes from ATM nowadays has become a major issue leading to an ultimate loss to common people. Common people are afraid to complain regarding this to respective banks and live in hope that may recover their money from respective banks. An algorithm is developed for automatically noting and saving the currency note number to server at the time of withdrawal, so that customers are benefitted in recovering their currency back. The proposed algorithm makes the ATMs more reliable, user friendly and efficient usage to the customers.

**Keyword:** Character recognition, Currency note number, Image Processing, Fake Currency, ATM.

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## 1. INTRODUCTION

Fake currency notes from ATMs are becoming a major problem across the country, which has created an alarming situation for the banking system. Such kind of currency notes from ATMs shows the strong flow of fake notes. Common man who is drawing notes from ATMs is in loss. Banking system is not affording to take the responsibility of such fake currency from ATM which does not produce effective evidence. Banks are rejecting such situations that customers are getting fake notes from their ATM machines. Since, it's very difficult to prove the source of fake notes, so at last the person gets nothing even after a complaint. This can be overcome by noting the currency note numbers at customer side and at bank databases. As manual process of noting down the INR (Indian Rupee) currency note numbers both at the customer side and by bank authority is tedious. An automated system is proposed in this paper for reading the INR note numbers at the ATM machines, using image processing. As we all know that character recognition, online/offline handwriting recognition and printed character recognition are the research areas that have been received a lot of attention since 1960's which plays an important role in industrial applications and financial transactions. Many research articles have been proposed which results in the fields of bank cheque

Processing [1], Zipcode [2], car license plate recognition [3]. Minimal studies are carried out on automatic recognition of bank note serial numbers [4][5][6], which is beneficial in reducing financial crime.

The proposed system investigates INR serial numbers, which are printed at right top corner and bottom left corner on Indian currency note numbers consists of 9 characters first three are prefix and the last six are the serial number. The first character of the prefix is numeral

and next two are alphabets. Currency note number will be extracted and recognized from the image and is noted, stored in database of respective banks.

The flow of research article is Section II presents the existing system; Section III is the proposed system for currency note number and reading mechanism which will be followed by sequence diagram for transactions in ATM machines. Section IV describes experimental results.

## 2. EXISTING SYSTEM

ATMs are one of the real-time front terminals which are supported by the central bank server and a centralized account database [7]. The existing machine is simple in operating which follows basic steps that include insertions of ATM card to machine, enter PIN, select money to be withdraw and exit. ATM machine also offers cheque deposit facility through cheque box, where the customer can do transactions as needed. People also use ATM cards for online bill payments such as electricity and telephone bills. ATM is the most convenient to access the accounts and financing transactions. The given existing ATM algorithm and flow chart describes the operation of ATM as in figure 1 during withdraw of notes from the ATM machine. However the machine doesn't know that the note is fake or original notes.

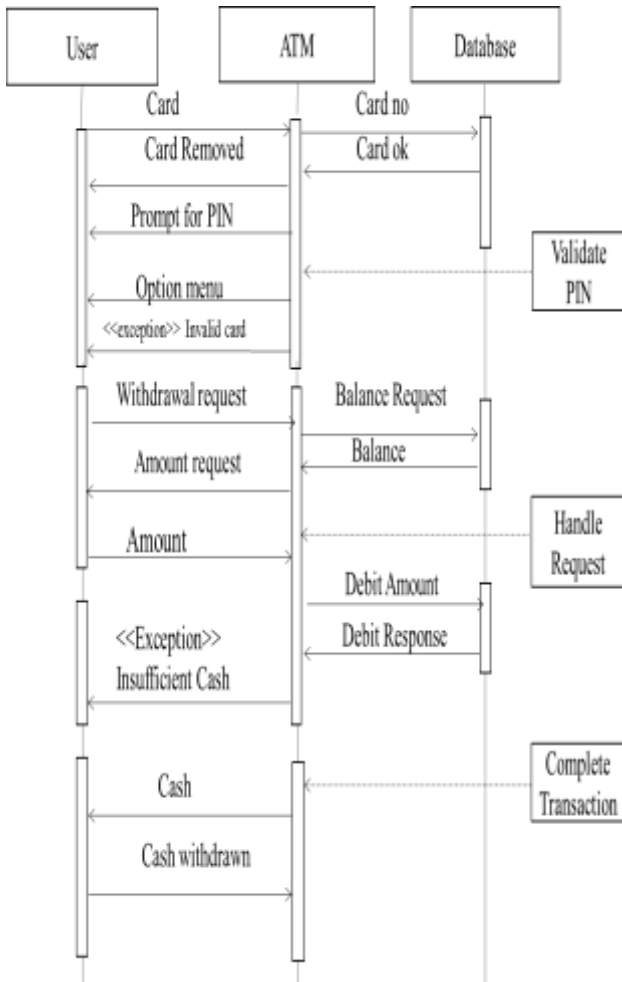


Fig. 1. Existing ATM Sequence Diagram using Pin

1. Customer swipes the ATM card in the Machine.
2. System will validate card number prompts for entering the PIN by customer.
3. Customer enters PIN number and system validates PIN.
4. The System provides an option to the customer whether to withdrawal or to check balance etc.
5. Customer will enter the amount and selects the submit Option on the cash withdrawal screen.
6. The amount entered by the customer will be verified by the machine for availability of cash requested by the customer and asks for the acknowledgement receipt of the transaction.
7. The customer selects 'Yes' on the Screen.
8. The system provides the cash, prints the receipt on customer request.

### 3. PROPOSED SYSTEM

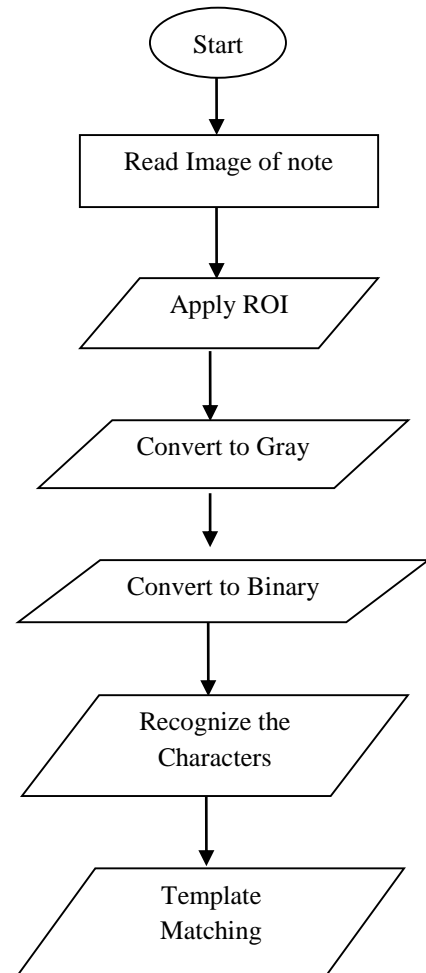
The research article is proposed to design and enhance security and satisfaction of the customer by avoiding any fake note during withdrawals from the ATM. For an existing ATM system we are proposing and image processing based algorithm for reading mechanism of INR currency note number which is capable of storing that number in the banks database and as

well as customer acknowledgement receipt during the time of withdrawals from the ATMs.

A simple algorithm is designed in image processing for reading the INR note number. The DIP is an area characterized by the need for extensive experimental work to establish the validity of proposed solutions to a given problem [9]. It encompasses processes whose inputs and outputs are images and encompasses processes that extract attributes from images up to and including the recognition of individual objects. This proposed system can be applied for Fake currency detection and counting machines respectively.

The proposed work is suitable for real time application system which will work on an image captured either by scanner or camera. The algorithm for discussed currency note number is implemented as follows.

- a. Image of paper currency will be acquired by simple scanner or digital camera.
- b. The image acquired is RGB image and then it will be converted into gray scale.
- c. Resize whole image and apply ROI for INR note number.
- d. Convert to Binary
- e. Recognise the characters.
- f. Load Template
- g. Extract letter
- h. Resize letter same as the template
- i. Match the extracted letters with the template.
- j. Display numbers and print.



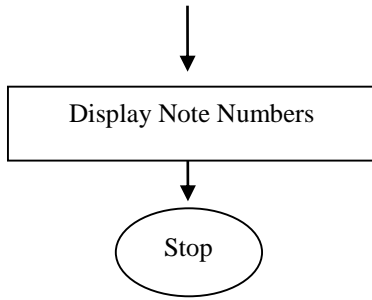


Fig. 2. Flow Chart for Currency Note no. recognition

The proposed ATM algorithm and Sequence diagram [10] describes the operation of ATM during withdrawal of currency notes by the customer from the ATM machine.

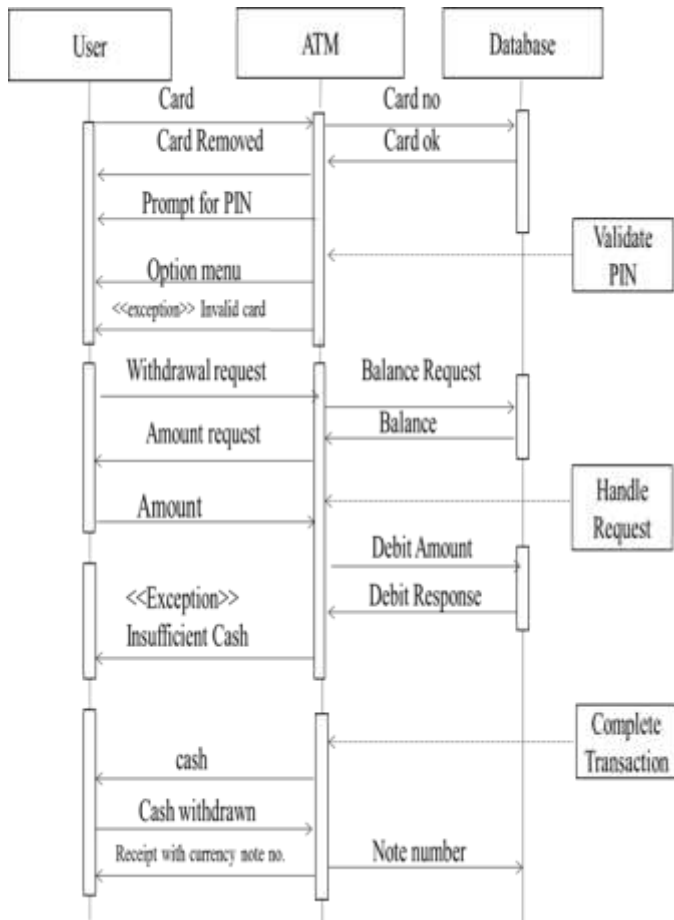


Fig. 3. Cash Withdrawal from ATM by Customer

The following describes the procedure stated in the flow diagram as illustrated in Figure 2:

1. Customer swipes the ATM card in the Machine.
2. System will validate card number prompts for entering the PIN by customer.
3. Customer enters PIN number and system validates PIN.
4. The System provides an option to the customer whether to

Withdrawal or to check balance etc.

5. Customer will enter the amount and selects the submit Option on the cash withdrawal screen.
6. The amount entered by the customer will be verified by the machine for availability of cash requested by the customer and asks for the acknowledgement receipt of the transaction.
7. The customer selects 'Yes' on the Screen.
8. The system asks the customer to collect the cash, prints the receipt with currency note numbers and updates the account balance of the customer and also in their respective bank database.

Advantages

Makes the banking system more reliable and user friendly especially to customers.

#### 4. EXPERIMENTAL RESULTS

The experimental results for reading the Indian currency note number is conducted offline as per the algorithm proposed in section III using image processing. The results has been tested on an Intel core i3 CPU, 3.20GHz, 2GB RAM. For experimental purpose ten notes of one thousand rupee currency note is considered for reading its serial number which is printed at right top corner of currency note. Following figure illustrates the experimental results.



Fig. 4. Input Image



Fig. 5. ROI Extracted

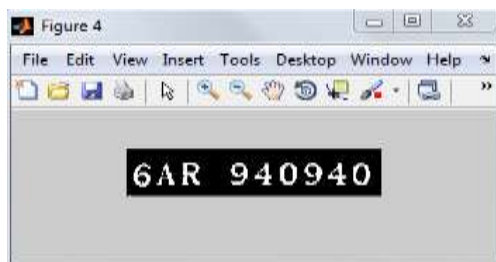


Fig. 6. Binary Image

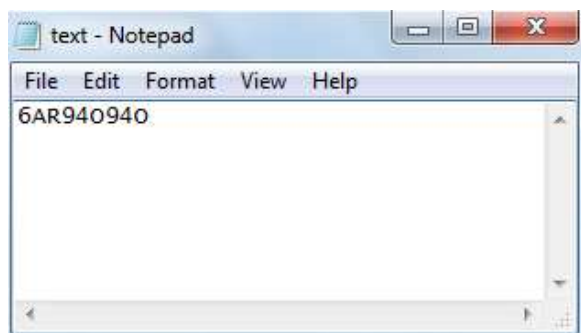


Fig. 7. Number Panel display of INR note

## 5. CONCLUSION AND FUTURE WORK

The proposed system mainly focuses on reading mechanism of Indian currency note number recognition using image processing for the existing ATM machines. This proposed system make the machines more efficient and user friendly especially to customers at the time of withdrawing money from ATM machines. The algorithm developed is tested for 1000 rupee notes which provides an accuracy of 86% for serial number extraction of Indian rupee currency note number and takes 0.568079 seconds for its execution.

Reading Mechanism for recognizing the currency note number for 500,100 Indian currency denomination has to be enhanced. This proposed system can be implemented to fake currency detecting machines and counting machines respectively. Additional study should be done on ATM network and server according to proposed system in this paper using parallel computation.

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